ORIGINAL ARTICLE

Risk Factors Contributing to Dyslipidemia among Female School Teachers

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Abstract:

Background: Dyslipidemia is a major risk factor of cardiovascular diseases. *Aim and Objectives:* The objective of the present study was to determine risk of dyslipidemia among female school teachers along with various factors contributing with it. *Material and Methods:* This cross sectional study was carried out among 175 female school teachers in Chennai city. Anthropometric measurements such as height, body weight and waist circumference were measured. BMI was calculated and blood pressure was recorded. Biochemical parameters such as fasting blood sugar and serum lipid profile were also analyzed. *Results:* From the results, it was clear that 34.29% of teachers had hypercholesterolemia, 12% had hypertriglyceridemia, 9.71% had mixed hyperlipidemia and 81.71% had low High Density Lipoprotein-Cholesterol (HDL-C) levels thereby indicating the risk of developing coronary heart disease. Factors such as age, intake of junk foods and increased consumption of refined cereals was significantly associated with dyslipidemia. *Conclusion:* The study clearly highlights the need for conducting regular routine screening programs as early screening and diagnosis for non-communicable diseases creates awareness on the importance of leading a healthy life style and also helps in prevention of further progression of the disease.

Keywords: Awareness, Dyslipidemia, Life Style, Lipid Profile

Introduction:

Globally, cardiovascular diseases are considered to be the prime causative factor for death. The term cardiovascular disease includes atherosclerotic vascular diseases such as Coronary Heart Disease (CHD), Cerebrovascular Disease (CVD), and the Peripheral Arterial Disease (PAD) [1].

The risk of developing cardiovascular disease is high among developing countries like India. Indians have 3-4 times higher risk of coronary artery disease than white Americans, 6 times higher than Chinese, and 20 times higher than Japanese [2]. In India, the prevalence of CHD is 3.7%. The prevalence is 6.1% and 6.7% in urban India (men and women) while in rural India the prevalence of CHD among men and women are found to be 2.1% and 2.7% respectively [3].

Dyslipidemia refers to increase in the plasma concentration of lipoproteins [4,5]. A desirable lipoprotein profile is a total cholesterol level <200 mg/dL, High Density Lipoprotein (HDL) > 40 mg/dL, and triglycerides <150 mg/dL [6]. Previous studies point out that men develop CHD much earlier than women, but in the present day scenario, women are also at a greater risk of suffering from CHD by 2-4 times [7].

Teaching is a profession that is sedentary in nature but at the same time requires long working hours [8]. Teachers spend most of the time in schools doing several tasks such as teaching students, career and curriculum development, organizing field trips, and other school administrative work

[9]. Drago *et al*. [10] reported that on an average, school teachers spend an additional of 1.75 hours extra in schools. Several studies have shown that public school teachers are also more vulnerable to develop non-communicable diseases such as Cardiovascular Disease (CVD), diabetes and hypertension [11, 12]. A study carried out by Erhun *et al*. [13] among teachers showed that teachers had low knowledge about CHD and had high prevalence of CHD risk factors. To date, very few studies have been carried out on risk of dyslipidemia among female school teachers. Hence the prime objective of the study was to determine risk of dyslipidemia among female school teachers along with various risk factors associated with it.

Materials and Methods:

This cross sectional study was carried out among 175 female school teachers in Chennai city, between June 2017 and January 2018. Convenient sampling technique was used to select the required number of teachers with no specific probability.

Inclusion criteria:

Teachers being in teaching profession for a minimum period of two years,

Willingness to participate in the study.

Exclusion criteria:

Part-time teachers were excluded.

Permission from school authorities as well as approval of study protocol by the Independent Ethics Committee was obtained before the commencement of the study. Teachers were briefed about the various anthropometric, biochemical and blood pressure assessments that would be carried out. A written informed consent was obtained individually from all teachers who wished to participate in the study. In addition, information pertaining to teacher's occupation details, dietary pattern, physical activity pattern, along with family and personal history of non-communicable diseases was obtained using a structured pre-tested questionnaire.

Anthropometric measurements:

Height (in centimeters) was measured using a wall mounted measuring tape to the nearest 0.1cm without shoes. Similarly body weight (in Kgs) was measured using a portable digital weighing machine. Waist circumference (in centimeters) was measured by measuring the distance around the waist half inch above the umbilicus (belly button) using a non-stretchable plastic measuring tape. Body mass index (BMI) was calculated as weight in kilograms divided by height in meter square.

Blood pressure:

Blood pressure was measured using an automated digital electronic device after the study participants rested for at least 5 minutes in a sitting position with the arm rested on a table. Two separate readings were taken and the average was considered as the final reading.

Biochemical parameters:

Five mL of venous blood was drawn from the mid-cubital vein after 10 to 12 hours of overnight fasting. Estimation of biochemical parameters was carried out in a standard laboratory (Lister Metropolis).

Plasma glucose was estimated using enzymatic glucose oxidase peroxidase method [14]. Enzymatic kit method developed by Allain *et al*. [15], Mc Gowan *et al*. [16] and Faasati *et al*. [17] was used to estimate serum total cholesterol and triglyceride levels respectively. Serum HDL–C was also estimated using enzymatic kit method

[18]. Lipid ratios and the following lipid parameters were calculated.

1. Serum Non – HDL = Total cholesterol – HDL
2. Serum LDL = Non – HDL – VLDL
3. Serum VLDL = $\frac{\text{Triglycerides}}{5}$
4. LDL/HDL ratio = $\frac{\text{LDL}}{\text{HDL}}$
5. CHOL/HDL ratio = $\frac{\text{Total Cholesterol}}{\text{HDL}}$

Dyslipidemia was classified according to the criteria given by the National Cholesterol Education Program-Adult Treatment Panel III and categorized into four groups

1. Hypertriglyceridemia was defined as serum triglycerides ⩾150mg/dL
2. Hypercholesterolemia was defined as total cholesterol ⩾200 mg/dL
3. Mixed hyperlipidemia was defined as triglycerides ⩾ 150 mg/dL and total cholesterol ⩾200 mg/dL.
4. Isolated low HDL-C was defined as HDL-C ⩽50 mg/dL. [19].

Statistical Analysis:

Data analysis was performed using Statistical Package for Social Sciences (SPSS version 15.0) software. Descriptive statistics such as frequency and percentage was used for categorical variables while mean and standard deviation was used for continuous variables. Chi-square test was used to study the relationship between two categorical variables. Comparison between continuous variables was carried out using independent t-test.

Results:

Teaching is a profession that has lot of commitments and teachers play a vital role as they are responsible for educating the students of future generation. One hundred and seventy five teachers handling class for primary, middle, high and higher secondary school students enrolled themselves in the present study. The age of the teachers who participated in the study ranged between 21-58 years and the mean age was 40.12±8.92. With regard to educational qualification, since teachers were chosen as the target group, all of them were graduates. Socioeconomic factors have been postulated to exert a higher impact on woman's CVD risk. In the present study, annual income was measured as the total annual income of all family members using the classification given by National Council of Applied Economics and Research [20]. According to this classification, majority of the teachers (93.7%) belonged to the middle class category as their annual income was Rs. 2, 00,000 to Rs. 10, 000,000. On an average teachers spent 7 ½ - 8 hours every day in school. With regard to teaching experience, all the teachers had minimum 3 years of teaching experience. With regard to family history of non-communicable diseases, maternal and paternal history of diabetes was evident in 29.1% and 31.4% respectively. Similarly the maternal and paternal history of diabetes was 8.6% and 12% respectively (Table 1).

Table 1: Occupational Details and Family History of Non-communicable Diseases

Particulars		Frequency	Percent
Age (Mean =40.12±8.92)	<25	11	6.3
	26-35	43	24.6
	36-45	69	39.4
	46-55	44	25.1
	>55	8	4.6
Annual income	Rs. < 90,000	3	1.7
	Rs. 2,00,000 – 10,00,000	164	93.7
	Rs. >10,00,000	8	4.6
Teaching experience	<5	41	23.4
	6-10	49	28.0
	11-15	29	16.6
	16-20	35	20.0
	21-25	12	6.9
	>25	9	5.1
Paternal history of diabetes	No	120	68.6
	Yes	55	31.4
Maternal history of diabetes	No	124	70.9
	Yes	51	29.1
Paternal history of heart disease	No	154	88
	Yes	21	12
Maternal history of heart disease	No	160	91.4
	Yes	15	8.6

Assessment of anthropometric indices indicated that teachers had a higher BMI (mean = 27.98 ± 4.35 Kg/m^2). Based on WHO BMI classification for South Asian, it can be noted that 15.43% of teachers were overweight and about 45.71% had grade I obesity [21]. Normal waist circumference cut off values is <90 cm and <80cm for men and women respectively [22]. The mean waist circumference was 87.31 ± 11.15 cm thereby indicating that majority of the teachers have abdominal obesity.

Blood pressure was categorized according to the classification given by Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure [23]. According to this classification, about 12.57% of teachers were in the pre-hypertensive stage while 19.43% of them were diagnosed with hypertension.

With regard to biochemical profile, 19.43% of teachers had fasting blood sugar greater than 100 mg/dL. The mean Low Density Lipoprotein (LDL) and non-HDL levels were also found to be higher than the optimal levels. Similarly the mean HDL (42.52± 8.36 mg/dL) was found to be low. HDL level >40 and >50 mg/dL for men and women is considered optimal for normal functioning of the heart.

From the results, it is clear that 34.29% had hyper-cholesterolemia, 12% had hypertriglyceridemia, 9.71% had mixed hyperlipidemia and 81.71% had isolated low HDL levels thereby indicating the risk of CHD (Table 2).

Table 2: Mean Anthropometric, Blood Pressure and Biochemical Parameters

Anthropometric Measurements	Height (cm)	156.17± 5.23	
	Body weight (Kgs)	68.43± 11.86	
	Waist circumference **Mean=87.31±11.15 cm**	<80 cm	39(22.29)
		>80 cm	136(77.71)
	Body Mass Index (BMI) **Mean = 27.98± 4.35 Kg/m^2**	<18.5 Kg/m^2	3(1.72)
		18.5–22.9 Kg/m^2	16(9.14)
		23–24.9 Kg/m^2	27(15.43)
		25–29.9 Kg/m^2	80(45.71)
		30–34.9 Kg/m^2	38(21.71)
		>35 Kg/m^2	11(6.29)
Blood pressure	Systolic blood pressure **Mean = 114.86 ± 15.96 mmHg** Diastolic blood pressure **Mean =73.17 ± 9.67 mmHg**	Normal	119(68)
		Pre-hypertension	22(12.57)
		Hypertension	34(19.43)

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Biochemical parameters	Fasting blood glucose **Mean= 94.48 ±22.18**	<100 mg/dL	141(80.57)
		>100 mg/dL	34(19.43)
	Total Cholesterol **Mean= 184.02± 37.25**	<200 mg/dL	115(65.71)
		>200 mg/dL	60(34.29)
	Triglycerides **Mean= 100.91± 40.50**	<150 mg/dL	154(88)
		>150 mg/dL	21(12)
	High density lipoproteins **Mean= 42.52± 8.36**	<50 mg/dL	143(81.71)
		>50 mg/dL	32(18.29)
	Low density lipoproteins **Mean= 121.35± 33.08**	<100 mg/dL	45(25.71)
		>100 mg/dL	130(74.29)
	Non – high density lipoprotein **Mean= 141.53± 36.72**	<159 mg/dL	120(68.57)
		>159 mg/dL	55(31.43)
	Very low density lipoprotein **Mean= 21.29± 17.28**	<30 mg/dL	154(88)
		>30 mg/dL	21(12)

Figure in parentheses indicates percentage

Teachers who participated in the study were divided into two groups: with (N= 60) and without dyslipidemia (N= 115). Atherogenic dyslipidemia is a prime clinical outcome that is repeatedly associated with metabolic syndrome. High total cholesterol levels (>200 mg/dL) was seen in 34.29% of teachers. Table 3 depicts a statistically significant difference ($p<0.01$) in lipid parameters among teachers with dyslipidemia in comparison with those who did not have dyslipidemia. Likewise, a significant difference in the systolic and diastolic blood pressure levels was noted in teachers with and without dyslipidemia ($p<0.05$).

Findings of the study indicate that age was significantly associated with dyslipidemia ($p<0.01$). With modernization and urbanization, number of eating outlets has increased that has led to increased consumption of foods that are rich in saturated fats, high in simple carbohydrates and low in micronutrients such as vitamins and minerals. The present study indicates that modifiable lifestyle determinants such as intake of junk foods and consumption of refined cereals were significantly associated with obesity (Table 4).

Table 5 depicts that about 7.43% of teachers were currently diagnosed with hypertension. On analyzing the serum lipid profile, it was clear that 32% of teachers were found to be dyslipidemic, while 12% of them had fasting blood sugar more than 100 mg/dL. Results of the present study indicates that early screening and diagnosis of non-communicable diseases provides an opportunity to render appropriate interventions that helps to prevent further progression and develop complications that are associated with it.

Table 3: Blood Pressure and Biochemical Parameters of Teachers With and Without Dyslipidemia

Variable	Dyslipidemia		p value
	Present (N=60)	Absent (N=115)	
Systolic blood pressure	118.62±15.59	112.90±15.89	0.024*
Diastolic blood pressure	75.75±8.21	71.82±10.13	0.010*
Fasting blood glucose	97.37± 24.68	92.97±20.72	0.215NS
Triglycerides	124.45±37.70	88.63±36.39	0.000**
HDL	43.82±7.65	41.84±8.67	0.139NS
Non-HDL	180.25±24.83	121.33±23.19	0.000**
LDL	155.36±25.23	103.61±20.36	0.000**
VLDL	28.22±26.48	17.68±.37	0.000**
Cholesterol-HDL ratio	5.27±1.08	4.07±1.14	0.000**
LDL-HDL ratio	3.67±0.94	2.61±0.91	0.000**

*** Significant at p<0.01 *Significant at p <0.05 NS Not significant;*
HDL - High Density Lipoprotein, LDL - Low Density Lipoprotein, VLDL - Very Low Density Lipoprotein,

Table 4: Risk Factors Associated with Dyslipidemia

Risk factor		Dyslipidemia		p value
		Yes	No	
Age	<25	2	9	0.006**
	26-35	12	31	
	36-45	22	47	
	46-55	24	20	
	>55	0	8	
Type of diet	Vegetarian	5	13	0.750NS
	Non-vegetarian	54	101	
	Ovo- vegetarian	1	1	

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Risk factor		Dyslipidemia		p value
		Yes	No	
Habit of eating out	Yes	50	104	0.220^{NS}
	No	10	11	
Physical activity	Yes	50	80	0.068^{NS}
	No	10	35	
Habit of snacking	Yes	55	109	0.514^{NS}
	No	5	6	
Consumption of junk food	Yes	21	58	0.040^{*}
	No	39	57	
Intake of refined cereals	Yes	24	73	0.006^{**}
	No	35	42	

** Significant at p<0.01 *Significant at p <0.05 NS Not significant

Table 5: Distribution of Teachers According to Past History and Newly Identified Subjects with Hypertension, Dyslipidemia and Elevated Blood Sugar

Condition	Previously diagnosed	Currently diagnosed
Hypertension	8(4.57)	13(7.43)
Dyslipidemia	4(2.29)	56(32)
Elevated blood sugar	17 (9.71)	21 (12)

Figure in parentheses indicates percentage

Discussion:

Globally, dyslipidemia is an evolving public health problem and is one of the major modifiable cardio vascular disease risk factors. Factors such as unhealthy diet, leading a sedentary lifestyle coupled with stress contribute to this. Sedentary work is defined as a job that includes majority of the time spent in sitting, with occasional walking and standing [24]. Though teaching job is sedentary in nature, school teachers are overwhelmed with several tasks such as delivering cognitive knowledge, excessive pressure to finish academic portions on time, conducting remedial classes to improve student performance in exams, doing administrative work

along with enabling the students to developing various skills required for personal growth and social development. Teachers are also at a risk of developing non-communicable diseases due to certain factors such as stress, being physically inactive along with unhealthy dietary habits that are commonly seen in them.

In the present study, prevalence of dyslipidemia (hypercholesterolemia) among female school teachers was 34.29%. Awosan *et al*. [25] reported the prevalence of hypercholesterolemia among school teachers to be 33.3%. Similarly, a cross sectional study conducted by Greiw *et al*. [11] 2010 in Benghazi, on 1200 school teachers, showed the prevalence rate of coronary heart disease and ischemic heart disease to be 15.1 % and 2.7% respectively. Factors such as age, gender, family history of hypertension, higher BMI, fasting blood sugar and low levels of HDL was significantly associated with it.

Findings of the present study showed that factors such as age, consumption of junk foods and intake of refined cereals was significantly associated with dyslipidemia. Several scientific research studies indicate that during aging, the ability to control blood sugar, serum lipid profile and blood pressure declines as a result of which the risk of developing diabetes, cardiovascular diseases and hypertension increases.

In today's scenario, individuals have the habit of consuming high-calorie fast foods. These foods are basically rich in refined carbohydrate, sodium, saturated fats, trans fatty acids, and poor in essential micronutrients [26]. The Multi-Ethnic Study of Atherosclerosis (MESA) conducted by Jennifer *et al*. [27] showed that frequent consumption of fried foods, refined grains, red or processed meat was positively associated with risk of cardio vascular disease. Consumption of fried and junk foods have been associated with risk of hypertension [28] diabetes [29] low HDL levels, larger waist circumference [30] and generalized obesity [31]. A three year follow-up of adults showed that each one unit increase in fast food consumption (1 time/week) was associated with 0.13 increase in BMI [32] Similarly Bahadoran *et al*. [33] reported that fast food consumption was significantly associated with low HDL-C and increased blood sugar among middle-age adults.

Bakhotmah [34] in his study on dietary practice of school teachers showed that food items such as bread, cheese sandwiches, fried foods along with beverages such as tea were commonly consumed as snacks. Ramel *et al*. [35] also reported that a hamburger meal comprising of hamburger, bacon and cola drink was associated with higher postprandial serum levels of glucose and insulin than a healthy meal with fiber rich sour-dough rye bread along with salad with vinegar.

The risk of developing dyslipidemia and diabetes also depends upon the type of carbohydrate consumed [36]. Refined carbohydrates are those carbohydrates that have the ability to increase the blood sugar level in the body. Sources include food items such as sweets, rolls, cakes, white bread, pasta, biscuits and pizza [37] Diet rich in simple carbohydrates increases fasting triacylglycerol concentrations, by increasing hepatic synthesis of VLDL, and reducing HDL-C in women [38].

One contributing factor to rapid increase in non-communicable diseases is lack of knowledge and awareness on early diagnosis and management of the same [39]. Hence there is need to promote knowledge and awareness of these conditions and its associated complications [40]. The findings of the present study therefore indicate the need to

have screening risk factor program at regular intervals for teachers that will help in creating awareness which will enable them to lead a healthy lifestyle.

Conclusion:

Globally, dyslipidemia is a major escalating public health problem and various factors such as urbanization, following unhealthy dietary habits coupled with leading a sedentary lifestyle increases the risk of developing dyslipidemia. Results of the present study showed that dyslipidemia is a significant health problem among school teachers and hence effective health promotive measures along with regular screening programs for non-communicable diseases needs to be provided in workplaces for teachers.

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