Effect of Nutritional Counselling on Risk Level of Dyslipidemia in Type 2 Diabetics

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Abstract

The study entitled Effect of Nutritional Counselling on Risk Level of Dyslipidemia in Type 2 Diabetics was carried out at Sardar Patel Medical College and Hospital, Bikaner city. For the purpose, 180 type II diabetics, belonging to the middle income group were selected. The selection of the subjects was done on the basis of the duration of the disease : diabetics suffering from, last 5 years (stratum I) and last 10 years (stratum II). Further each strata was divided on the basis of BMI into obese, normal weight and underweight group with equal number of males and females in each group. General information like subjects' age, sex, income, educational status, occupational status, food habits and type of life style were studied. Past history of the subjects in relation to diabetes like age at onset of disease, duration of disease, history of disease in the family, associated diseases and symptoms occurring on hyperglycemia were also studied. The lipid profile of the subjects was assessed in relation to total cholesterol, triglyceride and HDL cholesterol. Data on lipid profile was collected twice, first record was taken at starting of the study (prior to counselling) and the second after 3 months of nutrition counselling. Maximum per cent of subjects (55.55%) were falling in the age group of 45-55 years at the time of study. The mean age at the onset of diabetes was 47 years. Thus, maximum number of subjects suffered from diabetes above 40 years of age. Data regarding serum cholesterol and serum triglycerides stated that prior to counselling subjects were at 'high' and 'high moderate risk' of dyslipidemia, respectively. Further, subjects of stratum II were noted for significantly ($P<0.01$) higher levels of serum cholesterol and triglycerides prior to counselling. But impact of counselling was clearly noted by the significant ($P<0.005$) decrease in the levels, with majority of the subjects noted for 'low risk' of hyperlipidemia for both serum cholesterol and triglycerides level. The difference in between the two strata was non significant after the counselling. A non significant difference in HDL-C level of the subjects was noted within and in between the two strata with 'moderate risk' of hyperlipidemia noted at both prior and after the counselling.

Keywords: Non insulin independent diabetes mellitus; Dyslipidemia; Total cholesterol; Triglyceride level; High density lipo protein; Nutrition counselling.

Introduction

Diabetes mellitus (DM) is one of the leading health problems and contributing significantly to morbidity and mortality and adversely affecting both the quality and length of life. Diabetes is a disease that should be prevented and/or controlled, as it cannot be cured completely. The approach for the treatment of diabetes has been radically changed in the recent decades. Due to advanced technologies, diabetes is now one step closer to control by means of diet management, insulin/hypoglycemic drugs and exercise along with other life style changes.[1] In the past 30 years, the prevalence of Diabetes Type 2 has skyrocketed to such an extent that it is now viewed as an epidemic in the western world. From being a once fairly mild and rare ailment of the elderly to becoming a chronic disease, diabetes mellitus affects people of every age, race, and background, and is now a major modern cause of premature death in many countries

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around the world,

In fact, the success of treatment of diabetes mellitus largely depends upon effective motivation of the patients, for which education is the best way. Education has now become an integral part of managing diabetes and has proved to improve the various outcomes. Proper nutrition education and individual counselling help the patients to understand the disease and follow the therapy effectively. This in turn reduces the risk of complications to a greater extent and improves the quality of life.[2]

The role of diet management in diabetes has now been well recognized all over the world. Diet and exercise are so powerful tools that they free many of the patients from medications and insulin doses. Several long term studies have unequivocally proved the prime importance of calorie restricted well balanced diet in the treatment of disease. The diabetic diet is not complete deviation from the normal diet rather the vital aspect is routine of meals and quantity of food consumed.

Thus, to equip the patients with skill, knowledge and attitudes, to enable them to solve their health problems and better living with diabetes, the present investigation "Effect of Nutritional Counselling on risk level of Dyslipidemia in Type 2 Diabetics",was framed with the objective to find out the risk level of dyslipidemia in type II diabetics and to correlate the effect of nutrition counselling and risk level of dyslipidemia with the duration of disease and body mass index of the diabetics.

Material and Methods

Methodological aspects related to present study have been described in following phases:

Phase I: Selection of the Samples

Bikaner is one of the 7 divisions of Rajasthan having 5 sub-divisions. Bikaner division was chosen as the area for study. Further, those subjects were chosen who were residing in urban area of the Bikaner city. Purposive sampling method was undertaken to select the patients. Diabetic patients who were registered at Govt. Sardar Patel Medical College and hospital, Bikaner as outdoor patients were taken under the study group. The study was conducted on 180 middle aged diabetics. All subjects belonging to the middle income group were taken for the study.

Only those subjects were chosen for the study who were suffering from type II diabetes mellitus i.e. non insulin dependant diabetes mellitus and were only on oral hypoglycemic drugs for the treatment of the disease and not on insulin. Availability and willingness of the subjects to cooperate and participate during the course of the study were considered while selecting and recording the various information required.

The collection of sample was based on the duration of disease. The total sample was divided into 2 strata. Stratum I included diabetics suffering from last 5 years and stratum II included diabetics suffering from last 10 years. Further each strata was divided on the basis of BMI (Body Mass Index) into 3 categories i.e. Obese, normal weight and underweight. Further equal number of males and females were studied under each category.

General information like subjects' age, sex, income, educational status, occupational status, food habits and type of life style were studied. Past history of the subjects in relation to diabetes like age at onset of disease, duration of disease, history of disease in the family, associated diseases and symptoms occurring on hyperglycemia were also studied for effective counselling of the diabetics.

Phase II: Assessment of Risk Level of Dyslipidemia Prior and after Nutritional Counselling

Body fat pattern has been reported to be strongly associated with lipid concentration. The lipid profile of the subjects was assessed to find out the risk level of dyslipidemia. The most common pattern of dyslipidemia in type 2 diabetic patients is elevated total cholesterol,

triglyceride and decreased HDL cholesterol levels. Venous blood samples were collected from all the subjects after at least 8 hrs fasting. The sera were analysed for total cholesterol, triglycerides (TG) and high-density lipoprotein cholesterol (HDL). The blood samples were collected using anticoagulants. The serum total cholesterol was determined by enzymatic ERBA Test. The serum triglycerides was estimated by semi auto analyzer using enzymatic kits as described by Jacobs and Denmark.[3] The HDL cholesterol is estimated using ERBA cholesterol reagent as described by Miller.[4] The level of lipid proflile given by WHO was used to find out the risk level of dyslipidemia.[5]

Data on lipid profile was collected twice, first record was taken at starting of the study (prior to nutrition counselling) and the second after 3 months of nutrition counselling. Extreme efforts were done to train the patients to understand the disease and to help themselves to cope up with everyday demands of diabetes and to regulate it. For the purpose, a booklet was also prepared with the title "madhumeh ke sath jiye masti se". Complete information regarding etiology of diabetes and management of the disease was discussed in detail in the booklet. The booklet was prepared after thorough study of books, discussion with experts and on the basis of work experience in hospitals. Main three principles of management of diabetes were considered namely diet, drug and exercise in the detailed in booklet. Acute and chronic complication of diabetes were explained with the help of coloured photos so that subjects can be aware of the severity of the disease if not handled carefully. Exercise part was explained to the subject so that they can do these exercises by their own at home.

Next, the individual counselling method was opted to educate about the disease, for each of the patient. Education and counselling were imparted in a friendly environment. The education programme was rigorously evaluated to determine their outcomes, cost effectiveness and to optimize the method of counselling. No education programme can be said completed without evaluation of outcomes and desirable changes. Some possible biochemical measurements related to lipid profile, which are simple and easy to perform and at the same time giving the maximum information on risk level of dyslipidemia, were chosen for the present study.

Results and Discussion

The results of the present investigation are discussed as follows:

Bikaner is one of the 32 districts of Rajasthan (India) and occupies about 8 per cent area of the state. The number of diabetics in Bikaner city is increasing with a rapid rate for which heredity, ignorance and lack of knowledge are the main causative factors. Diet, drugs/insulin and exercise are the three main horses on which management of diabetes runs. Slight modification of diet according to the disease not only helps the patients to control diabetes but also fulfills the daily need of nutrients for the body. Along with the balanced diet, natural hypoglycemic foods also prove very beneficial in curing dyslipidemia and also have no side effects as compared to drugs. The most common pattern of dyslipidemia in type 2 diabetic patients is elevated cholesterol levels, triglyceride levels and decreased HDL cholesterol levels. Impaired lipid metabolism resulting from uncontrolled hyperglycaemia has been implicated in cardiovascular complications in diabetes patients. The aim of this study was to examine the impact of glycaemic control on the lipid profile of diabetic patients.

The mean age at the onset of diabetes was 47.0 years and 46.2 years for the subjects of stratum I and stratum II, respectively (Table 1). Comparing the data according to the sex, the results revealed that incidence of diabetes was slightly earlier in females as compared to males, although the difference was not significant. This may be due to the fact that menopause also occurs in between the age of

Table 1: Mean Age (in Years) of Diagnosis of the Diabetics

BMI	Obese		Normal weight		Underweight		Total		Overall
	M	F	M	F	M	F	M	F	
Stratum I									
Age (yrs)	47.2	45.4	48.2	48.3	47.5	45.7	47.6	46.4	47.0
± S.E.	± 2.26	± 1.95	± 1.72	± 1.87	± 1.71	± 1.71	± 1.13	± 1.06	± 0.77
Stratum II									
Age (yrs)	46.7	44.5	47.5	49.4	45.5	43.7	46.5	45.8	46.2
± S.E.	± 1.96	± 1.78	± 1.87	± 1.73	± 1.71	± 1.78	± 1.07	± 0.99	± 0.73
F Value	0.24	0.534	1.042	0.981	2.10	0.699	1.67	2.08	0.194

Table 2: Per Cent Distribution of the Diabetics According to the Risk Level of Cholesterol Dyslipidemia, Prior and after Counseling (Stratum I)

Cholesterol (mg/dl)	Risk	Obese		Normal weight		Under weight		Total		Overall
		M	F	M	F	M	F	M	F	
<200										
Prior Couns.	Low	13.33 (2)	--	13.33 (2)	26.67 (4)	40.00 (6)	46.67 (7)	22.22 (10)	24.44 (11)	23.33 (21)
After Couns.		40.00 (6)	53.33 (8)	46.67 (7)	46.67 (7)	66.67 (10)	60.00 (9)	51.11 (23)	53.33 (24)	52.22 (47)
201-239										
Prior Couns.	Moderate	6.67 (1)	13.33 (2)	33.33 (5)	6.67 (1)	33.33 (5)	33.33 (5)	24.45 (11)	17.78 (8)	21.11 (19)
After Couns.		33.33 (5)	33.33 (5)	46.67 (7)	13.33 (2)	33.33 (5)	40.00 (6)	37.78 (17)	28.89 (13)	33.33 (30)
> 240										
Prior Couns.	High	80.00 (12)	86.67 (13)	53.34 (8)	66.66 (10)	26.67 (4)	20.00 (3)	53.33 (24)	57.78 (26)	55.55 (50)
After Couns.		26.67 (4)	13.34 (2)	6.66 (1)	40.00 (6)	--	--	11.11 (5)	17.78 (8)	14.45 (13)

Figures in parenthesis denote no. of subjects   Counselling wise $\chi^2_2 = 34.12^{***}$ (P<0.001)

Table 3: Percent Distribution of the Diabetics According to the Risk Level of Cholesterol Dyslipidemia, Prior and after Counseling (Stratum II)

Cholesterol (mg/dl)	Risk	Obese		Normal weight		Under weight		Total		Overall
		M	F	M	F	M	F	M	F	
<200										
Prior Couns.	Low	6.67 (1)	--	20.0 (3)	13.33 (2)	46.66 (7)	--	24.44 (11)	4.44 (2)	14.44 (13)
After Couns.		53.33 (8)	13.33 (2)	53.33 (8)	53.33 (8)	60.00 (9)	66.67 (10)	55.56 (25)	44.44 (20)	50.00 (45)
201-239										
Prior Couns.	Moderate	-- (--)	--	6.67 (1)	13.33 (2)	26.67 (4)	80.00 (12)	11.11 (5)	31.11 (14)	21.11 (19)
After Couns.		40.00 (6)	86.67 (13)	33.33 (5)	26.67 (4)	26.67 (4)	33.33 (5)	33.33 (15)	48.89 (22)	41.11 (37)
> 240										
Prior Couns.	High	93.33 (14)	10.00 (15)	73.33 (11)	73.34 (11)	26.67 (4)	20.00 (3)	64.45 (29)	64.45 (29)	64.45 (58)
After Couns.		6.67 (1)	--	13.34 (2)	20.00 (3)	13.33 (2)	-- (--)	11.11 (5)	6.67 (3)	8.89 (8)

Figures in parenthesis denote no. of subjects Counselling wise $\chi^2_2 = 61.28^{***}$ (P<0.001)

Table 4: Percent Distribution of the Diabetics According to the Risk Level of Triglycerides Dyslipidemia, Prior and after Counseling (Stratum I)

Triglycerides (mg/dl)	Risk	Obese		Normal weight		Under weight		Total		Overall
		M	F	M	F	M	F	M	F	
<120 Prior Couns. After Couns.	Low	6.67 (1) 53.33 (8)	13.33 (2) 60.00 (9)	33.33 (5) 60.00 (9)	6.67 (1) 80.00 (12)	46.67 (7) 66.67 (10)	60.00 (9) 86.67 (13)	28.89 (13) 60.00 (27)	26.67 (12) 75.56 (34)	27.78 (25) 67.77 (61)
121-160 Prior Couns. After Couns.	Moderate	33.33 (5) 46.67 (7)	26.67 (4) 40.00 (6)	26.67 (4) 40.00 (6)	60.00 (9) 20.00 (3)	26.67 (4) 33.33 (5)	26.67 (4) 13.33 (2)	28.89 (13) 40.00 (18)	37.78 (17) 24.44 (11)	33.33 (30) 32.23 (29)
161-200 Prior Couns. After Couns.	High Moderate	53.33 (8) --	46.67 (7) –	33.33 (5) –	26.66 (4) --	26.66 (4) --	13.33 (2) --	37.78 (17) –	28.88 (13) --	33.33 (30) –
> 200 Prior Couns. After Couns.	High	6.67 (1) --	13.33 (2) –	6.67 (1) –	6.67 (1) --	--	--	4.44 (2) –	6.67 (3) --	5.56 (5) –

Figures in parenthesis denote no. of subjects   Counseling wise $\chi^2_3 = 50.07^{***}$ (P<0.001)

45-55 years and menopausal women are at a high risk of diabetes due to hormonal changes. Mayer *et al* also found that there is a greater incidence of higher levels of blood glucose and diabetes after menopause as compared to pre-menopausal stage.[6] Comparing the data on BMIbasis, obese and underweight subjects were having slightly earlier prediction of diabetes than normal weight group . But the difference found was not significant.

Assessment of Risk Level of Lipid Profile Prior and after Nutrition Counseling

The major problem associated with diabetes is hyperlipidemia. In the development of some diseases, biochemical changes can be expected to occur prior to clinical manifestations. It is therefore always advantageous and proper to have information regarding the effect on lipid profile in response to the treatment either herbal or any other, which may be advocated for control of hyperglycemia. In the present study, observations were recorded for total cholesterol, triglycerides and HDL-C at prior and after the impartation of education and counselling for each of the patientto find out

the effect of counselling on risk level of dyslipidemia. The results interpreted as follows:

Total Cholesterol

The total serum cholesterol is one of the most varying parameter of the body. The major sources of cholesterol to the body are both exogenous (i.e. through diet) and endogenous (synthesized in the body). It has both beneficial as well as deterioratory effect on the body.

Table 2 shows the results of per cent distributions of the subjects by the risk factors of cholesterol dyslipidemia. Results prior to counselling revealed that majority of the subjects i.e. 55.55 per cent were at 'high' risk of hyperlipidemia (>240 mg/dl) whereas 21.11 per cent and 23.33 per cent subjects were at 'moderate' and 'low' risk category in stratum I. As compared to stratum I, 64.45 subjects of the stratum II were at 'higher' risk whereas 21.11 and 14.44 per cent subjects were at 'moderate' and 'low' risk of dyslipidemia. Whereas after the counselling a significant (P<0.001) change in per cent subjects in

Table 5 : Percent Distribution of the Diabetics According to the Risk Level of Triglycerides Dyslipidemia, Prior and after Counseling (Stratum II)

Triglycerides (mg/dl)	Risk	Obese		Normal weight		Under weight		Total		Overall
		M	F	M	F	M	F	M	F	
<120 Prior Couns. After Couns.	Low	13.33 (2) 60.00 (9)	13.33 (2) 6.67 (10)	20.00 (3) 66.67 (10)	13.33 (2) 73.33 (11)	40.00 (6) 66.67 (10)	33.33 (5) 60.00 (9)	24.44 (11) 64.45 (29)	20.00 (9) 46.66 (30)	22.22 (20) 55.55 (59)
121-160 Prior Couns. After Couns.	Moderate	33.33 (5) 26.67 (4)	20.00 (3) 20.00 (3)	53.33 (8) 26.67 (4)	46.67 (7) 20.00 (3)	33.33 (5) 20.00 (3)	46.67 (7) 40.00 (6)	40.00 (18) 24.44 (11)	37.78 (17) 26.67 (12)	38.89 (35) 25.56 (23)
161-200 Prior Couns. After Couns.	High Moderate	26.67 (4) 13.33 (2)	26.67 (4) 13.33 (2)	20.00 (3) 6.66 (1)	33.33 (5) 6.67 (1)	20.00 (3) 13.33 (2)	20.00 (3) -- (--)	22.22 (10) 11.11 (5)	26.67 (12) 6.67 (3)	24.44 (22) 8.89 (8)
> 200 Prior Couns. After Couns.	High	26.67 (4) --	40.00 (6) --	6.67 (1) --	6.67 (1) --	6.67 (1) --	-- --	13.34 (6) --	15.55 (7) --	14.45 (13) --

Figures in parenthesis denote no. of subjects   Counselling wise χ^2_3= 41.24*** (P<0.001)

different risk levels was noted in both the strata. The majority of the subjects at the level of 'high risk' changed to 'low risk' level after the counselling. Only 14.45 and 8.89 per cent subjects were at 'high' risk whereas 52.22 per cent and 50.00 per cent were at 'low' risk and 33.33 and 41.11 per cent were at 'moderate' risk from stratum I and II respectively (Table 3).

In sratum I more females (57.78%) are under high risk category of cholesterol dyslipidemia as compared to males (53.33). After counselling significant change in risk level was observed in both males and females. In stratum II equal per cent of males and females are under high risk level of cholesterol dyslipidemia before counselling. But after counselling significant reduction in risk level of dyslipidemia was observed in both male and female.

Triglycerides

At prior counselling level equal per cent of subjects *i.e.* 33.33 and 38.89 per cent from both the strata were at 'moderate risk' whereas 33.33 and 24.44 per cent subjects were at 'high moderate risk' of triglycerides hyperlipidemia. 'High risk' was noted to be in 5.56 per cent and 14.45 per cent subjects of both the strata. Only 27.78 per cent from stratum I and 22.22 per cent subjects from stratum II were at 'low' risk of high lipid triglyceride in blood (Table 4).

Significant (P<0.001) changes were observed with the decrease in per cent subjects in high risk categories of triglycerides dyslipidemia after the counselling. No subject was found to be at 'high moderate' or 'high' risk of triglyceride dyslipidemia in stratum I. Only 8.89 per cent subjects were at 'high moderate' risk from stratum II. Nearly 67.77 and 55.55 per cent of subjects from stratum I and II were at 'low' risk. Thus majority of the subjects were found to be in low risk category after the counselling as compared to prior counselling, where the majority of the subjects were noted at 'moderate to high moderate' risk (Table 5).

Table 6: Percent Distribution of the Diabetics According to the Risk Level Of HDL-C Dyslipidemia, Prior and after Counseling (Stratum I)

HDL-C (mg/dl)	Risk	Obese		Normal weight		Under weight		Total		Overall
		M	F	M	F	M	F	M	F	
< 40										
Prior Couns.	High	26.67 (4)	6.67 (1)	13.33 (2)	13.33 (2)	–	26.67 (4)	13.33 (6)	15.56 (7)	14.45 (13)
After Couns.		26.67 (4)	13.33 (2)	6.67 (1)	--	–	--	11.11(5)	4.44 (2)	7.78 (7)
41 – 60										
Prior Couns.	Moderate	40.00 (6)	66.67 (10)	86.67 (13)	66.67 (10)	80.00 (12)	53.33 (8)	68.89 (31)	62.22 (28)	65.55 (59)
After Couns.		40.00 (6)	73.34 (11)	86.67 (13)	86.67 (13)	80.00 (12)	80.00 (12)	68.89 (31)	80.00 (36)	74.45 (67)
> 60										
Prior Couns.	Low	33.33 (5)	26.66 (4)	–	20.00 (3)	20.00 (3)	20.00 (3)	17.78 (8)	22.22 (10)	20.00 (18)
After Couns.		33.33 (5)	13.33 (2)	6.66 (1)	13.33 (2)	20.00 (3)	20.00 (3)	20.00 (9)	15.56 (7)	17.77 (16)

Figures in parenthesis denote no. of subjects   Counselling wise χ^2_2= 4.30^{NS}

HDL-C

Table 6 reveals clearly that in stratum I 65.55 and 20.00 per cent subjects were at 'moderate' and 'low risk' level with 14.45 per cent subjects at high risk level of HDL-C dyslipidemia prior to counselling. Comparing with after counselling data 7.78 per cent subjects were at 'high risk' with shift of majority of subjects in 'moderate' risk category. Reduction was also seen in low risk category with 17.77 per cent subjects. The change in per cent subjects was noted to be non significant after the counselling.

Nearly same figures were seen at different risk level category in stratum II also. 21.11 per cent and 64.44 per cent subjects were at 'high'

Table 7: Percent Distribution of the Diabetics According to the Risk Level Of HDL-C Dyslipidemia, Prior and after Counseling (Stratum II)

HDL-C (mg/dl)	Risk	Obese		Normal weight		Under weight		Total		Overall
		M	F	M	F	M	F	M	F	
<40										
Prior Couns.	High	26.67 (4)	26.67 (4)	20.00 (3)	20.00 (3)	13.33 (2)	20.00 (3)	20.00 (9)	22.22 (10)	21.11 (19)
After Couns.		26.67 (4)	33.33 (5)	13.33 (2)	--	6.67 (1)	--	15.55 (7)	11.11 (5)	13.33 (12)
41-60										
Prior Couns.	Moderate	53.33 (8)	53.33 (8)	73.33 (11)	66.67 (10)	73.34 (11)	66.67 (10)	66.67 (30)	62.22 (28)	64.44 (58)
After Couns.		46.66 (7)	53.33 (8)	66.67 (10)	86.67 (13)	86.66 (13)	86.67 (13)	66.67 (30)	75.56 (34)	71.11 (64)
> 60										
Prior Couns.	Low	20.00 (3)	20.00 (3)	6.67 (1)	13.33 (2)	13.33 (2)	13.33 (2)	13.33 (6)	15.56 (7)	14.45 (13)
After Couns.		26.67 (4)	13.34 (2)	20.00 (3)	13.33 (2)	6.67 (1)	13.33 (2)	17.78 (8)	13.33 (6)	15.56 (14)

Figures in parenthesis denote no. of subjects   Counselling wise χ^2_2= 1.91^{NS}

and 'moderate' risk with only 14.45 per cent in low risk category prior to counselling. With non significant variation in per cent subjects after the counselling, 15.56 per cent were at low risk and 71.11 per cent and 13.33 per cent subjects were at 'moderate' and 'high risk' of HDL-dyslipidemia (Table 7).

The conclusion drawn from the complete lipid profile data is that BMI wise prior to counselling the incidence of dyslipidemia was noted to be higher in obese group as compared to the normal weight and underweight groups. Further comparing stratum I and II, the levels of dyslipidemia was found to be higher in stratum II subjects. The reason may be due to the longer duration of the disease of stratum II subjects. Whereas after the counselling except for HDL-C significant decrease in serum cholesterol and triglycerides was noted in both the strata in all BMI groups.

Conclusion

Thus the overall view of data regarding serum cholesterol and serum triglycerides stated that prior to counselling subjects were at 'high' and 'high moderate risk' of dyslipidemia, respectively. Further, subjects of stratum II were noted for significantly (P<0.01) higher levels of serum cholesterol and triglycerides prior to counselling. But impact of counselling was clearly noted by the

significant (P<0.005) decrease in the levels, with majority of the subjects noted for 'low risk' of hyperlipidemia for both serum cholesterol and triglycerides level. The difference in between the two strata was non significant after the counselling. A non significant difference in HDL-C level of the subjects was noted within and in between the two strata with 'moderate risk' of hyperlipidemia noted at both prior and after the counselling.

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