Assessment of Therapeutic Lifestyle Changes (TLC) in Lowering High Blood Cholesterol Among Academic and Non-Academic Staff of University of Lagos

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A b s t r a c t

High Blood Cholesterol is prevalent among academic and non-academic staff of University of Lagos from previous data assessment. The purpose of this study was to assess the effect of Therapeutic Lifestyle Changes (TLC) in lowering High blood cholesterol and to investigate the knowledge and practice of Therapeutic Lifestyle Changes among the staff of University of Lagos. Two research methods were adopted in this study; Experimental research method and Descriptive research method using a total sample of one hundred and seventy-nine participants.162members of staff both academic and nonacademic participated in the descriptive survey study while 17 participants (male and female) randomly selected from among the academic and non-academic staff from five faculties of the university participated in the experimental study. The experimental group was divided into two groups (study and control) by randomization 9 participants comprised the study group while 8 participants comprised the control group. The blood samples were taken and the lipid profile was measured in the University health service laboratory by a qualified medical laboratory scientist using spectrophotometer optima 300 machine. The pre-test of the lipid profile of participants measured before the commencement of the TLC intervention of six weeks was compared with the posttest lipid result after the six weeks both among each group and between the two groups using paired sample T-test at a p-value of less 0.05 level of significance. The result obtained revealed that there was a significant improvement in the lipid profile of the study group who went through a six-week TLC intervention while there was no any improvement in the lipid profile of the control group who did not receive any TLC intervention. Hence it is ascertained in this study that Therapeutic lifestyle changes has a lowering effect on high blood cholesterol.

Keywords: *Assessment, Therapeutic, Cholesterol, Academic, Non-Academic*

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Background to the Study

High Blood cholesterol or Dyslipidemia as it is medically called is a major risk factor for cardiovascular disease. It is a state that arises as a result of abnormalities in the plasma lipids which could be quantitative, qualitative or both. High Blood Cholesterol occurs qualitatively when there is an elevated plasma total cholesterol (TC), elevated Low-density lipoprotein cholesterol (LDL-C) elevated Triglycerides (TG) and a reduced high-density lipoprotein cholesterol (HDL-C) Levels, occurring singly or in combinations. Qualitatively, high blood cholesterol implies changes in composition of LDL-Cholesterol or increased electro negativity of LDL-Cholesterol (Oguejiofo*et al.*, 2012). High blood cholesterol is a common disorder but most patients are not diagnosed and therefore not treated because it usually does not have any symptoms, until a sudden breakdown in the heart functions which could also go ahead to affect the brain.

Data are scanty on the prevalence and pattern of high blood cholesterol in Nigeria. However, some studies on the subject are now becoming available and have revealed that the burden of the condition is very high in terms of morbidity, mortality and medical cost. High Blood Cholesterol or Dyslipidemia is the second most prevalent cardiovascular risk factor. World Health Organization (WHO) estimates in 2002 showed that dyslipidemia accounted for 18% of Ischemic heart disease, 56% of stroke and more than 4 million deaths per year globally.

High Blood Cholesterol is one of the major risk factors for Coronary heart disease, Heart attack and stroke which are leading causes of death for both men and women of all races and ethnicities in the United State of America. In Nigeria, studies conducted among apparently healthy Nigerians by Oguejiofor et al have shown a very high prevalence values with consistent pattern of low HDL Cholesterol and high LDL Cholesterol. The results of the findings conducted revealed 60% in 2008, 60.5% and 59.3% respectively in 2010. While many of the studies which were carried out in urban locations did not adduce reasons for this high prevalence values, some postulated that this may be closely linked to rapidly urbanization and western diet with most urban cities saturated with fast food outlets and increasing sedentary lifestyle (Oguejiofor*et al*., 2012.).

Therapeutic Lifestyle Changes (TLC) is an effective lifestyle therapy targeting low density lipoproteins cholesterol (LDL-C) which is a risk a factor for coronary heart disease. TLC is the lifestyle component of the third report of the National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP) III guidelines, that focuses on diet, weight management and increased physical activity. TLC is a comprehensive lifestyle approach that includes specific dietary recommendations (TLC diet) Weight management, increased physical activity, smoking cessation and alcohol intake reduction.

The findings of this study and recommendations of this research work will equip individuals, management, authority and university community as a whole in achieving the following a better understanding of how to prevent, accept or control high blood cholesterol and other heart diseases risk. The study will also be useful to the management and authority of University of Lagos in understanding the various types of intervention to be adopted towards

the reduction of high blood cholesterol and cardiovascular diseases in the community. Finally, the study will also contribute to the body of knowledge by creating further enlightenment on several lifestyle practices and behaviours that could be a predisposing factor to high blood cholesterol and cardiovascular diseases and how to avoid them.

Statement of the Problem

The relationship between increased level of both total cholesterol and LDL cholesterol and the risk of coronary heart disease as well as other cardiovascular diseases is well established in the literature (Law et al., 1994). It has been demonstrated that every 10mg/dl increase in total or LDL cholesterol triggers 10 percent increase in risk of cardiovascular disease especially Coronary Heart Disease (CHD). Also, for 5mg/dl increase in HDL cholesterol, there is a corresponding 10 percent reduction in the risk of cardiovascular disease (Brown & Browner, 1996). From the data obtained in a personal survey conducted,953 out of the 2,920 participants in a medical screening which was inclusive of Blood Cholesterol were discovered to have either of elevated levels of Triglycerides (150mg/dl and above), Total cholesterol (240mg/dl and above), Low Density Lipoprotein(LDL 160mg/dl and above) and low levels of High Density Lipoproteins (HDL less 40mg/dl).Also from the medical records survey obtained from the health services unit of the university, cholesterol related diseases such as Hypertensive Heart Disease, Diabetes and High Blood Pressure are part of the Ten major diseases that are prevalent in the community.(Health services record, 2012).

In view of the aforementioned, the study therefore aims to assess the lowering effect of Therapeutic Lifestyle Changes on high blood Cholesterol and to investigate the knowledge, attitude and practice of therapeutic lifestyle changes among the staff of University of Lagos as a recommended way of lowering High Blood Cholesterol according to the National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP) III guidelines.

Purpose of the Study

The purpose of this study was to assess the lowering effect of Therapeutic lifestyle changes on high blood cholesterol and other related diseases among the academic and nonacademic staff of University of Lagos. It will also seek to achieve the following objectives:

1. Assess the effect of therapeutic diet on lowering High Blood Cholesterol among Academic and Nonacademic staff of University of Lagos
2. Assess the effect of therapeutic exercise on lowering High Blood Cholesterol among Academic and Nonacademic staff of University of Lagos
3. Assess the effect of reduction in Alcohol consumption on lowering High Blood Cholesterol among Academic and Nonacademic staff of University of Lagos
4. Assess the effect of weight reduction on lowering High Blood Cholesterol among Academic and Nonacademic staff of University of Lagos
5. Assess the effect of smoking cessation on lowering High Blood Cholesterol among Academic and Nonacademic staff of University of Lagos

Research Hypothesis

The following hypotheses were developed and tested in the study.

1. Therapeutic diet has no significant effect on lowering high blood cholesterol among the academic and non-academic staff of University of Lagos.
2. Therapeutic exercise has no significant effect on lowering High Blood Cholesterol among academic and non-academic staff of University of Lagos.
3. Reduction in alcohol consumption has no significant effect on lowering high blood cholesterol.
4. Weight reduction has no significant effect in lowering high blood cholesterol among academic and non-academic staff.
5. Smoking cessation has no significant effect on lowering high blood cholesterol among academic and non-academic staff.

Theoretical Framework
The study hinges on the Health Belief Model (HBM) Theory of Health Education
The Health Belief Model theory represents the connection of how new information (TLC Practice guidelines) can lead to a change in outcomes (Individual's lifestyle leading to lowered blood cholesterol level and decreased incidence of CHD). The Health Belief Model was developed in the 1950s and proposed by social psychologists Godfrey Hochbaum, Irwin Rosenstock and Kirscht who were seeking to explain why some people do not use health services such as immunization and screening. The theory argues that for people to adopt recommended physical activity behaviours, their perceived threat of disease and its severity and benefits of action must outweigh their perceived barriers to action. The model is still in common use. The basic elements of Health Belief Model include a Perceived Susceptibility, Perceived Severity, Perceived Benefits of Action, and Perceived Barriers to Action, Cues to action and Self Efficacy.

Perceived Susceptibility (or perceived vulnerability) is the individual's perceived risk of contracting the disease if he or she were to continue with the current course of action. Perceived Severity refers to the seriousness of the disease and its consequences as perceived by the individual. Perceived Benefits refer to the perceived advantages of the alternate course of action. It is an assessment of the value of efficacy of engaging in a health promoting behavior to decrease risk of disease by an individual. Perceived Barriers (or perceived costs) refers to the perceived disadvantages of adopting the recommended action as well as perceived obstacles, inconveniences, expenses, danger and discomfort that may prevent or hinder its successful performance. These factors are commonly assumed to combine additively to influence the likelihood of performing the behaviour. Thus, High Susceptibility, High Severity, High Benefits and Low Barriers are assumed to lead to a high probability of adopting the recommended action. Other elements that are frequently mentioned in connection with the HBM are Cues to action (events that trigger behaviour) and Self efficacy which is an individual's perception of his or her competence to successfully perform the behaviour.

Methodology
The study adopted the experimental research method and descriptive research method. The target population comprised all academic and non- academic staff of University of Lagos between the ages of 30-65 years, 165 members of staff randomly selected across the eight

faculties of Akoka Campus participated in the descriptive survey study through the use of validated questionnaires while 17 participants randomly selected from five faculties in the six weeks experimental study. The experimental group was nine participants comprised the study group. The experimental group was divided into groups (study and control by randomization nine participants comprised the study group while eight participants comprised the control group. A verbal and informed consent of the participants were obtained having gotten the approval of the University of Lagos, Human Kinetics and Health Education Department Ethics and Research Committee Research Instrument comprised of a professional column scale with height rod which was used to obtain the height and weight, a digital Omron blood pressure machine that obtained the systolic and diastolic blood pressure and a spectrophotometer optima 300 machine was used to analyze the blood cholesterol levels by a professional medical laboratory scientist in the University health services department. The pre-test lipid-profile result of the participants before the commencement of the six weeks TLC intervention was compared with the post-test lipid profile result after the six weeks. The intervention between the two groups using paired sample T-test at a P-value of less 0.05 level of significance through a statistical package SPSS 15.0 Version. Under the descriptive study, Chi square an analysis was adopted in testing all stated hypothesis at a P-value of less 0.05 level of significance.

Study Setting and Study Team
The study team consists of a Medical Laboratory Scientist, A dietician, a health information officer, and a Medical Laboratory Technician. The researcher, a Health Educator is also part of the team. The University of Lagos Health Services Department Laboratory and the Human Kinetics and Health Education high performance Laboratory were used as sample collection and health counselling centre respectively.

Result
Demographic Data of Subjects
Table 1.

	N (N=17)	Percentage	Study N=9	Percentage	Control group	Percentage
Sex						
Male	7	41.2%	5	55.56	2	25.00
Female	10	58.8%	4	44.44	6	75.00
	17	100%		100.0		100
Age						
30-39	2	11.76%	1	11.11	1	12.5
40-49	6	35.29%	2	22.22	2	25.00
50-59	7	41.20%	5	55.56	4	50.00
60 and above	2	11.76%	1	11.11	1	12.50
Total	17	100%		100.00		100.00
Emp. status						
Academic	5	29.4%	3	33.33	2	25.00
Non-academic	12	70.6	6	66.67	6	75.00
Total	17	100.0		100.0		100
Research status						
Study						
Control	9	52.9	9	100	0	-
Total	8	47.1	0	-	8	1
	17	100		100.00		100.00

The demographic characteristics of the studied population in general and the study and control groups in specific were summarized in Table 1. 41.2% of the studied population were male 58.8% were female, indicating more female than male 11.76% were within the age range of 30-39, 35.29% within age range of 40-49, 41.20% fell within the age of 50-59 and 11.76% within 60 years and above indicating age range 50-59 as the highest in the study. Also 29.4% were academic while 70.6% were nonacademic 52.9% of the studied population fell within the study group and 47.1% fell within the control group.

Table 2: Physical Characteristics of Subjects

Variable	All subjects (N=17) mean ±SD	Study group (N=9) Mean ±SD	Control group (N=8) mean ± SD
Age (years)	49.53 ± 8.46	50.44 ± 9.761	48.50 ± 7.25
Height (m)	1.63 ± 0.08	1.63 ± 0.08	1.62 ± 0.07
Weight (kg)	80.94 ± 3.99	79.67 ± 14.07	82.38 ± 19.67
BMI (m^2kg)	33.56 ± 12.60	35.45 ± 16.33	31.44 ± 6.95
SBP	128.06 ± 14.58	131.89± 14.590	123.75 ± 14.25
DBP	78.71 ± 10.32	80.88 ± 10.08	76.25 ± 10.69
Exercise No: Yes	6:11	2:7	4:4
Smoking No: Yes	17:0	9:0	8:0
Alcohol No: Yes	15.2	7:2	8:0
Family story of HHD No: Yes	13:4	7:2	6:2
Hypertension No: Yes	12:5		
Diabetes No: Yes	17:0	9:0	8:0

SD	-	Standard Deviation
SBP	-	Systolic blood pressure (Upper)
DBP	-	Diastolic blood pressure (lower)
HHD	-	Hypertensive heart disease
BMI	-	Body mass index

Table 2 summarises the physical characteristics of the subjects. The mean age, height, and weight of all the subjects were 49.53 ± 8.46 years, 1.63 ± 0.08 meter and 80.94 ± 3.99kg respectively. The mean body mass index (BMI) was 33.56 ± 12.60, indicating on overweighted population. With regard to cardiovascular risk factors 29.4% of the population were hypertensive, 35.3% were not physically active, 23.5% had a family history of hypertensive heart disease, 5.9% were smokers and none of the participants were diabetic.

Table 3: Comparison of lipid profile among the study group
Paired sample Statistics

		Meant ± SD	percentage	Diff. in %
Pair 1	Pre HDL	55.88 ± 11.569	51.08%	2.77
	Post HDL	53.50 ± 8.734	48.72%	
Pair 2	Pre LDL	110.00 ± 30.086	52.44	4.88
	Post LDL	99.75 ± 19.819	47.56	
Pair 3	Pre TC	190.13 ± 28.623	51.79	3.58
	Post TC	177.00 ± 21.514	48.21	
Pair 4	Pre TG	120.13 ± 27.158	51.62	3.24
	Post TG	112.63 ± 8.274	48.38	

Table 3 shows a comparison between the pre and posttest among the study group. The average value for pre-HDL was 55.88 while for post HDL was 53.53 indicating a 2.77% reduction in

HDL value after the intervention period. Also, the pre-LDL mean value was 110.00 while the post LDL mean value was 99.75. This indicated a 4.88% reduction in LDL over the period of intervention. The pre-total cholesterol (TC) value was 190.13 while the post TC was 177.00. This also shows a 3.58% reduction in total cholesterol. Also, the pre-triglycerides (TG) was 120.13 while the post TG was 112.63, this revealed a 3.24% reduction in the triglycerides level over the period of intervention.

Table 4: Comparison of lipid profile among control group
Paired sample statistics

		Meant $\pm$ SD	percentage	Diff in %
Pair 1	Pre HDL	54.71$\pm$ 12.257	54.48	8.96
	Post HDL	45.71 $\pm$ 7.111	45.52	
Pair 2	Pre LDL	111.29 $\pm$ 13.829	47.52	4.96
	Post LDL	122.86 $\pm$ 16.597	52.48	
Pair 3	Pre TC	191.43 $\pm$ 20.759	48.87	2.26
	Post TC	200.29 $\pm$ 24.350	51.13	
Pair 4	Pre TG	131.57 $\pm$ 35.113	48.91	2.18
	Post TG	137. 43 $\pm$ 31.837	51.69	

Table 4 shows a comparison between pre and posttest lipid profile result of the control group. The HDL average for pretest was 54.71 and that of posttest 45.71 indicating 8.96 % reduction in HDL value over a period of six weeks without any TLC intervention. Also, the LDL average for pretest was 111.29 and posttest 122.86 showing 4.94% increase in the LDL value. The total cholesterol average at pretest was 191.43 and at posttest 200.29 indicating 2.26% increase in the Total cholesterol value. Also, the triglycerides average at pre-test was 131.57 and at posttest was 137.43 showing 2.18% increase in the triglycerides value.

Table 5: Comparison of lipid profile between the study group and control group
Paired Sample T – Test

Study group		N	Mean $\pm$ SD	t. value	Df	p- value	Remark
Pair 1	Pre-lipid profile – post lipid profile	8	8.312 $\pm$ 7.053	3.333	7	0.013	significant
Control group							
Pair 1	Pre-lipid profile – post lipid profile	7	-4.321 $\pm$13.636	-0.838	6	0.434	Not significant

Table 5 shows a comparison between the lipid profile of the study group and that of the control group before and after the intervention period. At 0.05 level of significance, with a t-score of 3.333 and a df of 7, the p-value equals 0.013 for the study group, indicating that among the study group for a period of six weeks of TLC, there was a significant lowering effect on blood cholesterol. Also, at 0.05 level of significance, with a T score of -0.838 and a df

of 6, the p-value equals 0.434 for the control group, indicating that among the control group there was no any significant lowering effect on blood cholesterol profile for the period of 6 weeks of normal lifestyle.

Discussion

The key role played by cholesterol in essential pathophysiologic processes that lead to the occurrence of cardiovascular events is well established in the literature and the individual cardiovascular risk definition incorporates among other factors, the lipid profile, including total cholesterol, LDL cholesterol, HDL cholesterol and Triglycerides. It has also been demonstrated that every 10mg/dl increase in total or LDL cholesterol triggers 10 percent increase in risk of cardiovascular disease especially Coronary Heart Disease (CHD). Also, for 5mgl/dl increase in HDL cholesterol, there is a corresponding 10 percent reduction in the risk of cardiovascular disease (Brown & Browner, 1996).

The findings for this study that lipid profile (LDL, HDL, TC and TG) significantly improved among the study group that went through the TLC intervention over a period of six weeks while there was no any significant improvement among the control group that did not go through a TLC intervention over the same period of six weeks strongly supported the assertion that therapeutic lifestyle changes (TLC) is an effective therapy in reducing coronay heart disease risk. Findings from the analysis of the lipid profile in the pre and post test results showed 5% reduction in LDL cholesterol, 4% reduction in total cholesterol 3.24% reduction in Triglyceride and 2.8% reduction in HDL among the study group. While among the control group, there was 5% increase in LDL cholesterol, 2.26% increase in total cholesterol, 2.18% increase in triglycerides and 9% reduction in HDL cholesterol.

Comparing the two groups, there was a reduction in LDL cholesterol, Total cholesterol and triglycerides among the study group but with a reduction in the HDL cholesterol. While there was an increase in the LDL, total cholesterol and triglycerides of the control group with a higher reduction in HDL (9%) compared with the study group (2.8%). This strongly aligned with the National cholesterol Education program (NCEP) Adult treatment panel III (ATP III) recommendation of Therapeutic lifestyle changes (TLC) in lowering High blood cholesterol. The ATP (III) guidelines specifically target LDL cholesterol due to its strong positive correlation with CHD risk (Ncep circulation, 2002).

However, it has also been established in previous studies as well as this study that TLC diet positively affect LDL cholesterol, total cholesterol and serum triglyceride levels but with little or no effect on HDL cholesterol (Nowson, 2005). For a significant improvement to be seen in the HDL cholesterol, there is need for adequate exercise which is also part of the component of TLC. When an adequate exercise complements the TLC diet, there will be a remarkable improvement in all the lipid profiles.

Section B

The study under this section investigated the knowledge, attitude and practice of therapeutic lifestyle changes (TLC) among the staff (Academic and nonacademic) of University of

Lagos. The study is a descriptive survey study with Questionnaire. It examined other stated objectives of the study and all stated hypotheses were tested with the study.

Methods
A total of one hundred and eighty participants were involved in the study but only one hundred and sixty-two participants responded and submitted the questionnaire used as instrument of the study. The Questionnaire was distributed across the eight faculties of the University and five non-faculties through a simple random sampling technique. All the data obtained was processed using SPSS 15.0 version and all stated hypotheses were tested using chi-square analysis at a p-value of less 0.05.

Result
Table 6: Demographic Data of Respondents

	No of respondent	Percentage of respondent
Sex		
Male	90	55.9
Female	72	44.1
Total	**162**	100.0
Age		
30 - 39	55	34.9
40-49	59	36.2
50 – 59	39	24.3
60 and above	9	4.6
Total	**162**	
Marital Status		
Single	30	18.5
Married	124	76.5
Divorced/separated	7	4.3
Widow /widower	1	0.6
Total	**162**	100.0
Religion		
Islam	29	17.7
Christianity	129	79.7
Others	4	2.5
Total	**162**	100.0
Employment Status		
Academic	55	33.8
Non-Academic	107	66.2
Total	**162**	100.0

Table 6 shows that 55.9% of the respondents are male while 44.1% are female. 34.9% fall within the age group of 30-39years. 36.2% within the age group of 40-49, 24.3% in the age group of 50-59 and 4.6% in the age group of 60years and above underrating of group 40-49 as the highest representative. Also 18.5 of the sample is single 76.5% married 4.3% divorced or separated while 0.6% were widow/widower. The table also reflected the religion of the respondents showing that 17.7% are Islam 79.7% Christianity while 2.5% fall under others. Under the employment status 33.8% of the respondent were academic while 66.2% were

nonacademic, reflecting the non-academic as those with the highest number based on the quota sampling method used by the researcher.

Analysis of Research Questions
Research Question 1: Will knowledge and practice of therapeutic diet have an influence on lowering high blood cholesterol among the staff of University of Lagos.

Table 7

S/N		Yes	No	Not sure	Missing info
1.	Have you heard about high blood cholesterol before.	102 (88.7)	10 (8.7)	6.3 2.6)	
2.	Do you know the causes of high blood cholesterol?	79 (48.4)	57 (35.6)	24 (15.0)	
3.	Can you tell when your blood cholesterol is high or low?	31 (21.1)	76 (51.7)	40 (27.2)	
4.	Do you know the things you can do by yourself to prevent high blood cholesterol.	47 (32.2)	65 (44.5)	34 (23.3)	16
5.	Have you heard your blood cholesterol measured in the last one year?	66 (42.9)	85 (55.2)	3 (1.9)	8

Table 7 shows that 88.7% of the respondents have heard about HBC, 8.7% have not heard and 2.6% were not sure. Also 49.4% had the knowledge of the causes of HBC, 35.6% did not have while 15.0% were not sure. Furthermore 21.1% of the respondents could tell when their blood cholesterol is high or low, 51.7% could not tell whil 27.2% were not sure. Also 32.2% had the knowledge of how to present HBC by themselves 44.5% do not have while 23.3% were not sure. In addition, 42.9% have heard their blood cholesterol measured in the last one year, 55.2% have not heard it measured while 1.9% were not sure.

Table 8: Therapeutic diet knowledge and practice

		Yes (%)	No (%)	Not sure (%)	Missing info
1	Do you know if the foods you eat can affect your blood cholesterol level?	87 (78.4)	14 (12.6)	10 (9.0)	51
2	Do you know the types of diet that can increase your blood cholesterol level?	91 (60.3)	48 (31.8)	12 (7.9)	11
3	Do you know the type of diet that can lower your blood cholesterol level?	64 (42.7)	69 (46.0)	17 (11.3)	12
4	Have you been educated by your doctor or any health professional on the foods that help prevent high cholesterol in the body?	53 (36.6)	81 (55.9)	11 (7.6)	17

Table 8 reveals that 78.4% of the respondents had the knowledge that the food they eat can affect their blood cholesterol level 12.6% did not have the knowledge while 9.0% were not sure. Also 60.3% had the knowledge of the type of diet that can increase their blood

cholesterol level 31.8% did not have while 7.9% were not sure. Furthermore 42.7% of the respondents had the knowledge of the type of diet that could lower their blood cholesterol level, 46.0% did not have while 11.3% were not sure. Moreover 36.6% have been educated by their doctor or health professionals on the food that can present HBC, 55.9% have not received any education while 7.6% were not sure.

Table 9: Physical Exercise Knowledge and Practice

		Yes (%)	No (%)	Not sure (%)	Missing info
1	Do you know if physical exercise can regulate blood cholesterol?	98 (66.2)	28 (18.9)	22 (14.9)	14
2	Do you engage in physical exercise at least three 93) times in a week?	68 (43.0)	76 (48.1)	14 (8.9)	4
3	While at work, do you usually prefer to sue the stairs?	90 (64.3)	21 (15.0)	29 (20.7)	22
4	If physical exercise period is introduced for staff during working how, will you be willing to participate?	111 (77.1)	28 (19.4)	5 (3.5)	18

Table 9 shows that 66.2% of the respondents had the knowledge that physical exercise can regulate cholesterol level. 18.9% did not have the knowledge while 14.9% were not sure. Also 43.0% of the respondents engaged in physical activities at least 3 times a week, 48.1% did not while 8.9% were not sure. Moreover 64.3% preferred to use stairs while at work to using elevators while 15.0% preferred to sue elevator while at work instead of stairs 20.7% were not sure. Furthermore 77.1% of the respondents declared that they would be willing to participate if physical exercise period is introduced for staff during working hour 19.4% declared they would not while 3.5% were not sure.

Table 10: Alcohol Consumption Knowledge and Practice

		Yes (%)	No (%)	Not sure (%)	Missing info
1	Do you know if alcoholic drinks have any relationship with blood cholesterol?	97 (64.2)	27 (17.9)	27 (17.9)	11
2	Do you take alcoholic drinks such as beer stout, wine.	45 (29.2)	91 (59.1)	18 911.7)	8
3	If you are told that your blood cholesterol is high, will you be willing to stop taking alcohol.	97 (71.3)	22 (16.2)	17 (12.5)	26

Table 10 shows that 64.2% of the respondents had the knowledge that alcoholic drinks have any relationship with blood cholesterol level, 17.9% did not have the knowledge while 17.9% were also not sure. Furthermore, 29.2% consume alcoholic drink 59.1% did not while 11.1% declared not sure moreover 71.3% declared they would be willing to stop taking alcoholic drinks if they are told that their blood cholesterol is high while 16.2% were not willing and 12.5% declared not sure if they would stop.

Table 11: Weight reduction knowledge and practice

		Yes (%)	No (%)	Not sure (%)	Missing info
1	Do you know if being overweight can increase your blood cholesterol level	97 (71.3)	22 (16.2)	17 (12.5)	26
2	Do you know you weight?	115 (77.2)	21 (14.1)	13 (8.7)	13
3	Do you know how to check by yourself if you are overweight or underweight?	97 (65.1)	38 (25.5)	14 (9.4)	13
4	Does your work require longer time of sitting?	62 (42.2)	56 (38.1)	29 (19.7)	15
5	Have you been told recently by health professionals or discovered by yourself that you are overweight?	16 910.6)	124 (82.1)	11 (7.3)	11

Table 11 shows that 71.3% of the respondents had the knowledge that overweight can increase blood cholesterol level, 16.2% did not have the knowledge while 12.5% were not sure. Also 77.2% of the respondents knew their weight 14.1% did not know while 8.7% were not sure. Furthermore 65.1% of the respondents had the knowledge of detecting by themselves of the they are overweight or underweight 25.5% did not have the knowledge while 94% were not sure. In addition, 42.2% declared that their nature of job required longer time of sitting while 38.1% declared that their nature of job required longer hour of standing and 19.7% longer how of walking. More so 10.6% indicated that they have been told recently that they are overweight 82.1% declared they have not been told while 7.3% revealed they were not sure of their weight.

Table 12: Smoking Knowledge and Practice

		Yes (%)	No (%)	Not sure (%)	Missing info
1	Do you know if smoking has any relationship with blood cholesterol level?	62 943.4)	41 (28.7)	40 (28.0)	19
2	Do you smoke?	16 (10.6)	124 (82.1)	11 (7.3)	11
3	If you smoke, and you are told that your blood cholesterol is high, will you be willing to quit smoking?	41 (44.1)	50 (53.8)	2 (2.2)	69

Table 12 shows that 43.4% of the respondents had the knowledge that smoking affects blood cholesterol level, 28.7% did not have the knowledge while 28.0% were not sure. Also 10.6% of the respondent's smoke, 82.1% did not smoke while 7.3% declared they were not sure. Furthermore 44.1% declared that if they are told that their blood cholesterol is high, they would be willing to quit smoking 53.8% declared they were not willing to quite while 2.2% were not sure.

Testing of Hypotheses

Five hypotheses were stated in the study to be tested and they were run on the SPSS 15.0 version using chi square data analysis

Hypotheses 1

Therapeutic diet will have no significant influence on lowering high blood cholesterol among academic and non-academic staff of University of Lagos.

Hypothesis 1: Therapeutic diet has no significant effect on lowering high blood cholesterol among academic and non-academic staff of University of Lagos

Table 13: Chi square analysis on influence of therapeutic diet on High blood cholesterol

Variables	N	df	X^2cal	X^2tab (0.05)	P-value	remark
Therapeutic diet knowledge	162	4	25.569	9.487	0.000	Significant

P < 0.05

Table 13 shows that the calculated chi-square value of 25.569 is greater than table value of 9.487. Therefore, the null hypothesis which states that knowledge and practice of therapeutic diet will have no significant influence on lowering high blood cholesterol among academic and non-academic staff of University of Lagos is rejected while the alternate hypotheses accepted. This implies that knowledge and practice of therapeutic diet will have significant influence on lowering high blood cholesterol among the staff of University of Lagos.

Hypothesis 2: Therapeutic exercise has no significant effect on lowering high blood cholesterol among academic and non-academic staff of University of Lagos.

Table 14: Analysis on therapeutic exercise influence on high blood cholesterol

Variables	N	df	X^2cal	X^2tab (0.05)	P-value	remark
Therapeutic exercise	162	4	15.052	9.487	0.005	Significant

P < 0.05

Table 14 shows that the calculated chi-square value of 15.052 is greater than tabulated value of 9.487, therefore the null hypothesis which states that knowledge and practice of therapeutic exercise will have no significant influence on lowering high blood cholesterol among academic and non-academic staff of University of Lagos is rejected while the alternate hypothesis is accepted. This implies that therapeutic exercise will significantly reduce high blood cholesterol among academic and non-academic staff of University of Lagos.

Hypothesis 3: Reduction in alcohol consumption has no significant effect on lowering high blood cholesterol.

Table 15: X^2 Analysis on alcohol intake reduction influence on high blood cholesterol.

Variables	N	df	X^2cal	X^2tab (0.05)	P-value	Remark
Alcohol reduction	162	4	8.424	9.487	0.077	Insignificant

P < 0.05

Table 15 shows that calculated Chi-square value of 8.424 is less than tabulated value of 9.487, therefore the null hypothesis which states that alcohol intake reduction will have no significant influence on lowering high blood cholesterol is accepted while the alternate hypothesis is rejected. This implies that alcohol intake reduction will not influence lowering high blood cholesterol at a significant level among the staff of University of Lagos.

Hypothesis 4: Weight reduction has no significant effect on lowering high blood cholesterol among academic and non-academic staff of University of Lagos.

Table 16: X^2 Analysis on weight reduction influence on high blood cholesterol.

Variables	N	df	X^2cal	X^2tab	P-value	Remark
Weight Reduction	162	4	13.716	9.487	0.008	Significant

P < 0.05

Table 16 shows that the calculated Chi-square value of 13.716 is greater than the tabulated value of 9.487. Therefore, the null hypothesis which states that knowledge and practice of weight reduction will have no significant influence on high blood cholesterol is rejected while the alternate hypothesis is accepted. This implies that weight reduction will have significant influence on lowering high blood cholesterol among academic and non-academic staff of University of Lagos.

Hypothesis 5: Smoking cessation has no significant influence on lowering high blood cholesterol.

Table 17: X^2 analysis on smoking cessation influence on high blood cholesterol.

Variables	N	df	X^2cal	X^2tab	P-value	Remark
Weight Reduction	162	4	24.021	9.487	0.000	Significant

P < 0.05

Table 17 shows that the calculated Chi-square value of 24.021 is greater than tabulated value of 9.487, therefore the null hypothesis which states that smoking cessation knowledge and practice, will have no significant influence on lowering high blood cholesterol is rejected while the alternate hypothesis is accepted. This implies that knowledge and practice of smoking cessation will significantly lower high blood cholesterol among academic and non-academic staff of University of Lagos.

Discussion
The first hypothesis which states that therapeutic diet has no significant effects on lowering high blood cholesterol among the staff of University of Lagos was rejected while the alternate

hypothesis was accepted. This implies that therapeutic diet has a significant effect in lowering high blood cholesterol among the academic and non-academic staff of university of Lagos. It simply implies that lowering high blood cholesterol among the staff of University of Lagos depends on their practice of therapeutic diet. This finding is in line with the Ncep final report circulation, 2002 which submitted that the primary goal of the TLC diet is to achieve as much LDL cholesterol lowering as possible as this can be achieved through "maximal dietary therapy. The cumulative effect of the therapeutic diet can reduce LDL cholesterol by 25% compared with a typical U.S. diet. This submission is also supported by the findings in the experimental study of this research where there is a 5% reduction in the LDL cholesterol of the study group over a period of six weeks of TLC intervention, whereas there is a 5% increase in the LDL cholesterol of the control group over a period of six weeks of no TLC intervention.

Hypothesis two which states that therapeutic exercise has no significant effect on lowering high blood cholesterol among academic and non-academic staff of university of Lagos was rejected while the alternate hypothesis was accepted. This implies that lowering high blood cholesterol among the staff of University of Lagos will depend on their practice of therapeutic exercise. This finding was corroborated with the findings of Osaretin, 2003 which stated that physical activity or excise reduces the risk of cardiovascular disease because it reduces blood pressure and reduces serum cholesterol levels and body weight. Also, Williams & Blanche, 2005 observed that HDL cholesterols often, are increased with sustained aerobic exercise that results in an expenditure of above 1,200 calories/week. The greater the exercise volume (and caloric expenditure) the more likely an exerciser will achieve a significant increase in HDL cholesterol, however based on the study the effect may be genetically predetermined and the evidence for exercise alone reducing LDL cholesterol and total cholesterol was less conclusive.

Hypothesis three stated that reduction in alcohol consumption has no significant effect on lowering high blood cholesterol among the academic and non-academic staff of University of Lagos. This was not significant and therefore the hypothesis was accepted while the alternate hypothesis was rejected. This implies that reduction in alcohol consumption actually has no significant effect on lowering high blood cholesterol. This finding deviates from the popular findings that reduction in alcohol consumption will lower high blood cholesterol. However, the finding could be associated with the American Heart Association (AHA) which acknowledges the research findings that pointed out that reasonable intake of alcohol may result in greater HDL levels with reduction of LDL oxidation in case of red wine which contains tannies, which inhibit a type of LDL oxidation due to free radical's damage. (cholesterol menu.com, 2015). Because alcohol is considered to be of no effect on blood cholesterol when it is taken moderately at one or two bottles of bear per day the subjects of this study might have fallen into the moderate group, hence the finding was insignificant.

Hypothesis four states that weight reduction will have no significant effect in lowering high blood cholesterol among academic and non-academic staff of university of Lagos is rejected while the alternate hypothesis is accepted. This implies that weight reduction practice will

have significant effect in lowering high blood cholesterol among academic and non-academic staff of university of Lagos. This finding is in line with Dattilo A.M. & Kris Etherton 1992, who submitted that the TLC diets lowering effects on LDL cholesterol can be further enhanced by weight reduction in overweight individuals. A meta –analysis of 70 studies found weight loss to be associated with a significant decrease in LDL cholesterol. The study estimated that a 10-pound weight loss is associated with 4mg/dl decrease in LDL cholesterol. Also, in addition to reducing LDL cholesterol, weight loss in important for other CHD related risk factors such as elevated TG and low HDL levels (NCEP, 2002).

Hypothesis five which states that smoking cessation will have no significant effect on lowering high blood cholesterol among academic and non-academic staff of university of Lagos is rejected while the alternate hypothesis was accepted. This implies that smoking cessation practice will have a significant effect in lowering high blood cholesterol among academic and non-academic staff of University of Lagos. This is in line with Wyatt Myers article in 2011titled the cholesterol–smoking connection, where it was submitted that smoking directly lowers the HDL cholesterol, though smoking has not been shown to directly impact levels of LDL, it was observed that it could have dangerous indirect effects through the toxins produced and inhaled which could modify the existing LDL, leading to higher levels of oxidized LDL within the bloodstream, to make it more likely to cause inflammation. Smoking also raises total cholesterol and triglycerides numbers due to its effect on lipid metabolism as submitted by Wyatt Myers.

Conclusion
The objectives of this study were to assess the effects of Therapeutic Lifestyle Changes (TLC) through   its components of therapeutic diet, therapeutic exercise, alcohol reduction, smoking cessation and weight management on lowering High Blood Cholesterol among Academic and Nonacademic staff of University of Lagos. From the experimental study conducted, it was discovered that therapeutic lifestyle changes through therapeutic diet, therapeutic exercise, smoking cessation and weight management significantly lower high blood cholesterol among academic and non-academic staff of university of Lagos. Also, from the descriptive survey study, the findings revealed the knowledge and practice of therapeutic lifestyle changes among the academic and non-academic staff of university of Lagos will lower the rate of High blood cholesterol incidence among the staff of University of Lagos. The findings of this study are therefore in consistent with the American National Cholesterol Education Program (NCEP) guidelines third report of the expert panel on detection, evaluation and treatment of high blood cholesterol in adults (ATP III) which recommended therapeutic lifestyle changes as background therapy for the treatment of high blood cholesterol.

Recommendations
Based on the findings from the two studies adopted in this research work, the following recommendations were made.
1. The University of Lagos authority should take a proactive measure in sensitizing and educating its staff (both academics and non-academics) on the need to imbibe a

therapeutic lifestyle.
2. A Health Education and promotion unit should be included in the University Health Services Department where issues on preventive health and lifestyle would be handled by qualified health educators.
3. The university of Lagos authority should include in its working period exercise time that will officially permit all interested staff to participate.
4. A central parking space should be constructed few kilometers to the main campus so as to enforce all staff to embrace walking or cycling few distances to and fro their offices as being practiced in some developed countries universities.
5. Fruit vendors should be officially permitted in all department/faculties of the university and fruits should be included in all official servings for meetings and conferences.

References

Adam, Inc. (2007). *High blood cholesterol in-depth*, Retrieved from http:/www.cholesterolmenu.com

Adewunmi C. M. (2011) The psychology of exercise adherence among staff of tertiary institutions in Lagos. *5th ICHPER.SD Africa Region congress ICHPER.SD Africa Journal* 66

Angela, H. (2013). *Cholesterol and triglycerides, health centre tools and resources*.

Appel, L. J. et al. (2005). Effects of protein, Monounsaturated Fat and Carbohydrate intake on blood pressure and serum lipids: results of the omniheart randomized trial, *JAMA, 2005, 294* (19)2, 455-2,464

Appel, L. J. Et al., (2006). *Diet and life style recommendations revision 2006: a scientific statement from the American association nutrition committee calculation*.

April, K. (2012). *High blood cholesterol and triglyceride (Lipid Disorder).* Beckerman, J. web Md medical reference.

Brown, R. B. & Browner, W. S. (1996). *Lipids abnormalities in current medical diagnosis and treatment*, Tiemey L.M. Jnr M.C.

Cholesterol, M. (2015). *Alcohol and cholesterol*, Retrieved from http://www.cholesterolmenu.com/loweringcholesterolcholesterol Ncep circulation, (2002). Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults (ATP III) final report.

Chris, R. (2013). Livingstrong.com recommended fat intake by the American Heart Association, retrieved from www.livingstrong.com

Dattilo, A. M. & Kris-etherton, P. (1992*).* Effects of weight reduction on blood lipids and lipoproteins; A meta-analysis. *Am. J. Clin nutri.*, 320-328.

Elsevier, D. (2015) Hyperlipidemia causes, diagnosis & treatment – clinical key, Endothehal functions and inflammation markers in patients with combined hyperlipidemia.

Femi-Pearse, D., & Elegbeleye, C. M. (2010) Respiratory symptoms and their relationship to cigarette smoking, dust occupations and domestic air pollutions. Studies in random samples of an urban African population, *West African Journal Med. 1973, 22, 57-64.*

Folu, O. (2010). *Healthy diet and weight control tips*. Goodman's world of inspirations Publisher. ISBN 978-978-49602-1-2. 599- 600

Grundy, S. M. (2005). Stano esters as a component of maximal dietary therapy in the National cholesterol education program. Adult treatment panel III report, *The American Journal of Cardiology, 96* 47-50.

Haastrup, E. A., & Adeogun, J. O. (2005). Personal health and physical fitness, *Goldnetwork communications (GNC)* ISBN: 978-38424-5-5, 17-20.

Haboubi, G. & Sheikh, B. (2002). Do you Smoke? Then quit immediately, *American Health Journal, 4, 23-26*

Hu, F. B. & Willet, W. (2002). Optimal diets for prevention of coronary heart disease, *JAMA, 288 (20), 2569 – 2578.*

Ihesie, G. C. (2015). Foods and herbs that lower high blood cholesterol (February 27). *Guardian Newspaper.*

Ikulayo, P. B. & Adewunmi, C. M. (2011). *Psychological perspectives of fitness, wellness and health. A book of readings in fitness and health.* Department of Human kinetics and Health Education Publication. Olu-Akin Publishers. ISBN 978-978. 48425-3.2 pg 5.

Kris-Etherton, P.M. et al (2002), Nutrition committee fish consumption, fish oil, omega – 3 Fatty acids and cardiovascular disease. *Circulation, 106* (21), 2747-2757.

Law, M. R, Wald, N. J. & Thompson, S. G. (1994). *By how much and how quickly does reduction in serum cholesterol concentration lower risk of is chamid heart disease?* BMJ;308, 367-372

Mc-Mamara, D. J. (2000). The impact of egg limitations on coronary heart disease risk. DO the numbers add up? *J Am Call Nutr, 19*, 540-548.

Natarajan, S. et al (2003) Cholesterol measures to identify and treat individuals at risk for coronary heart disease, *Am J Prevmed, 25*, 50-57.

National Institute of Health (2006). *Your guide to lowering cholesterol with therapeutic lifestyle changes (TLC)*. Retrieved from http://www.inhi.nihgov/health.

National Institute of Health Publication, (2005). *Your guide to lowering you're your blood cholesterol*

National Cholesterol Education Program (NCEP) (1994*). The expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel ii). circulation,* 89, 1329-1445.

Otinwa, G. O. (2008). *Achieving wellness lifestyle*, Integrity press limited, ISBN: 978-372-237-9 pp. 23-56.

Park, K. (2013). *Park's textbook of preventive and social medicine*, Twenty second edition M/S Banarsidas Bhanot Publishers. India 599-600.

Rogers, C. (2013). *Recommended fat intake by the American*, retrieved from www.cholesterolmenu.com

Skillings, J. & Howes, D. G. (1996). *Hyperlypidemia and atherosclerosis part* 1. Physician assistant July 1996 32-68.

Superko, H. R. (1996). Lipid disorders contributing to coronary heart disease, an update, *Current problems in cardiology, 21 (*11), 733-780.

Sutton, S. A. (2000). *Understanding and changing health behavior*, from health beliefs to self-regulation 207-225.

Tolu, O. (2007). *Actnalising the University of our dream*, University of Lagos Press, Akoka-Yaba. 13.

U.S. Department of Health and Human Services and U.S. department of agriculture (2005). *Defary guidelines for Americans,* Available at www.healthier US. gov/dictary guidelines.

U.S. National Cholesterol Education Program (NCEP) Guidelines, (2012*). Third report of the expert panel on detection,* Evaluation and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Final Report circulation. (2002; 106125) 143-3.

Udemudia, J. & Ugwuja, E. (2008). *Plasma lipid profiles in hypertensive Nigerians.*

Wang, T. D. & Chen, W. J. (2003). Efficacy of Feno fibrate and Simvas, *A Systematic Review Am J. Chin Nutri.* 5-17.

Willet, W. C. (2006) The Mediterranean diet. Science and practice, *Public Health Nutrition, 9*, 105-110.

Williams, P. T., P.J. Blanche., R. Rawlings, et al concordant lipoprotein and weight responses to dietary fat change in identical twins with divergent exercise levels. *American Journal of Clinical Nutrition 181-*187, 2005.