

## Influence of Non-Vegetarian Diet on Serum Cholesterol (Total and Hdl) And Blood Pressure of General Population in District Ganderbal

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### Abstract:

**Background:** It is a common observation among doctors working in SKIMS Hospital, Srinagar (the main hospital in the valley) that the incidence of IHD is steadily increasing for the last 10-30 years. This increase is not only due to proper diagnosis but also paid to rapid change in socio-economic status, change in dietary habits, and high spread prevalence of hypertension. Though the staple diet of Kashmir's is rice, they include meat almost every day in their diet. This study is an attempt to find the effect of non-vegetarian diet on serum cholesterol and blood pressure. The present study was done to assess the influence of non-vegetarian diet on serum cholesterol and blood pressure of general population in district Ganderbal.

**Objective:** To determine dietary habits and dietary intake of fats and oils of sample, to determine the total serum cholesterol and blood pressure in non-vegetarian and vegetarians and to observe the effect of serum cholesterol on vegetarian diets.

**Design:** The study was done on 100 adults among general population living in district Ganderbal. The sample was assessed clinically as well as interviewed to obtain required data regarding physical activity, dietary intake and their general information. Out of 100 50 were vegetarian and 50 were non-vegetarian.

**Results and Discussion:** Results of the study clearly shown that mean serum cholesterol was significantly higher in non-vegetarians (238.4mg %) than in vegetarians (198.8mg %) while mean serum HDL-cholesterol of non-vegetarians (31.6mg %) was low as compared to vegetarians (34.4mg %). Mean serum cholesterol increased with increase in age and was high in sedentary workers (232.0mg %) with lowering of HDL-cholesterol (30.6mg %) and was highest in subjects using ghee (270.9mg %). Mean systolic diastolic pressure was almost normal but increased with advancing with advancing age and sedentary life style.

**Conclusion:** The data collected from the study indicated that all though the low iron intake of non-vegetarian and vegetarians was similar, more the vegetarians had the feelings of tiredness and pale-conjunctiva. Serum cholesterol was significantly higher in non-vegetarians as compared to vegetarians with lowering of HDL-cholesterol, due to inverse relationship. This trend was also seen in subjects consuming more of saturated fat and sedentary workers. Blood pressure was normal in both the groups and not significantly different.

### I. Introduction

Coronary heart disease (CHD) also known as ischemic heart disease is an important and challenging problem at the present time. Many industrialized countries are facing an epidemic of this disease which is showing no evidence of decline. It is one of the commonest causes of premature death today. Coronary heart disease is the end of result of the accumulation of atheromatous plaques within the walls of the coronary arteries that supply the myocardium (the muscle of the heart) oxygen and nutrients. After decades of progression, some of these atheromatous plaques may rupture and (along the activation of blood clotting system) start limiting blood flow to the heart muscles. The disease is the most common cause of sudden death and is also the most common reason of death for men and women over 20 years of age. According to present trends in the united states half of the healthy 40 years old males will develop CAD in the future and one in three healthy 40 years old women.

As the degree of coronary heart disease progresses, there may be near complete obstruction of the lumen of the coronary artery, several restricting the flow of oxygen carrying blood pressure to the myocardium. Individuals with this degree of coronary artery disease typically have suffered from one or more myocardial infections (heart attack) and may have signs and symptoms of angina at rest and flash pulmonary edema.

Extensive studies conducted over decades in many countries, demonstrating association between certain environmental, biochemical, psychological and pathological factors and the etiopathogenesis of IHD have evolved the concept of coronary risk factors. No single factor is an absolute cause of CHD. Many factors are

interrelated and to the extent that they are present, they increase the risk of the disease. Major risk factors are elevated serum cholesterol, hypertension and cigarette smoking. Other risk factors include a family history of early heart disease, other lipid abnormalities, glucose intolerance obesity certain personality behaviour pattern, lack of physical activity and stress. With the increasing interest in the study of these risk factors, the quantitative relationship has been proposed between dietary cholesterol and the increase in the serum level.

The amount of fat in the diet is not as important as the type of fat-saturated or polyunsaturated, saturates are about twice as effective in increasing serum cholesterol levels as polyunsaturated are in reducing them. Dietary saturated fatty acids come chiefly from products containing animal fat. Determination of serum cholesterol is considered by some to be the best single measurement for estimating risk for persons less than 50 years of age but for those over 50 years of age, measurement of high density lipoprotein cholesterol is the best indicator.

Hypertension has been correlated with both an increased rate of new myocardial infarction and sudden death. A positive correlation has been established between CHD and elevations in both systolic and diastolic blood pressure.

## **II. Materials And Methods**

The present study was conducted to find the influence of non-vegetarian diet on the serum cholesterol (total and HDL) and blood pressure of general population living in the District Ganderbal.

1. **Selection Of Sample:** The random sample consisted of total of 100 individuals of various age groups, selected from different villages of district Ganderbal. The experimental group consists of 30 vegetarians.
2. **Tools Used:** The main tool used for the study was interview-cum-questionnaire to collect details like general information about the subjects, clinical assessment, anthropometry, physical activity, diet survey and symptoms related to CHD.
  - A) **General Information:** This section contained questions regarding name, age, income, occupation, religion, village, vegetarian/ non-vegetarian.
  - B) **Clinical Assessment:** This section was based on questions regarding history of past illness, tiredness felt by the subjects while doing physical work, family history of CHD related disease like hypertension, diabetes, paleness, hair color, premature heart attack and stroke and signs of malnutrition and deficiency disease which was carried out by a doctor with the help of proforma evolved by WHO.
  - C) **Anthropometry:** Height of the subject, without shoes was recorded in cm with the help of steel tape; weight was recorded by the personal weighing machine, without shoes and light clothes. All the readings were taken thrice and the mean height and weight was calculated.
  - D) **Physical Activity:** This section included type of physical activity undertaken by the subjects and classified as heavy, moderate and sedentary.
  - E) **Diet Survey:** Diet survey includes the type of oil or fat used in cooking or eaten as such.
  - F) **Laboratory Analysis:-** Blood for estimation of serum cholesterol (total and HDL) was drawn by a doctor from all the 100 subjects, two hours after breakfast or lunch 0.5 ml of blood was drawn for the estimation. 5 samples were collected per day and stored in vials in the refrigerator. Serum from the sample was centrifuged and 0.1 ml of serum was taken for the estimation of total cholesterol and 0.5 ml of serum for HDL-Cholesterol.

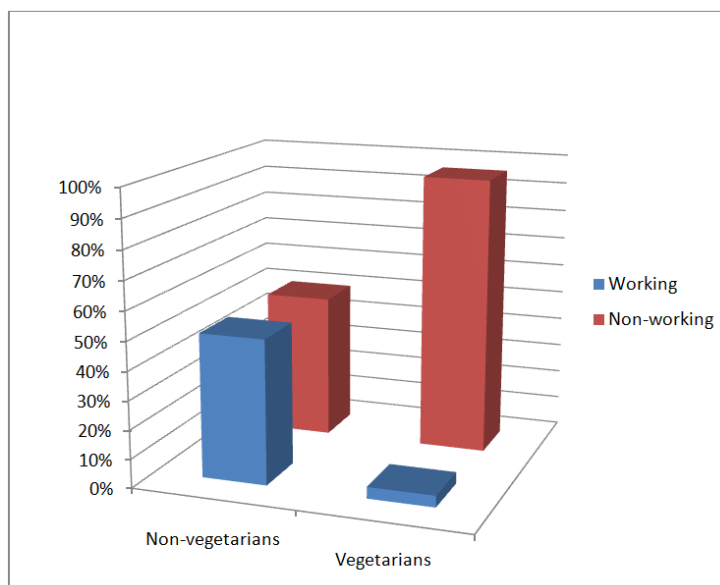
## **III. Results And Discussions**

A study on the “influence of non-vegetarian diet on serum cholesterol (total and HDL) and blood pressure of general population living in district Ganderbal was conducted the data collected is discussed under the following headings:-

### **1. General Information:-**

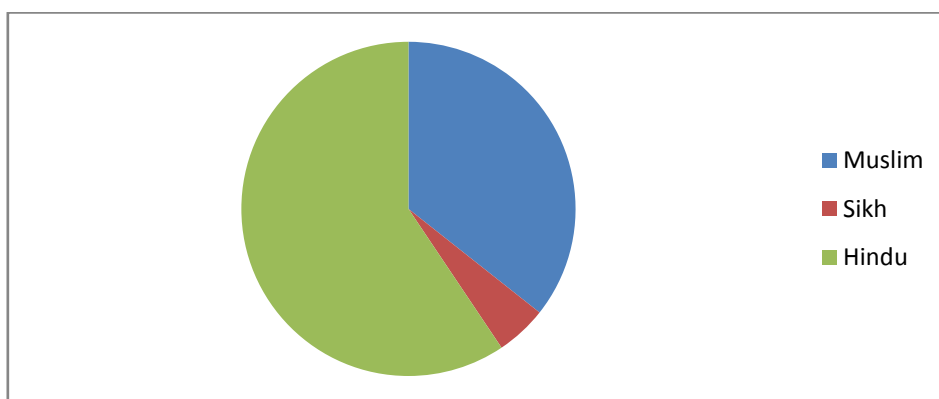
This section consists of information regarding occupation, religion, and socio-economic status.

- I) **Occupation:** Fig1 shows that non-vegetarians were equally distributed between working and non-working subjects, whereas majority of vegetarians (96%) were non-working subjects and only (4%) were working.



**Fig.1** Distribution of sample according to their occupation

**II) Religion:** As seen in fig. 2, (60%) of the population were Hindus followed by Muslims (36%) and Sikhs (4%). All the vegetarians were from the Hindu community



**Fig.2** Distribution of subjects according to their religion

**2) Clinical Assessment**

This section includes history of past illness of subjects, tiredness felt by subject while doing physical activity; family history of CHD related disease and signs of malnutrition and deficiency disease.

**D) History of past illness:**

**TABLE: 1** History of Past illness of subjects

Illness	Non-vegetarian		Vegetarian	
	Number	%	Number	%
Gall stone	6	12	1	4
Constipation	4	8	Nil	Nil
Appendicitis	3	6	Nil	Nil
Myocardial Infarction	4	8	Nil	Nil
Anemia	1	2	3	12
Hypertension	2	4	1	4
Asthma	Nil	Nil	1	4
Backache	2	4	1	4
Polio	1	2	Nil	Nil
Gastritis	2	4	1	4
Typhoid	1	2	1	4
Piles	1	2	Nil	Nil

(A case in repeated more than once)

Table1 indicates that non-vegetarian have a higher incidence of gall-stones, constipation, appendicitis, and myocardial infarction, whereas vegetarian mainly suffered from anemia.

**II) Tiredness felt by the subjects:**

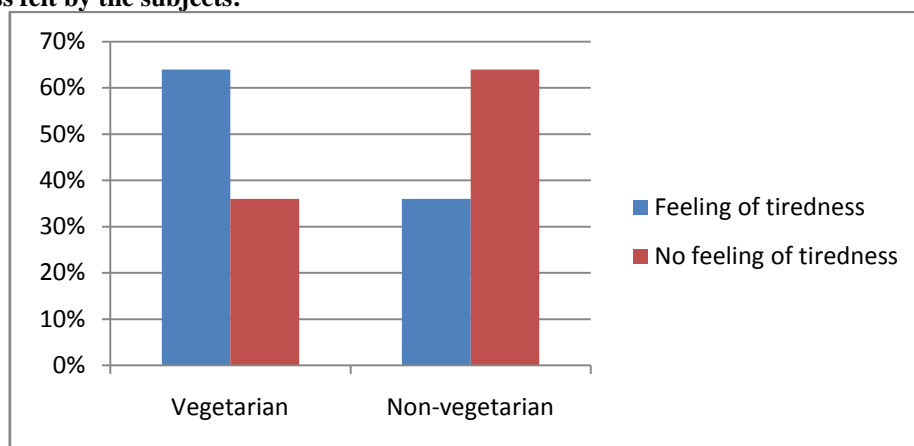
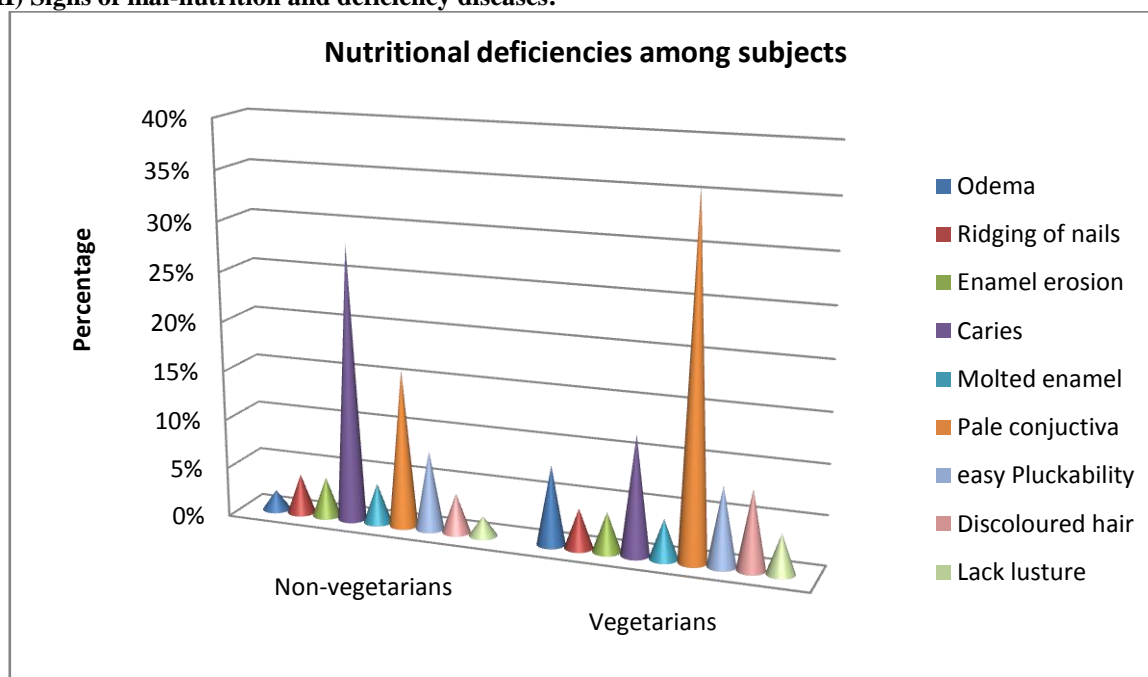


Figure: 3 Tiredness Felt by the subject

Fig. 3, that tiredness was felt more by vegetarians (64%) than non-vegetarians (36%) while doing physical work.

**III) Signs of mal-nutrition and deficiency diseases:**



(A case is repeated more than once)

Fig 4. Signs of malnutrition and nutritional deficiency disease

As illustrated in figure4, carries were more common in non-vegetarians (28%) than vegetarians (12%) while pale conjunctiva was more common in vegetarians (36%). Since non-vegetarian food provides more of heme iron which is rapidly absorbed and also heme iron helps in absorption of iron from plant sources and probably this may be the reason that the sign of pale conjunctiva was more prevalent in vegetarians. This correlates with the larger number of vegetarians feeling tired since tiredness is one of the symptoms of anemia.

**IV) History of CHD related diseases.**

Table 3 Distribution of sample according to family history of CHD related diseases.

Disease	Non-vegetarian		Vegetarian	
	Number	% age	Number	% age
Hypertension	14	28	4	16
Diabetes	7	14	1	4
Premature heart attack	2	4	2	8
Stroke	3	6	nil	nil

(a case is repeated more than once)

Table3 indicates that among the four diseases the highest incidence was the family history of hypertension of both the group. More of the non-vegetarians had family history of CHD related diseases as compared to vegetarians.

“According to CL Melby, MR Toohey and J Cebrick,(American journal of clinical nutrition, vol 53, 1994: Department of food sciences and nutrition, Colorado state university.) The semi-veg’s had lipid values intermediate to the Veg and Non-veg groups. A vegetarian diet is associated with lower cardiovascular disease risk factors than is an omnivorous diet cardiovascular disease is the major cause of mortality in Britain, being responsible for round 50% of deaths. The majority of these deaths are from coronary heart disease. Vegetarians suffer markedly from coronary heart disease compared to non-vegetarian. This risk may be related to the lower blood cholesterol levels of vegetarians.”

**V) Anthropometry**

Group	Height (cm)	Mean (SD)	Weight (KG)	Mean (SD)	Standard weight for height <sup>2</sup> (KG)
Non-vegetarians (n=50)NS	153.5	±5.0	57.0	#8.4	47.9
Vegetarian	152.3	±5.3	53.3	#5.0	

NS =Not significant (Significant (p<.05))

TABLE: 4 Height and weight measurement of subjects

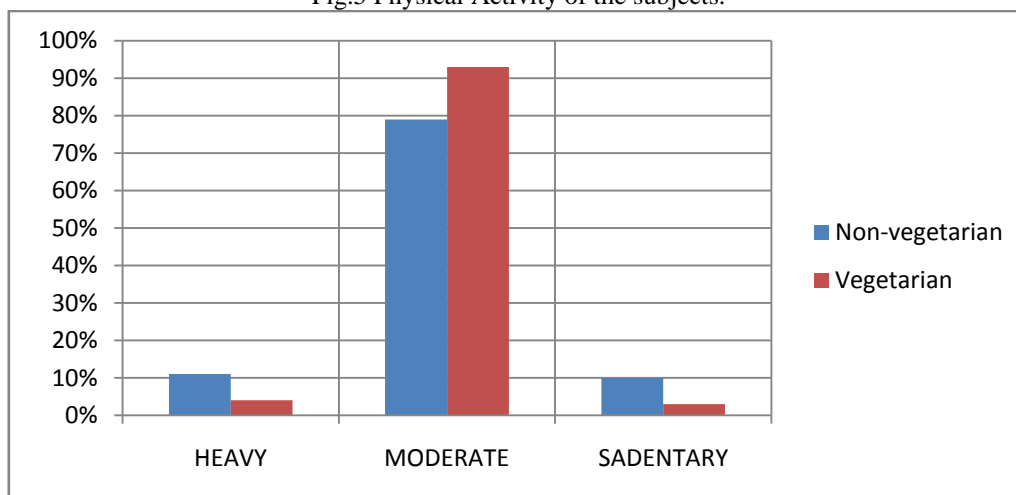
Table 4. Shows that the mean height of non-vegetarians is slightly taller and also their mean weight is significantly more than vegetarians.

According to Dreon et al (1998)usually obesity and obesity related diseases are related to dietary fat intake. Firstly, fat has a high caloric content that facilitates the accumulation of energy in the body,. Furthermore, most of the co-diseases are directly or indirectly caused by enhanced quantities of fat deposits in adipocyte augmented serum cholesterol levels, consequently most of the dietary regimens to lose weight are designed to reduce dietary fat intake.

**VI) Physical Activity**

Majority of the subjects in both the groups were doing moderate work as shown in fig.5

Fig.5 Physical Activity of the subjects.



**Diet Survey**

1) Fats/oils used by the subjects

Fat / Oil	Non-vegetarians (n=70)%	Vegetarians (n=30)%
Mustard oil	92	76
Hydrogenated oil	32	64
Pure ghee	18	24
Butter	56	36
Refined oil	10	56

(A case is repeated more than once)

TABLE: 5 Distribution of subjects according to fat/ oil consumption.

Table 5 reveals that majority of Kashmir's used mustard oil. Vegetarians used more of hydrogenated oil and refined oil as compared to non-vegetarians.

According to Wood et al, 2004, among fats the saturated from (SFA) is more likely related to unhealthy effects, where as some mono unsaturated (MUFA) and polyunsaturated fats (PUFA) are more associated with beneficial health status. Nutritionists have recommended as PUFA: SFA ratio of 0.4 or higher in a balanced healthy diet. Red meat has a PUFA: SFA ratio of 0.1 and is recognized as one of the main source of saturated fat in the human diet.

Morgan et al, (1993) found that reduction of saturated fatty acids was more likely to be necessary to produce cholesterol lowering effects than the diminution of total fat intake.

## II) Nutrient Intake

TABLE: 6 Nutrients intake of subjects.

Nutrients	Non-vegetarian	Mean SD	Vegetarian	Mean SD	ICMR * Standard
Protein (g)	47.5	±6.9	44.00	±7.9	45.0
Fat (g)	97.6	±21.3	65.2	±20.0	48.9
Energy (kcal.)	2232.8	±154.3	1999.1	±90.1	2200.0
Calcium (mg)	664.3	±134.4	674.3	±147.7	400-500
Iron (mg)	22.5	±3.7	20.6	±3.7	30.0
Vitamin A (µg)	762.4	±42.7	723.2	±49.0	750.0
Thiamine(mg)	1.00	±0.26	1.1	±0.31	1.1
Riboflavin (mg)	0.98	±0.15	0.98	±0.16	1.2
Vitamin C (mg)	66.5	±24.1	63.3	±6.7	50.0
Salt (g)	3.6	±0.9	3.4	±1.0	-

\*Gopalan, C (1982) Nutritive value of Indian foods, PP. 27, National Institute of Nutrition, Hyderabad.

A significant finding in table 6 was a high intake of fat by non-vegetarians (96.6g) as compared to vegetarians (65.2g). The caloric intake of vegetarian was low as compared to non-vegetarian. Iron intake was low in both the groups; otherwise the nutrient intake seemed to be adequate. Salt intake was normal in both the groups.

## IV. Laboratory Analysis

### I) Estimation of serum cholesterol

Serum cholesterol (mg)	Non-vegetarian		Vegetarian	
	Number	%	Number	%
100-149	6	12	1	4
150-199	10	20	14	56
200-249	16	32	7	28
250-299	13	26	3	12
>300	5	10	Nil	Nil

TABLE: 7 Serum cholesterol level in non-vegetarians and vegetarians

Table 7 indicates that the highest percentage of non-vegetarians had serum cholesterol range of 200-249mg%, whereas in the vegetarians, majority of the subjects had their serum cholesterol in the range of 150-199mg%. Mean serum cholesterol of non-vegetarians was significantly higher (P<.01) (238.4mg %) than in vegetarians (198.8 mg %). The mean cholesterol level of non-vegetarian was close to Americans. (230mg %), but was high as compared to vegetarians.

### II) Estimation of HDL-Cholesterol

HDL-cholesterol (mg %)	Non-vegetarian (no = 70)		Vegetarian (no = 30)	
	Number	%	Number	%
20-29	35	50	6	20
30-39	25	35.7	16	53.4
40-49	8	11.4	6	20
>50	2	2.9	2	6.6

Table 8: HDL-cholesterol levels in non-vegetarians and vegetarians

Table 8 points out that 50% of non-vegetarian had their HDL-cholesterol level in the range of 20-29 mg % and the mean was 31.6 mg %, whereas majority (53.4%) of vegetarians had their HDL-cholesterol level between 30-39 mg % and the mean was 34.4 mg %. This may be probably because of high serum cholesterol in non-vegetarians as compared to vegetarians, which increases the risk for CHD. Since HDL-cholesterol is also a risk factor for CHD but acting in a direction opposite to serum cholesterol, the higher the HDL levels the low the CHD risk. From table 7, it is clear that non-vegetarians had high risk of CHD as compared to vegetarians and this correlated with lower level of HDL-cholesterol in non-vegetarians (20-29 mg %).

**III) Relation between Serum cholesterol and type of fat/oil consumed.**

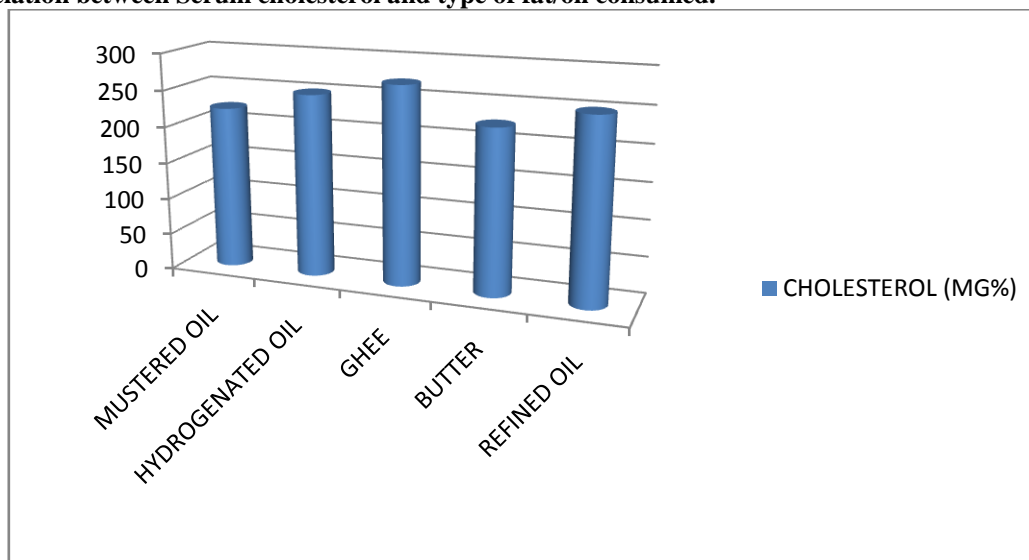


Fig 6.Total cholesterol according to fat/oil consumed

Figure 6 shows that the highest serum cholesterol was found in subjects using ghee (270.9 mg %) and is least in subjects using mustard oil (223.2 mg %). It correlated with the study of keys et al who found a significant positive correlation between saturated fat and cholesterol level (15). However, low level in subjects using butter and high level in subjects using refined oil (figure 6) were possibly because of low consumption of butter (5g) and refined oil (7g).

**IV) Relationship of serum cholesterol and physical activity**

Physical activity	No	Non-vegetarian		Vegetarian	
		Serum cholesterol (mg %)	HDL-C (mg %)	Serum cholesterol (mg %)	HDL-C(mg%)
Heavy	6	201.4	35.4	1180.6	45.7
Moderate	39	230.9	31.4	23198.8	33.8
Sedentary	5	232.0	30.6	1216.6	35.7

TABLE: 9 Serum cholesterol (total and HDL) levels of subjects according to physical activity.

**Table 9** clearly shows that the highest cholesterol level was in subjects leading sedentary life, the lowest being for heavy workers for both non-vegetarians and vegetarians, indicating that cholesterol level increased with decrease in activity. The reverse was the case with HDL-cholesterol.

**V) Blood pressure of the subjects.**

Group	Diastolic pressure (mmHg)		Systolic pressure (mm Hg)	
Non-vegetarian	NS	83.4±6.8	NS	124.7±12.5
Vegetarian		82.9±6.7		121.2±10.4

TABLE: 10 Blood Pressure (systolic and diastolic) of the subjects according to type of diet.

Table 10 indicates that there was hardly any difference in blood pressure reading of non-vegetarians and vegetarians and the difference was not significant.

**VI) Comparing the data of master, Dublin and Marks (1950) (34) and**

The present study according to age:

Age (years)	Present study		Master, Dublin and Marks	
	Systolic (mm Hg)	Diastolic (mm Hg)	Systolic (mm Hg)	Diastolic (mm Hg)
35-40	121.4	81.1	123.9	78.0
41-45	128.3	85.8	127.0	79.5

TABLE: 11 Blood pressures (systolic and diastolic) of the subjects according to age.

Table 11 shows that there was hardly any difference in the two studies and both the studies showed an increase in blood pressure with advancing age suggesting that blood pressure increased with increase in age.

**VII) Blood pressure according to physical activity**

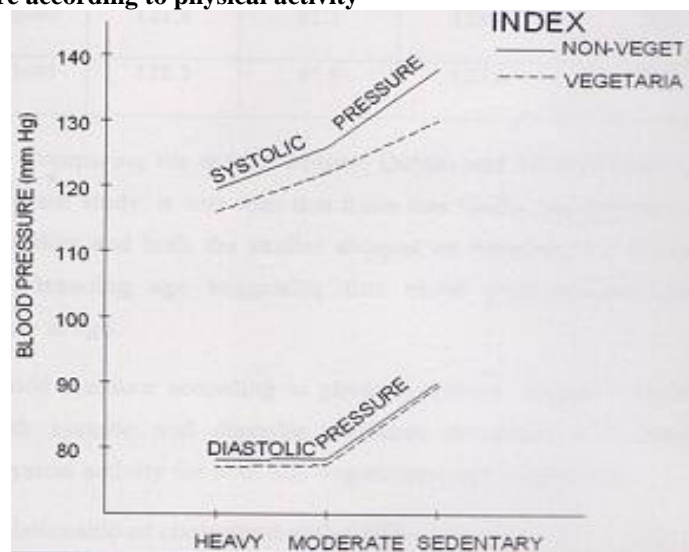


Fig. 7 Blood pressure according to physical activity .

Fig.7 showed that both systolic and diastolic pressure decreased with increase in physical activity for both non-vegetarians and vegetarians.

**VIII) Relationship of cholesterol with CHD.**

TABLE: 12 Symptoms related to CHD.

Symptoms	Non-vegetarian		Vegetarian	
	Number	%	Number	%
Obesity	11	22	4	16
Pain in chest	8	16	2	8
Pressing in chest	4	8	1	8
Burning in chest	2	4	Nil	Nil
Hypertension	12	24	5	20
Backache	6	12	2	8

(A case is repeated more than once).

Table 12 indicates that symptoms related to CHD were found to be more common in non-vegetarians than in vegetarians which increase the risk for CHD. 24% of non-vegetarians were suffering from hypertension which is one of the major risk factors in CHD.

**V. Summary And Conclusion**

A study on “influence of non-vegetarian diet on serum cholesterol (total and HDL) and blood pressure of general population in district Ganderbal” was conducted. The data collected is summarized under the following headings.

- 1) General information. Out of the total of 70 non-vegetarian and 30 vegetarians, non-vegetarians were equally distributed between working and non-working subjects, whereas majority of vegetarians (92%) were non-



- working subjects, 60% of non-vegetarians and all the vegetarians were Hindus. Majority of non-vegetarians (76%) and vegetarians (52%) belongs to high income group.
- 2) Clinical assessment. The common past illness suffered by no-vegetarians were gall-stone (12%) constipation (8%) and myocardial infarction (8%) whereas vegetarians mainly suffered from anemia (12%). Probably because of anemia, many vegetarians (64%) were feeling tired while doing physical work. Many non-vegetarians had a family history hypertension (28%) and diabetes (14%). Sign of mal nutrition and deficiency diseases showed that the common sign seen in non-vegetarians was carries (28%) whereas vegetarians mainly suffered from anemia (36%) showing the sign of pale conjunctiva.
  - 3) Anthropometry. Main height of non-vegetarians (153.5cm) was almost the same that of vegetarians (152.3cm) but the mean weight of non-vegetarians (57.0kgs) was significantly higher than that of vegetarians (52.3)
  - 4) Physical activity. 78% of non-vegetarians and 92% of vegetarians were moderate workers.
  - 5) Diet survey. Majority of non-vegetarians (92%) of vegetarians (76%) were using mustard oil. Fat intake was found to be high in non-vegetarians (97.6g) but iron intake was low in both the groups. Otherwise the nutrient intake seemed to be adequate.
  - 6) Serum cholesterol (total and HDL) and blood pressure. Mean serum total cholesterol of non-vegetarians (238.4mg %) was more than the vegetarians (198.8 mg %) while mean serum HDL-cholesterol of non-vegetarians was low (31.6 mg %) as compared to vegetarians (34.4 mg %). Mean serum cholesterol increased with increase in age and was high in sedentary workers (232.0) with lowering of HDL-cholesterol (30.6 mg %) and was highest in subjects using ghee (270.9 mg %). Mean systolic and diastolic pressure was almost normal but increased with advancing age and sedentary living.
  - 7) Relationship of dietary cholesterol with CHD. All the symptoms associated with CHD were more common among non-vegetarians as compared to vegetarians.

## VI. Suggestions

Result of study clearly showed that serum cholesterol was significantly higher in non-vegetarians than in vegetarians. Therefore non-vegetarian food should be included frequently in daily diets.

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