Impact of the administration of Soyflour on lipid level of selected Cardio-Vascular Disease Patients

By

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Introduction

I INTRODUCTION

Cardiovascular diseases are a major cause of mortality, morbidity and disability in both developed and developing countries. Due to the pace and pressure of modern life there has been an unprecedented increase in the incidence of coronary heart disease in recent years. In many developing countries coronary heart disease has already emerged, as a prominent public health problem affecting especially men in the prime of life when their productivity and social and family responsibilities are greater. In other words coronary heart disease poses a serious potential threat to health, and the probability is that unless this threat can be averted, or contained, it will soon reach proportions approaching those of the industrial countries.

Cardio-vascular diseases (CVD) are conspicuous among world health problems because they account for 16 per cent of deaths in developing countries and 48 per cent in developed countries (WHO - 1992) of 40 per cent of total cardiac admissions, coronary heart disease steadily increased from 4 per cent in 1960 to about 33 per cent in

1989, and congenital heart cases accounts for 24 per cent of cardiac admissions.

Diseases of cardiovascular system affect the heart and blood vessels, primarily the arteries. Coronary artery disease occurs with a deprivation of the blood supply to the heart, inducing atherosclerosis, angina pectoris, and myocardial infarction. Other cardiovascular disorders include congenital heart disease, rheumatic heart disease, and congestive heart failure.

The major predictors for cardiovascular disease are smoking, high blood pressure, and elevated blood cholesterol levels. Aronson (1990). Other related risk are obesity, diabetis-mellitus, physical inactivity, emotional stress and heredity. Mixon (1986).

The risk factors for CVD have multiple causes, and each plays an interrelated role in the predisposition to and development of the disease. Those factors which can be altered include hyperlipidemia, hypertension, and obesity (which are diet related) as well as smoking and physical

density lipoprotein (LDL). Cholesterol concentration with variable effects on HDL concentration in hyper-cholesterolemic patients (Gaddi et al., 1991).

Soyabean contains 40-42 per cent protein which is higher as compared to other sources. In other words 1 kg. of soyabean is equal to 2 kg. of meat or fish, 3 kg. of egg, 1.5 kg. of groundnut, 4 kg. of wheat, 6 kg. of rice, and 12 kg., of milk in terms of protein value. An addition of 20 per cent soyaflour to wheat flour will double the nutritive value of the bread (Singh, 1985).

Soyabean produces deoiled flour with higher percentage (55 to 60) of protein. Soy flour is highly blendable and thus can be made into chappatis. These chappatis had a higher rate of protein digestibility than 100 per cent wheat flour chappatis (Gonzatez, 1988).

Studies have shown that on soya formula total and low-density lipoprotein (LDL) cholesterol values were reduced significantly. Neither the milk based formula nor the control low energy diet lowered serum cholesterol

activity; those factors which are more difficult but still possible to alter include underlying diseases, stress and personality characteristics; and it is not possible to change heredity, the aging process and sexual status.

A primary emphasis is given to diet therapy to reduce the elevated plasma LDL cholesterol level. Diet should incorporate the goals like (a) maintenance of a reasonable weight; (b) reduction of total fat intake; (c) reduction of saturated fat intake; (d) reduction of cholesterol intake. Other dietary considerations include (i) reduction of sodium intake when blood pressure is evident; (ii) reduction of alcohol and refined sugar intake when blood triglycerides levels are elevated (iii) increase in fibre intake.Aronson (1990).

The importance of the source of the protein as a factor in coronary heart disease risk is supported indirectly by studies of the effects of different dietary protein on serum cholesterol - a well established risk factor for coronary heart disease. Total substitution of animal protein with textured soyaproteins in the diet has been reported to reduce plasma total cholesterol and low

significantly during the diet period (Jenkins et al., 1990). The soya diet, however, caused a marked decrease in total (20.8 per cent) and low diet lipoprotein (25.8 per cent) cholesterol and in apolipoprotein B (+ 4.1 per cent) (Gaddi et al., 1991).

On the basis of the results of the studies already done the present study is undertaken to study the impact of the administration of soyaflour on lipid level of selected cardio-vascular patients with the following objectives.

(A) Study of the background information of the selected hypercholesterolemic patients.

(B) Assess the impact of soya protein on lipid level of hypercholesterolemic patients.

(C) Comparing the effect of wheat flour protein with that of soyflour protein on the lipid level of hypercholesterolemic patients.

Review of Literature

II REVIEW OF LITERATURE

The literature pertaining to the study "Impact of the administration of soyflour on lipid level of selected cardio vascular disease patients" is presented in the following side headings:

A. Hyper cholesterolemia - the role of it as risk of cardio-vascular disease.

B. Role of diet in the prevention of cardio-vascular diseases.

C. Soyabean - its hypocholesterolemic effect.

A. HYPER CHOLESTEROLEMIA-THE ROLE OF IT AS RISK OF CARDIO-VASCULAR DISEASE:

Cardio-vascular diseases has been aptly called 20th century diseases. They are the leading cause of death among men and second or third leading cause of death among women. A disturbing trend in these countries is that younger age groups are increasingly being affected. It has been stated that if present conditions persist, every second person born alive will ultimately die from CHD (park and park, 1986).

Ischemic Heart disease is more important cause of morbidity and morlatity amongest non-inflection diseased

in our country with betterment of living conditions, the incidence of coronary heart disease is on us (Gambhir et al., 1990).

A.1 Hyperlipoproteinemia:

An elevated plasma cholesterol concentration has been shown to be a major risk factor for coronary heart disease (CHD). Hyperlipidemia, or hyperlipoproteinemia, arises from a complex consideration of factors, including, Predisposition, dimentary condition and other environmental factors and stimuli (Yamamoto et al., 1984).

Risk is positively related to an elevated plasma low density lipoprotein (LDL) cholesterol concentration. There appears to be an inverse relationship for the level of High density lipoprotein (HDL). (Aronson; 1990, Glueek, 1983). Berier et al., 1985 says that it seems possible that defective HDL are co-responsible for the pathogenesis of premature atherosclerosis in familial hypercholesterolemia.

Variations in Low density lipoprotein cholesterol concentrations account for a large part of variance in

coronary heart disease incidence within populations at high risk. The National cholesterol Education Programme (1990) classified coronary heart disease risk as being average for individuals with a plasma total cholesterol concentration of < 5.2 mmol/L, moderate at 5.2-6.2 mmol/L and high at > 6.2 mmol/L.

Although elevated concentration of Low density lipoprotein (LDL) cholesterol were shown to increase Coronary heart disease risk, studies also showed that low plasma high density lipoprotein cholesterol is a risk factor for CHD and that one of the strongest determinants of coronary heart disease risk is the LDL-HDL ratio. There are number of factors related to a low plasma HDL cholesterol concentration including cigarette smoking, obesity, lack of excises, and ^v^rogenic steroids, hypertriglycrides and genetics (McNamara, 1990).

A.2 Classification:

Familial hyperlipoproteinemia has been roughly classified into four categories. So^v^me of them manifest severe hypercholesterolemia, and the others mainly hypertriglyceridemia. Atherosclerosis usually occurs in cases with severe hypercholesterolemia.

(a) Primary type I hyperlipoproteinemia (Familial hyperchylomicronemia):

The disease is caused by either a deficiency in lipoproteinlipase or its activator, apo-c II, or by the presence of an inhibitor of this enzyme. Regardless of the cause this type of hyperlipidemia can usually be well-managed by a low-fat diet.

(b) Familial hypercholesterolemia (Primary type IIa hyperlipoproteinemia):

Familial hypercholesterolemia is one of the most common congenital metabolic diseases. It is caused by a deficiency in low-density lipoprotein (LDL) receptors and is closely associated with premature atherosclerosis (Vega, et al., 1992).

Restriction of the intake of total calories, fat and cholesterol in an ordinary diet can reduce serum cholesterol.

(c) Combined hyperlipidemia and type III hyperlipoproteinemia:

Combined hyperlipidemia and type III hyperlipoproteinemia, especially the later, are fairly sensitive

to dietary management, involving restiction of total calories, animal fat, and cholesterol and an increase in the use of vegetable oils.

(d) Endogenous hypertriglyceridemia (Type IV hyperlipoproteinemia):

Endogenous hypertriglyceridemia is the most common type of primary hyperlipoproteinemias. In most cases of this type of hyperlipidemia, multiple dietary management, consisting of a reduction of the total caloric intake (25-30 Kcal per kg body weight), relatively low carbohydrates and an adequate supply of dietary fiber is recommended.

A.3 Etiology:

Since 1964, CHD mortality has declined steadily with a 42% decrease between 1964 and 1985. Even with these dramatic and encouraging results from medical care and lifestyle changes, coronary heart diseases remains the leading cause of mortality in the United States (1990 Mc Namara). The decline has been greatest among the socially advantaged and the young (Stephen et al., 1991).

Jocobsen and Thelle (1988) says that there is relationships between level of education, life style variables and major risk factors for coronary heart disease. Intensive modification of diet, stress management, smoking cessation, and moderate exercise may stop or even reverse progression of coronary atherosclerosis (Ornish; 1991).

The risk factors for cardio vascular disease have multiple causes, and each plays an interelated role in the predisposition to and development of the disease. Those factors which can be altered include hyperlipidemia, hypertension, and obesity (which are diet related), as well as smoking and physical activity, those factors which are more difficult but still possible to alter include underlying diseases, stress, and personality characteristics, and it is not possible to change heredity, the aging process, and sexual stress. (Aronson 1990).

(a) Cholesterol:

CHD is closely related to serum total-cholesterol and prospective studies have shown that the risk of CHD can be reduced by decreasing total cholesterol levels. One measurement of serum total cholesterol is enough to predict future levels in healthy post menopausal women (merete, et al., 1992).

It is stressed that adopting a healthy diet is in sufficient adequately to lower serum cholesterol in a person with familial cholesterolemia who has a high blood cholesterol due to an imborn error of cholesterol metabolism rather than a diet high in saturated fat (Betterridge, 1990).

The report of serum cholesterol deminishes with advancing age, (Kannel 1989).

(b) Hypertension:

Every clinical manifestation of coronary heart diseases including angina and myocardial infarction and sudden death occurs at increased rate in hypertensive patients cardio-vascular disease mortality is tripled in the hypertensive elderly compared to norm tensive of the same age. Today, myocardial infarction is the cause of about 30 percentage of the people, suffering from high blood pressure (Hanns et al., 1983). High blood pressure is a well established major risk factor for coronary heart disease and stroke.

(c) Heredity:

Heredity plays a part in CHD. Short, stocky and short-necked subjects are more likely to develop coronary heart disease than tall, thin people. Probably the environment, dietary habits, and the mode of living of a family also predispose the individual to coronary heart disease (Anita 1989).

(d) Age:

Coronary heart disease usually manifests itself after the age of 50 but and with a strong hereditary predisposition it occurs earlier. HDL cholesterol is lower and LDL and total cholesterol are higher in younger obese persons than in either groups (Felt 1988).

The British Regional Heart study showed that by 55-59 years nearly one in 3 men had symptoms or signs of CHD. Established CV risk factors apply in the elderly as well as in the young but with less impact. Most cardio-vascular risk factors are highly prevalent in the elderly, but the rise in blood lipids, blood-pressure and blood glucose with advancing age is not inevitable.

Taylor et al., (1987) and Isevat et al., (1991) says that eliminating CHD mortality is estimated to extend the average life expectancy of a 35 years old man by 31 years and a 35 years old women by 33 years.

(e) Hormones (Sex):

Although atherosclerosis occurs both in males and females, males in general are more predisposed to coronary heart disease (Antia, 1989). CHD in the elderly is much more a disease of women, and at advanced ages, it becomes almost exclusively. Although women enjoy lower rates of CHD at every age compared with men, once the disease is evident, their course is as bad or worse than that of men (Ayanian et al., 1991; Steingart et al., 1991; Healy, 1991).

Generally women are 10 to 15 years older than men when symptoms develop (Dustan, 1987). Besides genetic determinates, dietary cholesterol, dietary fat, total energy intake, alcohol consumption, cigrates smoking and physical activity are known to influence concentrations of lipids in women. Some of the strongest determinats of cholestrol and lipoprotein concentrations in women are sex hormones including oestrogen and progestin (Bush et al., 1989).

The masculine love of rich food, alcohol and tobacco, rather than sex horomones, may be responsible for the higher incidence in the male. Estrogen used in post menopausal, women increases the risks of cardio-vascular morbidity, including stroke and especially amongst smokers, myocardial infraction (Wilson et al., 1985).

Exogenous use of these hormones markedly influences HDL and LDL cholesterol; additional evidence suggests that endogenous sex hormones also, influence lipid and lipoprotein concentrations (Bush, 1989).

(f) Obesity:

Obesity is related to coronary heart disease. Men and women with masculine type of fat distribution, with a high ratio of waist and hip circumference, have cardiovascular risk factors such as high blood pressure, high serum lipids and tendency to diabetes (Larsson, 1984).

Subcutaneous fat deposits on the trunk are more related to CHD risk factors than subcutaneous fat deposits on the extremities (Blair et al., 1988).

Weight control showed significantly greater, relative weight and weight changes are related to reductions in fasting serum triglyecides and total serum cholesterol and increase in HDL-cholesterol (Epslein; et al., 1989). Prevention of the onset of obesity in childhood may, therefore, be important in reducing the risk of coronary arteries disease later in life (Smoak; 1987).

(g) Alcohol:

The epidemiological evidence to data supports the idea that moderate alcohol consumption. Defined as two drinks a day or less, may offer some protection for coronary heart disease, but that higher intake of alcohol promotes hypertension and is directly toxic to the heart, leading to stroke, arrhythmias, cardiomyopathy, and perhaps even coronary heart disease (CRIQUI, 1988).

Prospective data suggest that among middle aged women, moderate alcohol consumption decreases the risk of CHD & Ischemic stroke but may increase the list of subarachnoid hemorrhage (Slampfer et al., 1988).

(h) Smoking:

Those who smoke have an almost 3 times higher risk of heart disease than non-smokers. The risk increases with the number of cigarettes, particularly in those over 50 years but quitting smoking even in the elderly has a benefical effect (Jajich et al., 1984).

Cigarette smoking has been shown in a number of epidemiologic studies to be a significant risk factor in males, oand to a lesser extent in females, in contributing to the development of CHD and to the significantly greater mortality rates among cigarettee smokes.

Smokers of low nicotine cigarettes do not consume less nicotine. Filter cigarette smokers do not have a incidence of heart disease than non filter smokers. Inhaling other people's cigarette smoke has a deleterious effect (Benowitz 1983) Nicotine chewing gum used as an aid to giving-up smoking does not help, cigar and pipe smoking are equally harmful (Jamrozik et al., 1984).

(i) Exercise:

For reducing cardiac risk factors, sports, building up stamina such as running, cycling or swimming are

recommended (Wirth 1990) Fitness monitoring clinic focuses on the early detection of risk factors, as cardio vcscular fitness blood pressure, body fact percentage, cholesterol levels-both HDL and LDL (Fisher 1988).

Barnard; (1992) says that a diet high in complex carbohyderates and fibre and low in fat and cholesterol combined with daily aerobic exercise (primarily walking) reduces cholesterol values by 23%. Exercise raises HDL cholesterol prdominantly by its effects on weight (Wood et al., 1988).

A sudden increase in vigorous exercise may result in cardiac arrest with sudden death (Hin 1984).

(j) Coffee, Caffine:

Caffee drinking is probably not linked with coronary heart disease but increasing the intake of coffee may contribute to raised serum cholesterol.

Read et al., (1986) says that there is a significant positive relationship exists between coffee consumption and serum cholesterol which is not present

with other sources of caffiene. Caffiene containing beverages such as coffee, tea and cola should be restricted because in suceptible heart disease patient may aggravate irregular heart beats. (Garboys et al., 1983).

Drinking filtered coffee hardly raised the serum cholesterol concentration where as drinking 4 to 6 cups of unfiltered coffee a day was associates with an increase of total cholesterol of 0.50 mm/dl (Dags 1991, Bak et al., 1989).

(k) Water:

Cardiovascular mortality is about 10 percent higher in areas with very soft water compared to areas with medium-hard water. In areas where water supply had changed during the previous 30 days, a favourable effect on cardio vascular death rate were seen where water had become harder and an unfavourable effect where water had become softer (Antia 1989).

(l) Mental Stress:

Ischemic heart disease is reported to be common amongst business executives, lawyers and doctors who are subject to constant mental strain. However, the incidence

is also noted to be fairly high among labourers. The higher incidence in recent times has been ascribed to the mental stress of modern living. Blood samples for cholesterol obtained from medical student was elevated from 19 (5 mmol/l) during their normal studies to 235 mg/100 ml (6 mmol/l) during examinations (Antia, 1989).

(m) Insulin:

Atherosclerotic patients have diabetes or a tendency to high blood sugar and increased insulin secretion. During acute myocardial infraction, insulin secretion is decreased, possibly following shock which reduces pancreatic blood flow resulting in decreased sugar tolerance and increased plasma-free-fatty acide.

Ratzmam, et al., (1985) says that a disturbed glucose tolerance is accompained by significantly decreased HDL-cholesterol, combined glucose intolerance and obesity, HDL-cholesterol values were lowest. He further states that there is no correlation between HDL cholesterol and indices of glucose tolerance, and secretion of insulin.

(n) Snoring:

People who snore every night might be at an increased risk of having myocardial infarction because

they are more commonly affected by sleep aponed, which might put chronic stress on the cardio vascular system. Snoring is itself might, however, cause cardio-vascular stress (Alessandro et al., 1990).

(o) Blood group:

Higher prevelence of blood group 'O' had higher incidence of Ishenric heart Disease. The incidence of ishemic heart disease is higher in those with group A than in those with either blood groups. ABO blood type is associated with the risk of IHD (Whincop et al., 1991).

(p) Triglycerides:

The majority of patients with diabetes or CHD synthesize Triglycerided elevated levels of Triglycerides is related to the extent of coronary artery disease in both sexes. The association between triglycerides and coronary artery occlusion is strongest at total cholesterol levels 250 mgl/dl (Rimm et al., 1988).

Framingham study observed that serum triglycerides elevation are highly significant independent risk factor

for IHD (Ischemic heart disease) in women over 50 years (Castelli: 1986) Munoz; (1981) says that the association of serum cholesterol and triglyceride levels with weight mainly reflects the adipose tissue component of body weight.

(q) Fats:

The serum cholesterol level is not necessarily dependent upon cholesterol intake. Increasing the amount of fat in the diet, without increasing the cholesterol intake, elevates the serum cholesterol level. A diet low in unsaturated fats (vegetable marine oil) lowers the incidence of coronary infraction sudden death and cerebral infraction, but not the total mortality (Brown, 1984).

Dietary Cholesterol leads predominantly to elevation of LDL cholesterol concentrations, whereas saturated fatty acids (SFAs) elevate both LDL and HDL cholesterol (Hegsted et al., 1988) when substituted for SFAs polyunsaterated fatty acids (PUFAs) lead to both lower LDL and HDL cholesterol concentrations. Monounsaturated fatty acids (MUFAs) substituted for SFAs leads to decreased LDL cholesterol but have little or no effect on HDL - cholesterol. (Grundy 1989, Vega et al., 1988). A reduced

intake of fat have on effective cholesterol lowering effect (Berry et al., 1986).

B. ROLE OF DIET IN THE PREVENTION OF CARDIO-VASCULAR DISEASES:

Diet is believed to play a significant role in the prevention of atherosclerosis. Preventive dietary treatment in coronary heart disease has evolved recently into a more unified staged approach, (Leaman et al., 1988) regardless of risk factors status (American Heart Association 1984).

The goals of nutrition intervention or dietary treatment in heart disease are, to reduce the individual risks of disease, to prevent morbidity and mortality. Individuals potentially can alter their diet to reduce risk for developing coronary heat disease.

The vegetarian diet typically low in total fat, saturated fatty acids, and cholesterol and high in fiber has a reduced risk of coronary heart disease. Also a reduction in Blood pressure was reported with vegetarian diet and with Oat bran, red spring wheat bran, have been

reported to be hypocholesterolemic, while soft wheat bran did not lower serum cholesterol Jenkins (1989). Kushi et al., (1985) says that decreased fibre consumption was associated with increased risk of coronary heart disease, but the association was no longce significant when either risk factors were taken into account.

Snowdon et al., (1989) showed that meat consumption had a moderately strong positive association with coronary heart disease in males and females. For males the relative risks were moderately strong for meat consumption. Among females, the relative risks were weak in strength for both meat and egg. Lacto vegetarians in comparison with omnivorous control subjects were shown to have lower serum cholesterol levels of total cholesterol and low density lipoprotien cholesterol lower blood pressure and a reduced risk of coronary heart disease.

Stanford school of medicine warns that some diabetic and hypertensives should not reduce there fat intake below 40 percent calories because a high-carbohydrate diet increases insulin production, subsequently increasing synthesis of enzymes needed to produce very low density lipoprotein by the liver (risk factors in heart disease),

blood levels of High density lipoprotein are reduced, and they are protective factors in heart disease (Waslien, 1987).

Grundy, (1988) says that reduction of total fat to 30 percent of toal calories, saturated fatty acids to less than 20 percent and dietary cholesterol to less than 200 mg/day is adequate. If the LDL cholesterol level falls to 140 mg/dl or less, there is no need for further alteration of diet.

Lau et al., (1983) says that in animal and human studies, components of garlic have been shown to decrease blood cholesterol and triglycerides. Garlic has also been shown to change blood lipoprotein and to affect coagulation factors. Available literature suggests that garlic may be of value in the prevention or treatment of atherosclerotic diseases. Sogani et al., (1981) says that in the either hand, higher cholesterol values and higher prevalence of atherosclerotic heart disease was seen in heavy garlic and onion consumers.

The majority of studies indicate that moderate intake of fish oils can effectively lower plasma

triglycerides concentration in hypertrigyceridemic individuals (Mc Namara 1990). An average consumption of 30g fish per day may be of preventive value (Kromhout et al., 1985).

Capsicum is reported to increase fibrinolytic activity in blood and thus reduces the chance of thromboem bolism.

C. SOYABEAN – ITS HYPOCHOLESTEROLEMIC EFFECT:

Today soya is used in many forms both as a functional ingredient and as a meat replacer in the form of textured soyaprotein. As a functional ingredient soya is highly successful. Soyaprotein has proved invaluable in a wide variety of food products including bakery products, confectionary deserts, meats and fish products and snacks (Byrne, 1988). Also it has been reported that vegetables type, soyabean are superior to grain type varieties in flavour, texture, cooking and low in trypsin inhibitor activity (Anonymous 1980).

Soyaflour is highly blendable and thus can be used in many preparations. Soyaflour could be blended

with sorghum flour upto 50 percent levels for making deep fat fried items like metha pakoda, Murukku, upma and sevai (Jayalakshmi et al., 1987).

A study revealed that increasing levels of 5 percent, 10 percent and 25 percent soyaflour in bread increased protein aminoacide and ash content thus increasing the nutritional quality of bread (Dixit et al., 1986).

It contains 40.42% protein which is higher as compared to other source. In other words 1 Kg of soyabeam is equal to 2 Kg of meat or fish, 3 Kg of egg, 1.5 Kg of goundnut 4 Kg of wheat, 6 Kgs of rice and 12 Kg of milk in terms of protein value (Gandhi 1987) - Having lysine content can very effectively combined with cereals which are deficient in lysine. An addition of 20 percent soyaflour to wheat will double the nutertive value of the bread. Soya contains 20-22 percent oil. The oil rich in unsaturated fatty acid which are important from the nutritional point of view (Singh, 1985).

A study by Gaddi et al (1987) shows that when 16 children with familial hypercholesterolaemia were given a textured diet based on soyabean protein, with a simi

fat composition, all the children had a highly significant decrease in total cholesterol on average 21.8 percent against the baseline after 8 weeks.

Another study on type II hypercholesterolemic patients shows that soya diet has caused marked decrease in total cholesterol by 20.8 percent and low density lipoprotein cholesterol - 25.8 percent and in apolipoprotein B - 14.1 percent in 4 weeks (Gaddi et al., 1991 and Verillo et al., 1985).

Jenkins et al., (1990) says that use of a vegetable protein (Soyaprotein) supplement in a weight loss programme with induced moderate weight loss was associated with a reduction in blood lipids where as moderate weight loss on a control low-energy diet or milk based formula was not.

The hypocholesterolaemic effect of soyabean protein is influenced not only by the amount of protein but also by the presence or absence of dietary cholesterol (Okita et al., 1990).

A study by Kolb et al., (1985) shows that 81g soya given in the form of crispbread has shown a significant

decrease in total cholesterol of hypercholesteroleamic patients. Soya polysaccarides significantly reduced the use of post prandial plasma triglyceride levels (Tasi et al., 1987).

Danielle et al., (1991) says that administration of soya protein may induce clinically benefical effects in children with familial hypercholeroleamia.

Although the soyabean has high protein content and is used as an alternative to animal protein. However, the nutritive value of soyabean protein is poor due to deficiency of the sulpur containing amino acids, particularly methionine (Ali et al., 1991).

Methodology

III METHODOLOGY

The methodology for the study "Impact of the administration of soyaflour on lipid level of selected cardio-vascular disease patients" was carried out as given below:

A. Selection of the subjects
B. Background information of the subjects
C. Administration of soyaflour incorporated chappatis to the subjects.
D. Impact study of soyaflour administration to the hypercholesterolemic patients.
E. Comparative study of the impact of soya protein with that of wheat protein.

A. SELECTION OF THE SUBJECTS

The area for carrying out the experiment selected was Gupta Nursing Home, Roorkee (U.P). The area selected is home town of the investigator. So, it was convenient to carry out the experiment there with the full cooperation of the Doctor and patients. Also the nursing home is mainly for the cardiac patients.

The selection of samples for the study was done by probability sampling (also known as random sampling).

Probability sampling methods are those in which every item in the universe has a known chance, or probability, of being chosen for the sample. This implies that the selection of sample items is independent of the person making the study that is, the sampling operation is controlled so objectively that the items will be chosen strictly at random (Gupta; 1989).

Out of the samples selected randomly mainly those patients were chosen for the experiment, who are ready to co-operate with the investigator; and also those who belong to the age limit of 25 to 50 years.

For the experiment mainly males were selected as the incidence rate of female patients is comparitively low than the males. Dustan (1987) also says that atherosclerosis occurs more commonly in men than in women; generally, women are 10 to 15 years older than men when symptoms develops. Out of the total number of patients interviewed, 16 were chosen for experiment; that is 8 patients each for experimental and controlled group.

B. BACKGROUND INFORMATION OF THE SUBJECTS

The data regarding the study were collected by primary source. The background information relating to meal pattern, personal habits, family history, fat consumption and the foods restricted by the subjects were collected.

Direct personal interview method was used (Appendix III). A direct personal interview method is a face to face contact obtained (known as informants). The interviewer asks them questions pertaining to the survey and collects the desired information. (Gupta; 1989).

Kothari (1989) says this sort of interview may be in the form of direct personal investigation or it may be an indirect personal investigation.

C. ADMINISTRATION OF SOYAFLOUR INCORPORATED CHAPPATIES TO THE PATIENTS

An acceptability test was done by ranking and scoring method with 30%, 20% and 10% incorporation of soyaflour in wheat flour chappaties, as chappatis are staple food in Uttar Pradesh, where the experiment was carried out. Lowe (1966) says that acceptance or preference tests

determine what a representative population prefers and require large numbers of people. They are also called as consumer preference test. A ranking and scoring methods of evaluating qualities of foods are used in situations when differences in quality are readily detectable. Samples may be ranked in order of the intensity of an attribute such as flavour or tenderness, or they may be scored on a numerical scale. The methods are fast, since multiple samples may be evaluated at the same time (Palmer; 1972).

After the acceptability test a calculated amount of 50 g per day of soya flour for 4 weeks, was given to the experimental group with full instruction about how to use it and consume it. Full details about soya flour incorporation in wheat flour chappaties were given by the investigator. The control group was taking only the wheat flour chappaties, where as experimental group was taking wheat flour chappaties with soya flour incorporation.

D. IMPACT OF STUDY OF SOYAFLOUR ADMINISTRATION

A lipid profile estimation was done before and after the supplementation of soya flour for 4 weeks; to see

the impact of soya flour on the cholesterol and also the difference in serum LDL, serum HDL and serum triglyceride levels. The blood lipid profile was done by 'Zaks' method (Appendix II).

E. COMPARITIVE STUDY OF THE IMPACT OF SOYA PROTEIN WITH THAT OF WHEAT PROTEIN

Comparision of blood profile of the experimental group and control group was done to study the impact of soya protein with wheat protein.

Results and Discussion

IV RESULTS AND DISCUSSIONS

The results of the study "impact of the administration of soyaflour on lipid level of selected cardio-vascular disease" patients has been discussed under the following headings:

A. Background Information of the Selected patients

B. Administration of Soyaflour incorporated chappaties to the patients.

C. Study of impact of soyaflour on lipid level of the patients.

D. Compare the effect of soyaprotein with that of wheat protein.

A. BACKGROUND INFORMATION OF THE SELECTED PATIENTS:

Background information of the patients was collected with the help of interview method. Information collected was on age; height; weight, income, foodpattern, habits, likes and dislikes, and family background which has been discussed below in detail.

A.1 Age, Height and Weight:

The age group for the selection of patients for the study was 35 to 50 years. The results of age, height and weight for the patients are given in the Table I.

TABLE I

AGE, HEIGHT AND WEIGHT OF THE CARDIO-VASCULAR PATIENTS

(N = 26) Males - 21
Females - 5

Age (Years)			Height (cms)			Weight (Kg)		
Range	Number		Range	Number		Range	Number	
	Males	Females		Males	Females		Males	Females
35-39 years	2	-	162-167 cms	6	5	50-59 Kgs	1	1
40-44 years	7	2	168-173 cms	7	-	60-69 Kgs	12	2
45-49 years	10	2	174-179 cms	6	-	70-79 Kgs	3	1
50-54 years	2	1	180-184 cms	2	-	80-89 Kgs	5	1

The data presented in Table I reveals that ten males and two female patients belong to the age group of 40 - 49 years. Two patients were under the category of 35 - 39 years, seven males and two females belong to the age group of 40 - 44 years and two males and one female comes under the age group of 50 - 54 years.

In this study most of the patients were above 40 years of age. This result consides with Antia (1989) and Kannel (1988) that coronary heart disease is more applicable to elederly than the young ones and also that coronary heart disease coronary heart disease usually manifests itself after the age of 50.

The height and weight of the patients shows that the minimum height was 162 cms. and maximum 179 cms; the minimum weight was 50 kgs. and maximum was 87 kgs; six males and 5 females are under 162-167 cms group, 7 males, 6 males and 2 males comes under the groups of 168-173 cms, 174-179 cms and 180-184 cms respectively. For weight results one male and one female have weight in the range of 50-59 kgs, 12 males and 2 females falls under the group of 60-69 kgs, 3 males and 1 female have weight within 70-79 kgs and one female and 5 males have weight within the group range of 80-89 kgs.

According to LIC standards ( ) of the height and weight most of the patients have normal weight according to height. Only 2 females and 5 males were obese, and coincides with the theory of Larsson (1984) that men and women with masculine type of distribution, with a high ratio of waist and lip circumstances have cardio-vascullar risk factors. Out of the twenty six patients, sixteen were selected for the study. All were males. All the sixteen patients selected for experimental group and controlled group were under the age limit of 35-50 years. Height and weight of the patients was within the range of 162 cms - 184 cms and 55 kgs to 85 kgs respectively.

A.2 Occupation and Income:

The results on patients occupation and income reveals that most of the patients are business man and professionals like bank officers executives, professor. According to Eleanor et al., (1984) and James et al., (1990) business comes under light and very light activity and office work comes under light activity only.

Most of the income levels for patients was above 4,000 Rs. per month to 7,000 per month. According to Subramaniam (1990).

Below 2000 Rs. per month - Low Income

2000 Rs. to 5000 per month - Middle Income

5000 Rs. to 10,000 per month - High Middle Income

Above 10,000 Rs. per month - High Income

According to this reference, patients were falling under the middle income group and high middle income groups.

It has been observed that people of high middle income usually consumes rich foods and as they are doing light and very light activities, the energy expenditure or calories expenditure was considerably low. This leads to obesity in long term. The results of the study coincides with Antia (1989) that with the approach of middle age, promotion to executive jobs involve longer hours at or with less physical work leads to obesity in long term. A study by Achaya (1984) also supports the results obtained, that richer people spend on food a smaller amount of their higher earnings, and also tend to buy more expensive protective foods like milk, milk-products, eggs and fleshy foods. But rich people may also be tempted to fill themselves with too many soft drinks or sweets or too much alcohol, and thus could also end up eating lopsided and unbalanced diets leading to obesity and other

complications. The sixteen patients selected were coming under the middle income and high middle income groups. Most of them were engaged in business, and few were doing professions like lecturers, executives and bank manager.

A.3 Meal Pattern:

Out of the 26 patients, interviewed 14 were vegetarian and patients were non-vegetarian and 4 patients were ova-vegetarian. All the eight patients who were non-vegetarian have stopped taking non-vegetarian after the occurance of disease. It was observed that among the patients having heart disease, have a general view that non-vegetarian foods and egg leads to heart disease. This believe has been supported by Wiche et al., (1984) that there is an increased plasma total cholesterol and systolic blood pressure with meal; whereas Flynn et al., (1982) says that there was no significant change in serum cholesterol values when diet was self-selected for beef, port, poultry or fish similarly, Dawber et al., (1982) depicts' that there is no correlation between egg intake and coronary heart disease consumption of one or two eggs per day is quite safe unless the patient already has very high blood cholesterol. the meal pattern of the selected sixteen patients except two all of them were vegetarians, and the two were ova-vegetarians.

A.4 Fat Consumption:

Fat consumption pattern of the patients was within 25 to 50 gms per day. Out of the 26 patients 21 were taking 25g. (1tb. sp) per day. Twenty two of the patients were using refined oil like ground oil, Saffra, Sunflower oil and vital. Only four patients were using saturated fat i.e. dalda.

The fat consumption of the sixteen patients selected was within 25 gm to 50 gm per day and all of them were consuming refined oil only.

It was observed that, some of the patients have charged from the saturated fat to unsaturated fat after the occurence of the disease and also because of the believe that saturated fat is more dominating risk factor for coronary heart disease. Dustan (1987) also supports this, as he had said that dietary intake of saturated fat is potent factor in determining the blood cholesterol level, and reducing intake often decreases the level, thus less-ening the risk of atherosclerotic complications.

A.5 Personal Habits:

The different personal habits prevailing among the patients were smoking, alcohol, pan and drinking tea. Table II shows the different personal habits of the patients.

TABLE II

PERSONAL HABITS OF CARDIO-VASCULAR PATIENTS

Habits	Yes	No
	Number	Number
Smoking	13	13
Alcohol	7	19
Pan	11	15
Tea	25	1

Above Table II shows that 50 per cent of the patients were smoking, whereas 50 per cent of the patients were non-smokers. Smoking is one of the major risk factor which leads to coronary heart disease. This has been supported by Jajich et al., (1984) study that smoking increases almost 3 times higher risk of heart diseases that non-smokers.

Out of 26 patients only 7 were taking alcohol, rest of the patients i.e. 19 were not taking alcohol. Out of 7 patients who were taking alcohol, 2 were heavy drinkers. As alcohol is one of the risk factor leading

to CHD therefore for rest 19 of the patients some other risk factor might be the cause of heart disease.

Taking Pan was the habit of only 11 patients. Drinking tea was the only habit which was prevailing among all the patients except one. Caffine present in the tea or coffee supposed to the factor which leads to coronary heart disease. This results coincides with Garboys et al., (1983) that increased intake of caffine may contribute to raised serum cholesterol.

The personal habits prevailing among the selected sixteen patients was that 11 were smoking cigarettes or pipes. In case of alcohol consumption, 5 of them were consuming alcohol. Seven of them were taking pan and drinking tea was the habit prevailing among all of them.

A.6 Foods Avoided and Included by the Patients:

There were certain foods which were avoided and included by the patients. The results shows that vegetables were included by 18 patients, fruits by 14 patients refined oil by 18 patients and salads by 11 patients. Eighteen patients avoides Dalda or Ghee, salt by 3 patients, sugar by 6, non-vegetarian by 3 patients,

potato by 6 patients and cheese or butter by 3 patients. The patients were not avoiding the foods completely. Frequency of foods intake was by 1 person once in a week, by 5 once in 15 days, once in a month by 7 and occasionally by 1 patients. The selected sixteen patients were including vegetables, fruits, refined oil salads in their daily diet. The food items avoided by the patients were dalda, ghee, cheese, butter, potato and fleshy foods and they consumed these items once in fortnight or occasionally.

A.7 Details of Other Family Members Having the Disease:

The data obtained shows that mainly mother, father and brother were the persons in the family, who had heart disease. For 1 patient, his mother got the disease at the age of 25 - 39 years. Where as for other 2 patients, their mother got the disease at the age of 40 - 54 years. For 4 patients their father had heart disease at the age of 40 - 54 years. Similarly, for 2 patients their brother developed heart disease at the age of 40 - 54 years. Results obtained depicts that heredity is also one of the risk factor for coronary heart disease. Anita (1989) also says that heredity plays a part in coronary heart. Apart from heredity, probably the environment, dietary habits and mode of living of a family also

predispose the individual to coronary heart disease. The selected sixteen patients hereditary picture shows that for 2 patients their mother was having coronary having coronary heart disease. The age at which the disease was evident for the family member was 40 - 54 years.

A.8 Mental Stress:

Mental stress is another risk factor which may lead to coronary heart disease. Results show that 14 of the patients suffers with mental stress of both kind i.e. family problems and office problems. Where as 12 patients suffers from mental stress only occasionally. Results were supported by Antia (1989) that Ischaemic heart disease is reported to be common amongst business executives, lawyers and doctors who are subject to constant mental strain. The selected sixteen patients were having mental stress of both kind that is, family problems and office problems as, they were, involved in business and professions like executives and managers.

A. 9 Weight Maintance and Visits to Health Clubs by the Patients and Frequency Clinic Visit:

Results show that 20 patients does exercises daily to maintain their weight, where as 6 patients does

not do regular exercises. Only one patient goes to health club for exercise, where as rest of the patients are doing at home. Exercise helps in reducing the HDL level and also helps to maintain standard weight according to height. Results also coincides with the Morris, (1980) that physical exercise increases HDL and may be beneficial in making an individual less tense. Most of the patients were going for check up once in fortnight; one patient was visiting 3 times a week and 2 were visiting the clinic only occassionally. Sixteen patients selected were doing regular exercises at home for maintence of their body weight. No one was going to the health club. Frequency of the visit to clinic for check-up was once in fortnight for all the sixteen patients.

A. 10 Knowledge about Saya Flour and Source of Information:

As soya flour is a newly launched food stuff in India, it is not so popular among the common people, especially among North Indians. Inspite of that only 4 patients have the knowledge about soya flour rest 22 patients were unaware of soya bean existance as a flour. They were only aware of soya as a bean. The source of information was T.V. (Health Programmes), and through doctor. The selected sixteen patients were unaware of soya flour and its importance in heart disease. Only

2 patients were aware of its importance through T.V. health programmes.

A. 11 Complications Other than Hypercholestrolemia Prevailing Among Patients:

Out of 26 patients 22 were having hypertension, 5 had diabetis mellitus, 6 were obese, 1 had myocardial infraction, 7 patients had anginapectioris and 2 patients were having kidney problem. For some patients 2 - 3 complications were together prevailing. Hypertension, diabetes - mellitus, obesity are said to be pre-disposing factors for coronary heart disease. Diehl (1989) also says that high blood pressure, high cholesterol (especially LDC cholesterol) obesity and diabetes are major risk factors. Other complications accompained with the hypercholesteroleamics for the selected sixteen patients were hypertension, obesity, angina-pectoris and myocordial infarction.

A.12 Controlled Diet Intake by Patients:

All the 26 respondents were on controlled diet rather than on recommended diet. Virginia (1990) also say that general diet plan for the patients with cardio-vascular disease based on certain guidlines refuces the LDL and cholesterol values. The selected sixteen patients were on controlled diet since the occurance of the disease.

B. ADMINISTRATION OF SOYAFLOUR INCORPORATED CHAPPATIES TO THE PATIENTS:

Out of the 26 patients surved 16 were choosen for the incorporation of soya flour in the diets intro-duction on soya flour was given to the individual patients. Then according to their willingness to take pait in the experimental group and other 8 were taken as a controlled group. All the 16 patients were males as, the female patients was very less. The incorporation of the soya flour was done in the staple food of the patients namely wheat chappati. The incorporation of soya flour was done at 20 per cent level. So, a calculated amount of soya flour i.e. 50g. per day was given for a 4 weeks to the patients. A regular supervision was done in order to see, whether the patients are consuming the soya flour or not.

TABLE III

MEAN NUTRIENT INTAKE OF THE SELECTED PATIENTS BEFORE AND AFTER DURING INCORPORATION SOYA FLOUR

Nutrients	Recommended Allowances	Before Supplementation	After Supplementation	Difference
Protein (g)	60	62.24	80.40	18.16
Fat (g)	15	44.81	50.11	5.3
CHO (g)	-	275.18	287.98	12.8
Calories(K.Cal)	2350	1724	1938	214
Sodium (mg)	8-10 g	600.00	678.30	77.85
Fc (mg)	28	18.27	23.77	5.5
Ca (mg)	400	561.31	615.26	53.95
Vit. A (mg)	2400	12144.30	616.928	-5982.37
Vit. C (mg)	40	88.95	113.33	24.38
Thiamin (mg)	1.2	1.813	2.127	0.314
Riboflavin (mg)	1.4	2.606	2.77	0.164
Niacin (mg)	16	20.78	21.30	0.52

Results on nutrient intake shows that before incorporation of soya flour, calories intake was very less than the normal and even the iron intake was very low. Recommended dietary allowances are estimates of intakes of nutrients which individuals in a population group need to consume to ensure that the physiological needs of all subects in that population are met. In arriving at RDA is the bioavailability of the nutrients from the diet. Bio availability depends both upon the nutritive value of the particular nutrient and on the quality and components of the whole diet (ICMR, 1989).

Calories intake and iron content increased after the incroporation of the soya flour. Other nutrients intake was also increased. Table No. IV shows the mean nutrients content of 100 g. soya bean.

TABLE IV

NUTRIENTS CONTENT OF 100 g SOYA BEAN

Nutrients	Content/100 g
Protein (g)	43.2
Fat (g)	19.5
Carbohydrates (g)	20.9
Calories (KCal)	432
Calcium (mg)	240
Iron (mg)	10.4
Carotene (mg)	426
Thiamine (mg)	0.73
Riboflavin (mg)	0.39
Niacine	3.2
Sodium (mg)	--

That shows that soya bean is a rich source of protein, vegetable type soybeans are already popular as a food in the orient, where the incidence of heart disease is low (Anonymous, 1980). Also it has been reported that vegetable type soybeans are superior to grain type. Varieties in flavour, texture, cooking and low in trypsin inhibator activity. Although the soybean has high protein content and is used as an alternative to animal protein. However, the nutritive value of soybean protein is poor due to deficiency of the sulpur containing amino acids, particularly methionine. (Hafez, 1983).

Table V shows the mean nutrient intake of controlled group before and during the incorporation of soy flour:

The results of Table V depicts that the mean nutrient intake of the controlled group was low as compared to the recommended allowances give by ICMR (1989). protein, calories and iron intake was low than recommended and the rest of the nutrients were near to the recommended allowances.

TABLE V

THE NUTRIENT INTAKE OF THE PATIENTS WHO HAVE NOT RECEIVED THE SOYA FLOUR

Nutrients	Recommended Allowances	Before Incorpo-ration	After Incorpo-ration	Difference
Protein (g)	60	53	56.74	2.77
Fat (g)	15	44.	36.60	8.29
CHO (g)	-	257.56	269	12.43
Calories(K.Cal)	2350	1601	1604	39
Sodium (mg)	810 g	785.188	704.63	80.55
Fc (mg)	28	14.69	15.98	1.29
Ca (mg)	400	494.5	515.45	20
Carotene (mg)	2400	3953.31	3985.23	31
Vit. C (mg)	40	80.59	99.60	19.01
Thiamin (mg)	1.2	1.392	1.712	0.32
Riboflavin (mg)	1.4	3.064	3.304	0.24
Niacin (mg)	16	15.66	16.04	0.48

Difference in the before and during the period of incorporation is because of the change in the food items taken during that period i.e. for 3 consecutive days for which the calculation is being done. This shows that wheat flour have has less nutrients than the soyflour.

C. STUDY OF IMPACT OF SOYAFLOUR ON LIPID LEVEL OF THE PATIENTS:

Table No. VI present the lipid profile for controlled group and Table No. VII shows the experimental group before and after the incorporation.

To study the impact of soyaflour on lipid level of the patients, lipid profile test was done before and after the administration of soyaflour incorporated chappaties for the period of four weeks.

Table No. VI shows the lipid profile picture of the patients under controlled group, who did not receive any soyflour incorporation. Their was hardly any difference of the lipid profile before and after the incorporation period, which shows that wheat protein does not have any marked effect on the cholesterol and low density lipoprotein (LDL) cholesterol level of the hypercholesteroleamic patients.

TABLE VI

LIPID PROFILE OF CONTROLLED GROUP

Normal	Cholesterol 130-250 mg%			LDL 150 mg%			HDL 30-63 mg%			Tgt 30-150 mg%		
	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference
1	260	259	1	187	185	2	35	35	0	180	180	0
2	264	260	4	197	192	5	28	29	-1	192	190	2
3	256	256	0	193	191	2	30	32	-2	206	206	0
4	276	275	1	202	200	2	28	29	-1	220	220	0
5	264	260	4	188	182	6	32	34	-2	252	252	0
6	256	255	1	184	183	1	30	30	0	212	210	2
7	268	266	2	200	198	2	30	30	0	180	180	0
8	258	255	3	178	174	4	38	38	0	212	210	2

FIG. A

CHOLESTEROL VALUE OF EXPERIMENTAL GROUP BEFORE AND AFTER THE INCORPORATION OF SOYFLOUR

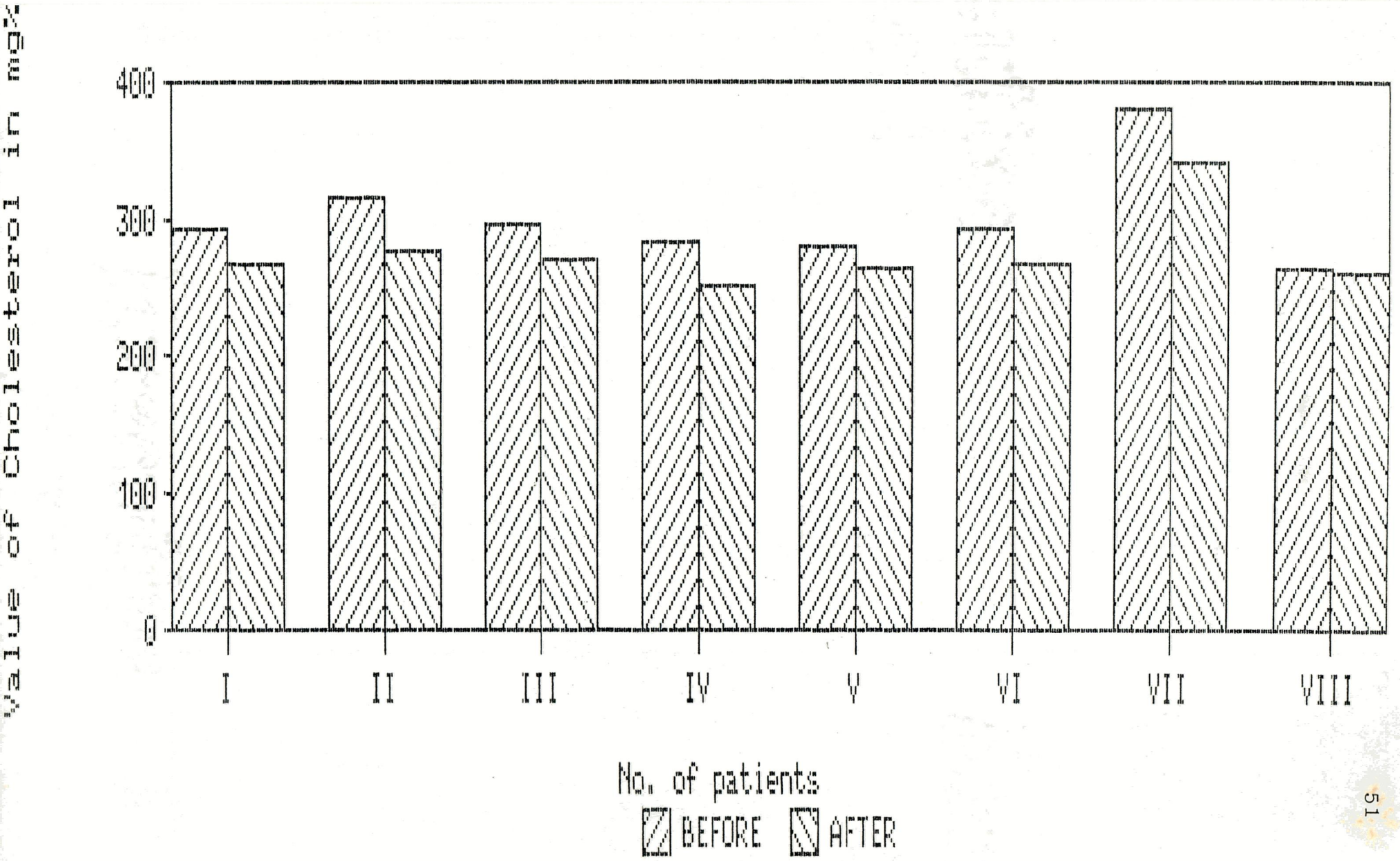

FIG. B

LDL LEVEL OF EXPERIMENTAL GROUP BEFORE AND AFTER THE INCORPORATION OF SOYFLOUR

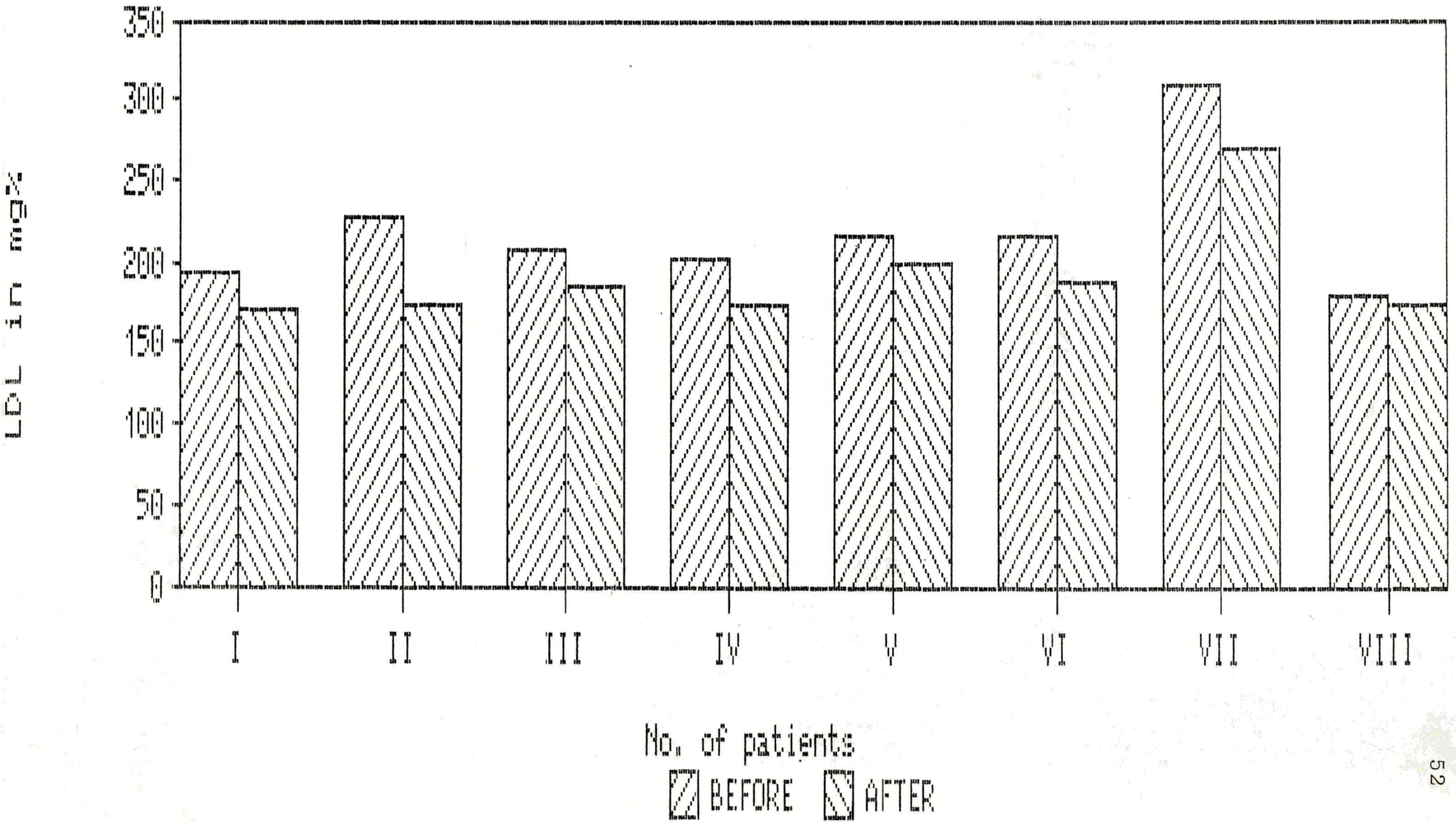

FIG. C

HDL LEVEL OF EXPERIMENTAL GROUP BEFORE AND AFTER THE INCORPORATION OF SOYFLOUR

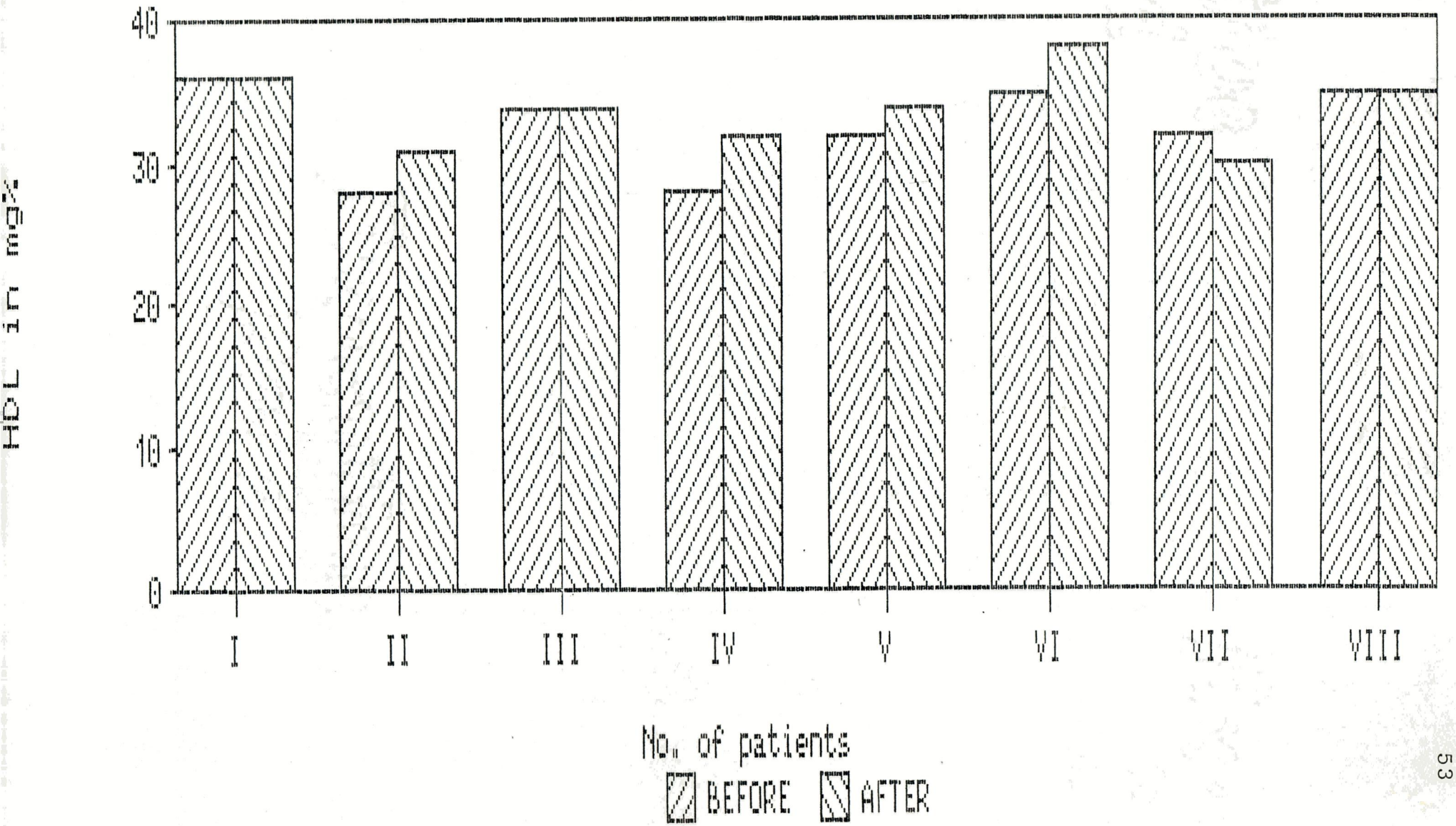

FIG. D

TRIGLYCERIDES VALUE OF EXPERIMENTAL GROUP BEFORE AND AFTER THE INCORPORATION OF SOYFLOUR

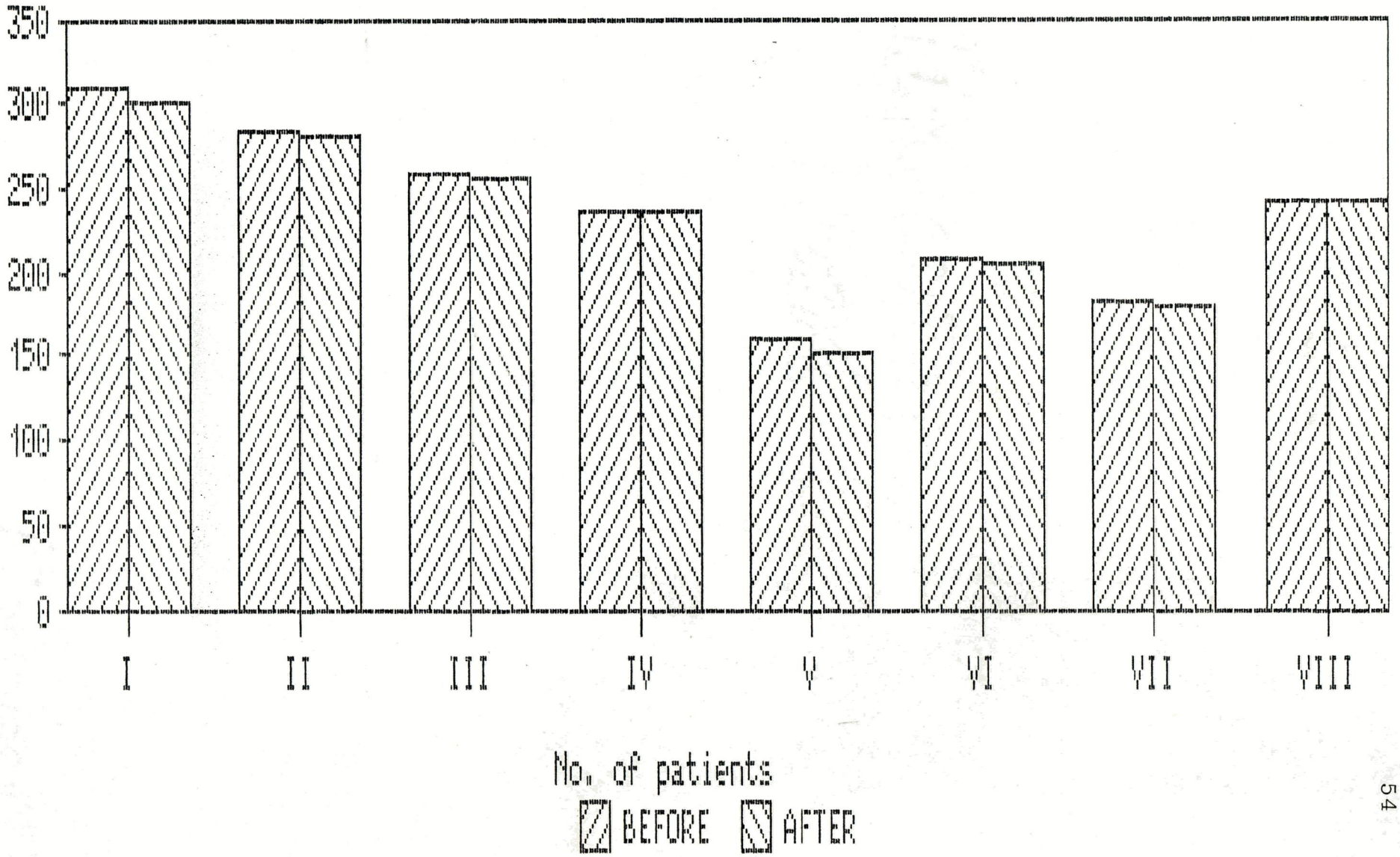

FIG. E

MEAN DIFFERENCE IN THE VALUE OF LIPID PROFILE OF EXPERIMENTAL AND CONTROLLED GROUP BEFORE AND AFTER THE INCORPORATION OF SOYFLOUR

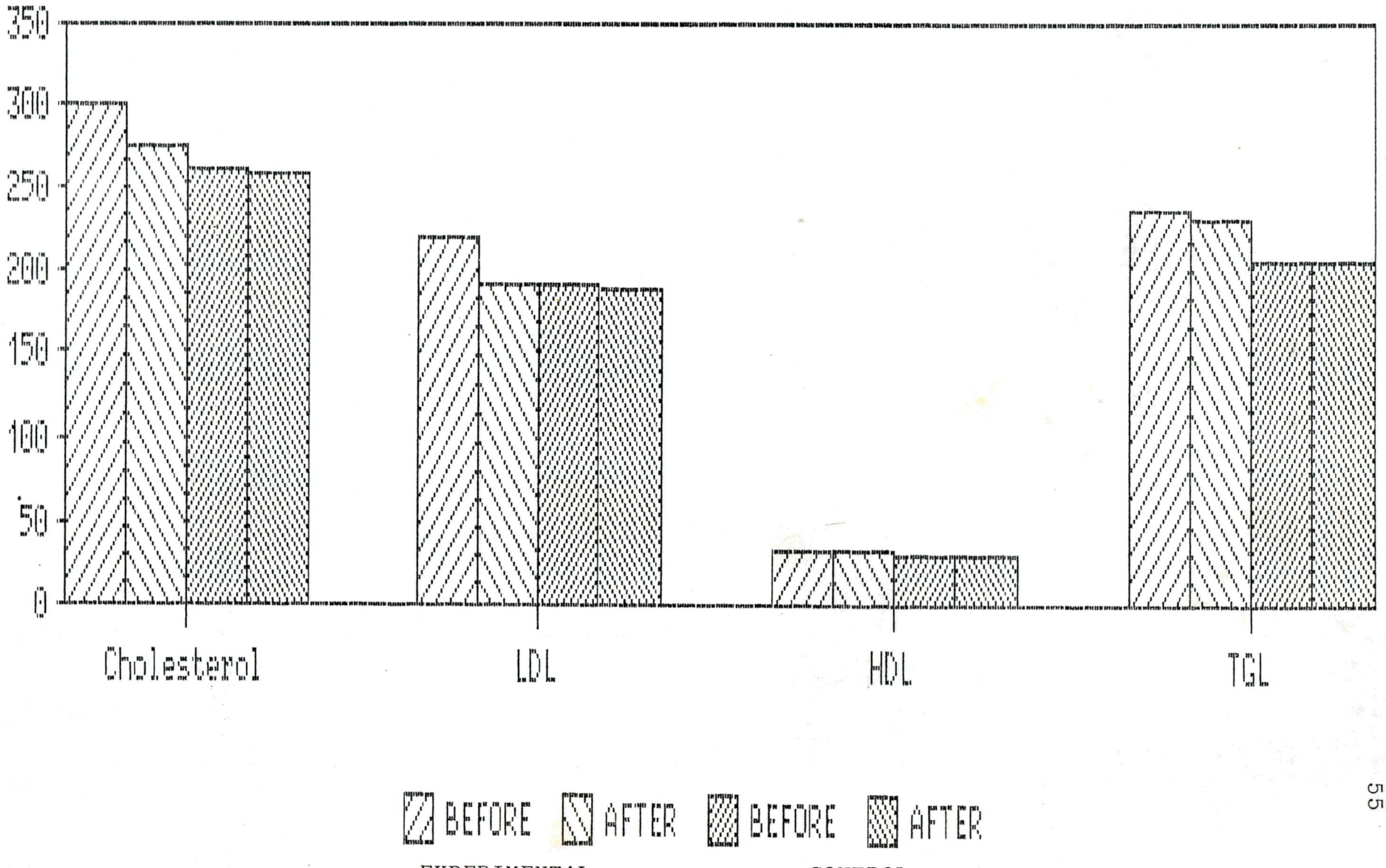

TABLE VII

LIPID PROFILE OF EXPERIMENTAL GROUP BEFORE AND AFTER SOYAFLOUR INCORPORATION

Cholestrol mg/100ml			LDL mg/100ml			HDL mg/100ml			Triglycerides mg/100ml		
Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference
294	268	26	196	172	24	36	36	0	310	302	8
316	279	37	230	176	54	28	31	-3	284	282	2
296	270	26	210	186	24	34	34	0	260	258	2
284	252	32	202	174	28	28	32	-4	236	236	0
282	266	16	216	202	14	32	34	-2	160	152	8
292	268	24	216	190	26	35	38	-3	210	206	4
380	342	38	311	272	39	32	30	2	184	180	4
266	262	4	180	175	5	35	35	0	242	242	0

Table VII shows that their was a prominent difference between the initial and final levels of lipid profile before and after the incorporation of soyaflour to the patients. A marked difference predicts that soyaflour has hypochlesterolemic effect on hypercholesterolemic patients. It helps in decreasing the total cholesterol and also the low density lipoprotein (LDL) cholesterol; where as it has slight effect on High denesity lipoproteins (HDL) cholesterol in increasing its level. HDL is a preventive factor for hypercholesterolemic patients, as it strongly inversely correlated to the risk for developing coronary heart disease (Vessby, 1989). Soyaflour has also shown a slight effect on total triglycerides level.

Hypochlesterolemic effect of soybean has been proved by several studies. Vessby, (1989) says that there is today rather good evidence that substitution of soybean protein for animal protein in a lipid lowering diet may cause a further reduction of the serum cholesterol levels. The reduction seems to be confined is the potentially otherogenic low density - lipoproteins while no effect has been demonstrated on the supposedly protective high density lipoproteins. (Karlstrom, 1982).

TABLE VIII

LIPID PROFILE OF THE EXPERIMENTAL GROUP

	Before Incorporation	After Incorporation	't' value
Cholesterol level	301.25 + 32.58	275.85 + 23.53	6.58*
Triglycerides level	1235.75 + 46.82	232.25 + 47.39	1.015**
LDL-Cholesterol	220.12 + 33.86	193.37 + 31.18	5.21***
HDL-Cholesterol	32.6 + 2.59	33.75 + 1.58	1.82****

$t_{0.005}$ (1%) 3.499 $t_{0.025}$ (5%) 2.365

* Significant at 1%

** Not significant at 1% and 5%

*** Significant at 1%

**** Not significant at 1% and 5%

Table VIII depicts the results that there is a significant difference in the initial and final values of cholesterol and LDL-cholesterol values. The 't' test values depicts the result that cholesterol and LDL-cholesterol are highly significant at 1 percent level to the soyflour incorporation whereas, trigleceride value is not significant to the soyflour incorporation, similarly HDL-cholesterol also not significant.

D. COMPARING THE EFFECT OF SOYA-PROTEIN WITH THAT OF WHEAT PROTEIN:

To compare the effect of Soya-protein with that of wheat protein, lipid profile for both the groups experimental group and controlled group and a difference was found out. This is presented in Table IX.

TABLE IX

DIFFERENCE IN THE LIPID PROFILE OF EXPERIMENTAL GROUP AND CONTROLLED GROUP

Lipid Profile	Experimental group	Controlled group	Difference
Cholesterol mg/100ml	25.375	1.625	23.75
LDL mg/100ml	26.75	2.625	24.125
HDL mg/100ml	-1.25	-0.75	-0.5
Triglycerides mg/100 ml	3.5	0.5	3.0

The Table shows that there was no significant change in the lipid profile after the incorporation period of the controlled group. Where as there was significant change in the lipid profile of the experimental group after the administration of soyaflour incorporated chappaties for a period of 4 weeks.

These results depicts that soyaflour has hypocholesterolemic effect on the cholesterol level of the hypercholesterolemic patients and wheat protein does not show this effect.

Summary and Conclusion

V SUMMARY AND CONCLUSION

The study of "impact of the adminstration of Soyaflour on lipid level of selected Cardio-Vascular disease patients" was mainly carried on hypercholesterolemic patients and to see the hypocholesterolemic effect of the soya flour.

Patients selected for the study were only hypercholesterolemic patients having cholesterol level above the normal level that is 130-250 percent. Out of 26 hypercholesterolemic patients a subsample of 8 patients for each experimental group and controlled group was selected. Except for a patients all were not aware of Soyflour existence and its impact on cholesterol. An introduction was given to the patients individually on soyaflour. Incorporation of soyaflour was done in chappaties, as wheat chappaties were the staple food of the patients. 50g of the soyflour was given daily for the period of 4 weeks.

The results of the study reveals that there is a significant decrease in the cholesterol and low density lipoporteins (LDL) level. For cholesterol the decrease was almost (25.4 mg/dl) where as, for LDL -

Cholesterol it was (26.75 mg/dl). For Triglycerides the decrease was just (3.5 mg/dl). There was not much effect on the HDL - Cholesterol level.

In case of experimental group shown difference in the lipid profile after the administration of Soyaflour after the period of 4 weeks. Whereas, the control group which consumed wheat chappaties does not show much difference in the lipid profile. Soyaprotein has got hypocholesterolemic effect as compare to wheat protein.

The results can be concluded as-soyaflour has shown a remarkable effect the cholesterol and LDL - Cholestrol levels of the hyper cholesterolemic patients. The hypocholesterolemic effect of soyaflour is proved positively in this study.

In order to get more reliable results, longitudinal studies should be undertaken which will be of use to large majority of population who have got hypercholesteroleamia which will prevent the occurance of various types of cardio-vascular diseases.

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Appendix

APPENDIX - I

INDIVIDUAL MEAN NUTRIENT INTAKE OF EXPERIMENTAL GROUP BEFORE INCORPORATION OF SOYAFLOUR

PATIENT - 1

Ings.	Amt. g.	Pro g.	Fat g.	CHO g.	Cals kcal	Na mg.	Fe mg.	Ca mg.	Vit A µg	Vit C mg.	Thia mg.	Ribo mg.	Niacin mg.
Flour	253	30.62	4.3	175.6	864	50.6	2.45	24	73.37	-	1.239	0.177	6.072
Rice	33.3	2.26	0.16	26.04	115	-	0.2	3.32	-	-	0.016	0.016	0.628
Red gram	25	5.5	0.42	14.9	84	7.125	0.675	18.25	33	-	0.11	0.045	0.725
Onion	33.3	0.37	0.03	3.5	16	5.328	0.16	15.56	-	3.652	0.024	0.002	0.132
Tomato	25	0.22	0.05	0.9	5	3.22	0.16	12	78.75	6.75	0.03	0.05	0.1
Potato	16.6	0.26	0.01	3.75	16	1.826	0.079	1.66	3.98	2.82	0.016	0.001	0.149
Cauliflower	50	1.3	0.2	2	15	26.5	0.615	16.5	15	28	0.02	0.5	0.5
Carrot	50	0.45	0.1	5.3	24	2.8	0.515	40	945	1.5	0.02	0.01	0.3
Palak	50	1	0.35	1.45	13	29.25	0.57	146	2790	0.015	0.13	0.25	14
Peas	16.6	1.19	0.01	2.64	15	1.295	0.245	3.33	13.8	1.495	0.04	0.001	0.133
Milk	30	0.96	1.35	1.32	20	7.68	0.06	36	54	1.2	0.015	0.057	0.03
Curd	50	1.55	2.0	1.5	30	16	0.1	74.5	51	0.5	0.025	0.08	0.05
Sugar	20	0.02	-	19.88	80	-	0.03	2.4	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		45.7	33.98	258.28	1521	151.62	5.699	393.52	4057.9	45.932	1.685	1.189	22.819

PATIENT – 2

Ings.	Amt. g.	Pro. g.	Fat. g.	CHO. g.	Cals kcal	Na mg.	Fe mg.	Ca mg.	Vit A µg.	Vit C mg.	Thia mg.	Ribo mg.	Niacin mg.
Flour	240	29.04	4.08	166.5	818	48	11.72	115.2	69.6	–	1.176	1.68	5.76
Redgram	50	11	0.84	28.8	167	14.25	1.35	36.5	66	–	0.22	0.09	1.43
Rice	13.2	0.88	0.06	10.32	46	–	0.09	1.32	–	–	0.007	0.007	0.25
Potato	33.3	0.53	0.03	7.52	32	3.652	0.158	3.32	7.968	5.644	0.032	0.002	0.398
Peas	100	7.2	0.10	15.9	93	7.8	1.5	20	83	9	0.25	0.01	0.8
Onion	31.6	0.37	0.03	3.50	16	1.26	0.18	14.82	–	0.63	0.025	0.003	0.126
Raddish	33.3	0.22	0.02	1.12	6	12.6	0.12	12	1.0	6	0.024	0.008	0.2
Lotus stem	33.3	1.36	0.43	17.1	78	145.8	20.17	134.8	–	0.999	0.273	0.402	0.632
Tomato	30	0.26	0.06	1.08	6	3.87	0.192	14.4	105.3	8.1	0.036	0.018	0.12
Carrot	12.2	0.10	0.02	1.16	6	4.34	0.125	9.76	230.5	0.36	0.004	0.002	0.073
Palak	100	2	0.70	2.9	26	58.5	1.14	292	5580	0.03	0.26	0.5	28
Milk	65	2.06	2.66	2.86	44	10.4	0.13	120.65	117	1.3	0.032	0.123	0.06
Curd	16.6	0.51	0.66	0.49	10	5.31	0.033	24.73	16.93	0.166	0.008	0.02	0.016
Egg	13.3	1.76	1.76	–	23	–	0.279	7.98	79.8	–	0.013	0.053	0.013
Sugar	20	0.02	–	19.88	80	–	0.031	2.4	–	–	–	–	–
Oil	25	–	25	–	225	–	–	–	–	–	–	–	–
		57.31	36.45	279.13	1676	315.78	37.218	809.88	6357.09	32.229	2.648	2.918	37.862

PATIENT – 3

Ings.	Amt. g.	Pro. g.	Fat. g.	CHO. g.	Cals kcal	Na mg.	Fe mg.	Ca mg.	Vit A µg.	Vit C mg.	Thia mg.	Ribo mg.	Niacin mg.
Bread	120	1.2	0.84	62.28	294	-	1.32	13.2	-	-	0.084	-	0.84
Flour	186	22.4	3.16	129.2	636	37.2	9.114	89.28	53.94	-	0.911	0.316	7.99
Redgramdal	50	11.14	0.84	28.8	168	14.25	1.35	36.5	66	-	0.22	0.09	1.43
Palak	100	2	0.70	2.9	26	58.5	1.14	292	5580	0.03	0.26	0.5	28
Onion	50	0.6	0.05	5.54	25	0.2	0.30	23.45	-	5.5	0.04	0.005	0.2
Carrot	333	0.28	0.06	3.50	16	11.85	0.342	26.64	629.37	0.999	0.013	0.006	0.199
Raddish	50	0.34	0.04	1.70	8	16.5	0.2	17.5	1.5	7.5	0.03	0.01	0.25
Peas	333	2.39	0.03	5.29	31	2.59	0.49	6.66	27.6	2.99	0.08	0.003	0.266
Cucumber	66.6	0.26	0.06	1.66	3	6.78	0.46	6.66	-	4.66	0.018	-	0.132
Cauliflower	33.3	0.86	0.12	1.32	10	17.6	0.503	10.95	9.99	18.64	0.013	3.33	0.33
Tomato	16.6	0.14	0.03	0.59	3	2.14	0.106	7.96	58.26	4.482	0.019	0.009	0.066
Milk	118	3.68	4.71	5.06	77	18.4	0.23	138	207	2.3	0.057	0.218	0.115
Curd	50	1.55	2	1.5	30	16	0.1	74.5	51	0.5	0.025	0.08	0.05
Sugar	16.6	0.01	-	16.5	60	-	0.025	1.99	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		47.03	43.4	265.84	1612	201.83	15.68	745.49	6684.6	47.601	1.77	4.567	39.86

PATIENT – 4

Ings.	Amt. g.	Pro. g.	Fat. g.	CHO. g.	Cals kals	Na mg.	Fe mg.	Ca mg.	Vit A µg.	Vit C mg.	Thia mg.	Ribo mg.	Niacin mg.
Flour	274	33.08	4.64	189.6	932	54.8	12.10	118.56	71.53	-	1.210	0.419	10.62
Redgramdal	43	9.62	0.72	24.88	145	12.25	1.161	31.39	56.76	-	0.193	0.081	1.247
Bengal gram	66.6	11.38	3.52	40.4	240	24.76	3.04	134	23718	1.96	0.16	0.08	1.92
Peas	33.3	2.38	0.02	5.26	31	2.59	0.49	6.66	27.6	2.99	0.08	0.003	0.266
Potato	25	0.4	0.02	5.65	24	2.75	0.12	2.5	6	4.25	0.025	0.002	0.3
Cauliflower	100	2.6	0.4	4	30	54	1.23	33	30	56.	0.04	1	1
Tomato	63.3	0.56	0.12	2.27	12	8.14	0.404	30.32	221.8	170.6	0.074	0.036	0.252
Raddish	16.6	0.11	0.01	0.56	3	6.3	0.06	6	0.5	3	0.012	0.004	0.1
Carrot	8.3	0.07	0.01	0.87	4	2.96	0.08	6.66	157.34	2.249	0.003	0.001	0.049
Onion	16.6	0.18	0.01	1.84	10	2.664	0.08	7.78	-	1.826	0.012	0.0016	0.066
Cucumber	66.6	0.26	0.06	1.66	9	6.78	0.46	6.66	-	4.66	0.018	-	0.132
Cabbage	16.6	0.29	0.01	0.76	5	-	0.13	0.702	20.16	20.82	0.010	0.015	0.065
Milk	30	0.96	1.22	1.32	20	7.68	0.06	36	54	1.2	0.015	0.057	0.03
Curd	166.6	5.16	6.66	4.99	100	53.31	0.33	248.23	169.93	1.66	0.083	0.266	0.166
Sugar	20	0.02	-	19.88	80	-	0.03	2.4	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		67.01	42.42	303.94	1871	238.98	19.71	670.86	24533.9	115.685	1.935	1.965	16.213

PATIENT – 5

Ings.	Amt. g.	Prot. g.	Fat. g.	CHO. g.	Cals kcal	Na mg.	Fe mg.	Ca mg.	Vit A µg.	Vit C mg.	Thia mg.	Ribo mg.	Niacin mg.
Bread	80	6.24	0.56	41.52	196	–	0.88	8.8	–	–	0.056	–	0.56
Flour	220	28.9	3.92	159	543	45.6	11.17	109.4	66.12	–	1.117	0.38	4.80
Redgramdal	50	11.14	0.84	28.8	168	14.25	1.35	36.5	66	–	0.22	0.09	1.43
Bengalgram(w)	66.6	11.38	3.52	40.4	240	24.76	3.04	134	23716	1.96	0.16	0.08	1.92
Peas	33.3	2.34	0.32	5	30	2.59	0.49	19.2	140.4	10.8	0.048	0.024	0.16
Potato	50	0.8	0.05	11.3	32	5.50	0.24	5	12	8.5	0.05	0.004	0.6
Carrot	33.3	0.29	0.06	3.52	16	11.85	0.342	26.64	629.37	0.999	0.013	0.006	0.199
Cauliflower	100	2.6	0.4	4	30	53	1.22	33	30	56	0.04	1	1
Cucumber	50	0.2	0.05	1.25	67	5.1	0.30	5	–	3.5	0.015	–	0.1
Tomato	100	0.9	0.2	3.2	20	12.88	0.64	48	315	27	0.12	0.06	0.4
Onion	50	0.6	0.04	5.54	26	0.2	0.30	23.45	–	5.5	0.04	0.005	0.2
Orange	60	0.42	0.12	6.54	29	2.7	0.19	15.6	684	18	–	–	–
Egg	20	2.7	2.74	–	35	–	0.42	12	120	–	0.02	0.08	0.002
Milk	81.6	2.6	3.3	3.59	55	20.48	0.16	96	144	3.2	0.04	0.152	0.08
Curd	66.6	2.06	2.66	1.99	40	21.24	0.132	98.92	64.92	0.664	0.032	0.08	0.064
Sugar	13.3	0.013	–	13.2	53	–	0.02	0.59	–	–	–	–	–
Oil	25	–	25	–	225	–	–	–	–	–	–	–	–
		72.18	43.78	329.85	2048	220.21	20.894	67.21	2598.78	119.923	1.971	2.681	11.51

PATIENT-6

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Bread	33.3	2.05	0.18	13.8	56	-	0.45	4.56	-	-	0.02	-	0.2
Flour	226	27.4	3.84	157.2	784	44	10.78	105.6	63.8	-	1.078	0.37	9.46
Redgramdal	33.3	7.4	0.56	18.8	112	9.46	.896	24.22	43.82	-	0.148	.062	.962
Blackgramdal	30	7.2	0.42	17.8	104	13.2	1.26	51	12.5	-	0.12	0.06	0.66
Bengalgram (w)	66.6	11.2	3.52	40.2	240	24.76	3.04	134	2371.6	1.96	0.16	0.08	1.92
Cucumber	133	3.46	0.53	5.32	80	17.28	0.83	13.33	-	9.33	0.039	-	0.266
Cauliflower	100	2.6	0.4	4	30	54	1.23	33	30	56	0.04	1	1
Cabbage	100	1.8	0.1	4.6	28	-	0.8	39	120	124	0.06	0.09	0.4
Tomato	50	0.44	0.08	1.8	10	6.44	0.32	24	157.50	13.50	0.06	0.10	0.2
Carrot	16.6	0.14	0.03	1.75	16	5.92	0.16	13.32	314.68	.498	0.006	0.002	.098
Brinjal	16.6	0.23	0.04	0.66	8	0.49	0.063	2.995	12.34	1.995	0.006	0.018	0.149
Onion	50	0.6	0.04	5.54	25	0.2	0.30	23.45	-	5.5	0.04	0.005	0.2
Milk	160	3.84	5.04	5.28	80	40.96	0.32	192	288	6.4	0.08	0.304	0.16
Curd	75	2.3	3	2.25	45	24	0.15	111.75	76.5	0.75	0.03	0.12	0.075
Sugar	23	0.02	-	23.16	93	-	0.036	2.79	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
Egg	20	2.66	2.66	-	35	-	0.42	12	120	-	0.02	0.08	0.002
		73.35	45.44	302.16	1981	240.72	21.055	787.01	24795.24	219.93	1.897	2.291	14.75

PATIENT-7

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Flour	166.6	20.1	2.83	115.6	568	33.32	8.1634	79.96	48.31	-	0.816	0.283	7.16
Bread	26.6	2.07	0.1	13.8	65	-	0.292	2.926	-	-	0.018	-	0.18
Rice	8.3	0.56	0.04	6.49	29	-	0.06	1.10	-	-	0.005	0.005	0.207
Maida	16.6	1.82	0.14	12.2	58	1.543	0.448	3.818	4.15	-	0.019	0.011	0.398
Potato	33.3	0.53	0.03	7.52	32	3.652	0.158	31.12	-	7.304	0.048	0.004	0.264
Onion	48.3	0.57	0.04	5.36	24	7.992	0.24	23.34	-	5.478	0.036	0.004	0.198
Carrot	33.3	0.29	0.06	3.52	16	11.85	0.342	26.64	629.37	0.999	0.013	0.006	0.199
Beans	16.6	1.22	0.16	4.94	26	-	0.431	8.3	5.644	4.482	0.053	0.031	-
Cauliflower	33.3	0.86	0.13	1.33	10	17.6	0.503	10.95	9.99	12.64	0.013	3.33	0.33
Peas	25	1.8	0.02	3.97	23	1.95	0.375	5	20.75	2.25	0.06	0.002	0.2
Tomato	11.6	0.10	0.02	0.41	2	1.496	0.072	5.568	40.71	3.132	0.013	0.006	0.046
Bengalgram	8.3	1.62	0.46	4.96	31	3.095	0.38	16.75	2964.5	0.245	0.006	0.003	0.02
Redgram	25	5.57	0.42	14.4	84	7.125	0.675	18.25	33	-	0.11	0.045	0.725
Milk	121.6	5.22	7.9	6.08	142	19.45	0.243	145.92	218.8	2.432	0.06	0.231	0.121
Curd	16.6	0.51	0.66	0.49	10	5.31	0.033	24.73	16.93	0.166	0.008	0.02	0.016
Sugar	16.6	0.01	-	16.5	66	-	0.025	1.901	-	-	-	-	-
Oil	28.3	-	28.3	-	255	-	-	-	-	-	-	-	-
		42.95	41.3	217.57	1440	114.383	12.737	1046.064	3992.15	45.128	1.275	3.981	10.06

PATIENT-8

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Bread	36.6	2.8	0.25	18.9	90	-	0.402	4.026	-	-	0.025	-	0.25
Flour	200	24.2	3.4	138.8	682	40	9.8	9.6	58	-	0.99	0.34	8.6
Redgramdal	8.3	1.25	0.14	4.78	28	2.36	0.224	6.055	10.95	-	0.037	0.015	2.365
Blackgramdal	16.6	3.9	0.23	9.8	58	6.606	0.63	25.5	6.30	-	0.06	0.03	0.33
Horsegram	16.6	3.65	0.08	9.49	53	-	-	-	-	-	-	-	-
Peas	16.6	1.19	0.01	2.63	16	1.295	0.245	3.33	13.8	1.495	0.04	0.001	0.133
Cucumber	16.6	0.06	0.11	0.41	2	0.147	0.115	1.665	-	1.165	0.004	-	0.06
Tomato	8.33	0.74	0.16	2.94	17								
Cauliflower	50	1.3	0.2	2	15	26.5	0.615	16.5	15	28	0.02	0.5	0.5
Onion	25	0.3	0.02	2.77	13	0.1	0.15	11.72	-	2.75	0.02	0.002	0.1
Carrot	16.6	0.14	0.03	1.75	8	5.92	0.171	13.32	314.68	0.499	0.006	0.003	0.099
Cabbage	33.3	0.59	0.03	1.53	9	-	0.26	1.404	40.32	41.66	0.020	0.080	0.13
Brinjal	33.3	0.46	0.09	1.33	8	0.99	0.126	5.99	24.64	3.99	0.013	0.036	0.299
Milk	115	3.68	4.71	5.06	77.6	18.4	0.23	.38	207	2.3	0.057	0.218	0.115
Curd	50	1.55	2	1.5	30	16	0.1	74.5	51	0.5	0.025	0.08	0.05
Sugar	12.3	001	-	16.1	.73	-	0.031	2.4	-	-	-	-	-
Oil	50	-	50	-	450	-	-	-	-	-	-	-	-
		46.72	71.72	244.79	1640	120.14	13.178	402.07	745.69	85.181	1.33	1.256	13.23

INDIVIDUAL MEAN NUTRIENT INTAKE OF EXPERIMENTAL GROUP AFTER SOAYAFLOUR INCORPORATION

PATIENT-1

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Bread	80	2.06	0.18	13.8	66	-	0.88	88	-	-	0.056	-	0.56
Flour	214	25.6	3.61	147.8	728	42.8	10.48	102.72	55.64	-	1.048	0.36	9.84
Rajamh	16.6	3.8	0.21	10.08	58	-	0.84	43.29	-	-	-	-	-
Redgramdal	16.6	3.7	0.28	9.4	56	4.73	0.448	12.11	21.91	-	0.074	0.031	0.481
Onion	16.6	0.19	0.01	1.84	8	2.664	0.08	7.78	-	1.826	0.012	0.001	0.066
Cauliflower	66.6	1.29	1.98	10.14	15	35.2	1.007	21.9	19.98	37.29	0.026	6.66	0.666
Tomato	25	0.22	0.04	0.9	5	3.22	0.16	12	78.75	6.75	0.03	0.015	0.1
Brinjal	16.6	0.23	0.04	0.66	4	0.495	0.063	2.99	12.3	1.99	0.006	0.018	0.649
Carrot	16.6	0.14	0.03	1.75	8	5.92	0.171	13.32	314.68	0.499	0.006	0.003	0.07
Potato	16.6	0.26	0.01	3.75	16	1.826	0.079	1.66	3.9890	2.822	0.016	0.001	0.199
Cabbage	33.3	0.58	0.03	1.52	9	-	0.26	1.404	40.32	41.66	0.020	0.030	0.13
Milk	233	7.4	9.56	10.26	150	326.2	0.3	180	419.4	4.66	0.116	0.44	0.23
Curd	33.3	1.03	1.33	0.99	20	10.62	0.066	49.46	33.86	0.332	0.016	0.04	0.032
Sugar	23.3	2.3	-	23.1	93	-	0.036	2.79	-	-	-	-	-
Oil	25	-	25	-	-	225	-	-	-	-	-	-	-
Cucumber	33	0.13	0.003	0.3	0.83	3.39	0.23	3.33	-	2.33	0.009	-	0.066
Soyaflour (bean)	50	21.6	9.75	10.45	216	-	5.2	120	213	-	0.365	0.195	1.6
		16.16	50.75	247.07	1742	437.05	20.3	583.35	1220.72	103.26	1.8	7.755	14.28

PATIENT – 2

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Bread	80	6.24	0.56	41.52	196	–	0.88	8.8	–	–	0.056	–	0.56
Flour	228	28.9	3.92	159	543	45.6	11.17	109.4	66.12	–	1.117	0.38	9.80
Redgramdal	50	11.14	0.84	28.8	168	14.25	1.35	36.5	66	–	0.22	0.09	1.43
Bengalgram (w)	66.6	11.38	3.52	40.4	240	24.76	3.04	134	2371.6	1.96	0.16	0.08	1.92
Peas	33.3	2.34	0.32	5	30	2.59	0.49	19.2	140.4	10.8	0.048	0.024	0.16
Potato	50	0.8	0.05	11.3	32	5.50	0.24	5	12	8.5	0.05	0.004	0.6
Carrot	33.3	0.29	0.06	3.52	16	11.85	0.342	26.64	629.32	0.999	0.013	0.006	0.199
Cauliflower	100	2.6	0.4	4	30	53	1.22	33	30	56	0.04	1	1
Cucumber	50	0.2	0.05	1.25	67	5.1	0.30	5	–	3.5	0.015	–	0.1
Tomato	100	0.9	0.2	3.2	20	1288	0.64	48	315	27	0.12	0.06	04
Onion	50	0.6	0.04	5.54	26	0.2	0.30	23.45	–	5.5	0.04	0.005	0.2
Orange	60	0.42	0.12	6.54	29	2.7	0.19	15.6	684	18	–	–	–
Egg	20	2.7	2.74	–	35	–	0.42	12	120	–	.02	0.08	0.002
Milk	81.6	2.6	3.3	3.59	55	20.48	0.16	96	144	3.2	0.04	0.152	0.08
Curd	66.6	2.06	2.66	1.99	40	21.24	0.132	98.92	64.92	0.664	0.032	0.08	0.064
Sugar	13.3	0.013	–	13.2	5.3	–	0.02	0.59	–	–	–	–	–
Oil	25	–	25	–	225	–	–	–	–	–	–	–	–
Soyaflour	50	21.6	9.75	10.45	216	–	5.2	120	213	–	0.365	0.195	1.6
		93.78	53.53	340.3	2264	220.21	26.094	187.21	26200.8	119.923	2.336	2.876	13.17

PATIENT – 3

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Bread	120	9.36	0.84	62.28	294	–	1.32	1.2	–	–	0.084	–	0.84
Flour	160	19.36	2.72	111	546	32	7.84	76.8	46.4	–	0.78	0.056	6.88
Rice	33.3	2.26	0.16	26	115	–	0.15	2.49	–	–	0.012	0.012	0.471
Redgramdal	50	11.14	0.84	28.8	16.8	14.25	1.35	36.5	66	–	0.22	0.09	1.45
Peas	58.3	4.19	0.05	9.26	54	4.54	0.874	11.66	48.38	5.247	0.145	0.005	0.466
Rajamh	66.6	15.2	0.86	40.34	230	–	3.39	173.16	–	–	–	–	–
Brinjal	50	0.7	0.15	2	12	1.5	0.19	9	37	6	0.02	0.05	6.45
Onion	33.3	0.38	0.03	3.68	17	3.99	0.12	11.67	–	2.739	0.018	0.002	0.099
Tomato	50	0.44	0.08	1.8	10	6.44	0.32	24	156.5	13.50	0.06	0.030	0.2
Ladies finger	33.3	0.63	0.06	2.13	12	2.29	0.116	21.97	17.31	4.32	0.023	0.03	0.199
Potato	25	0.4	0.02	5.65	24	2.75	0.12	2.5	6	4.25	0.025	0.002	0.3
Cabbage	100	1.8	0.1	4.6	20	–	0.8	39	120	124	0.06	0.09	0.4
Carrot	16.6	0.14	0.32	1.74	8	5.92	0.130	13.32	314.64	0.498	0.006	0.002	0.098
Cauliflower	8.3	0.86	0.13	1.33	20	8.8	0.25	5.47	4.995	9.322	0.006	1.60	0.166
Milk	60	1.92	2.52	2.64	40	15.36	0.12	72	108	2.4	0.03	0.114	0.06
Curd	16.6	0.51	0.66	0.49	20	5.31	0.033	24.73	16.93	0.166	0.008	0.02	0.016
Sugar	40	0.04	–	39.6	160	–	0.06	4.8	–	–	–	–	–
Oil	25	–	25	–	225	–	–	–	–	–	–	–	–
Soyaflour	50	21.6	9.75	10.45	216	–	5.2	120	213	–	0.365	0.195	1.6
		90.93	44.31	353.7	219.9	103.16	22.42	650.27	1155.15	172.44	1.862	2.277	13.695

PATIENT – 4

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Ribo mg	Thia mg	Niacin mg
Flour	280	33.88	4.76	194.32	954	56	13.72	134.4	81.2	–	1.372	0.476	12.04
Bread	16.6	1.29	0.11	8.61	41	–	0.182	1.826	–	–	0.011	–	0.11
Peas	58.3	4.19	0.05	9.26	54	4.54	0.874	11.66	48.38	5.247	0.145	0.005	0.466
Redgram	16.6	3.7	0.28	9.56	56	4.73	0.448	12.11	21.91	–	0.074	0.031	0.481
Bengalgram (w)	50	8.55	265	30.45	180	18.65	2.3	101	94.5	0.15	0.075	0.34	1.5
Onion	48.3	0.57	0.04	5.36	24	1.932	0.289	22.65	–	5.313	0.038	0.004	0.193
Tomato	31.6	0.28	0.06	1.13	6	4.07	0.202	15.16	110.9	8.53	0.037	0.018	0.126
Potato	16.6	0.26	0.01	3.75	16	1.826	0.079	1.66	3.984	2.822	0.016	0.001	0.199
Palak	33.3	0.66	0.23	0.96	9	19.48	0.379	24.3	1858.1	9.32	0.009	0.086	0.166
Cauliflower	50	1.3	0.2	2	15	26.5	0.615	16.5	15	28	0.02	0.5	0.5
Milk	20	0.64	0.82	0.58	13	5.12	0.04	24	36	0.8	0.01	0.038	0.02
Sugar	13.3	0.01	–	13.2	53	–	0.02	1.59	–	–	–	–	–
Curd	16.6	0.51	0.66	0.49	10	5.31	0.033	24.73	16.93	0.166	0.008	0.02	0.016
Oil	25	–	25	–	225	–	–	–	–	–	–	–	–
Soyaflour	50	21.6	9.75	10.45	216	–	5.2	120	213	–	0.365	0.195	1.6
		77.44	44.62	289.97	1872	147.97	24.38	510.58	2499.94	60.34	2.18	2.185	17.41

PATIENT – 5

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Ribo mg	Thia mg	Niacin mg
Bread	80	6.24	0.64	41.32	196	–	0.88	8.8	–	–	0.056	–	0.56
Flour	113.3	13.7	1.92	78.6	386	22.66	5.55	54.38	32.85	–	0.5	0.192	4.87
Redgramdal	50	11	0.84	28.8	167	14.25	1.35	36.5	66	–	0.22	0.09	1.43
Blackgram	33.3	7.95	0.46	19.96	116	13.21	1.26	51.0	12.6	–	0.12	0.06	0.66
Peas	66.6	4.78	0.06	10.58	62	5.18	0.98	38.4	280.8	21.6	0.096	0.04	0.32
Potato	50	0.8	0.05	11.3	49	5.50	0.24	5.0	12	8.50	0.05	0.004	0.6
Onion	58	0.69	0.05	6.47	29	2.32	0.348	27.20	–	1.16	0.046	0.005	0.29
Tomato	58	0.52	0.11	3.09	12	7.48	0.371	27.84	203.5	15.66	0.06	0.03	0.0232
Palak	100	2	0.70	21.9	26	58.50	1.14	292	5580	0.030	0.26	0.50	28
Cauliflower	100	2.6	0.4	4	30	53	1.220	33	30	56	0.04	1.0	1.0
Cabbage	66.6	1.18	0.06	3.06	18	–	0.52	1.808	80.64	83.32	0.02	0.060	0.26
Milk	100	2.08	1.48	6.48	48	140	0.2	120	180	2	0.048	0.16	0.08
Sugar	33.3	0.02	–	3.3	132	–	0.05	3.99	–	–	–	–	–
Curd	41.6	1.28	1.65	1.23	3	13.31	–	–	42.43	0.416	0.02	0.066	0.041
Oil	25	–	25	–	225	–	–	–	–	–	–	–	–
Soyaflower	50	21.6	9.75	10.45	2.10	–	5.2	120	213	–	0.365	0.195	1.6
		76.45	43.17	260.44	1709	335.41	19.309	819.91	5633.82	188.186	2.897	2.41	39.94

PATIENT - **6**

Ings	Amt g.	Protein g	Fat g	CHO g	Cals KCal	Na mg	Fe mg	Ca mg	Vit.A ug	Vit.C mg	Thia mg	Ribo mg	Niacin mg
Flaked rice	16.6	1.09	0.19	12.83	57.4	1.80	3.32	3.32	-	-	0.034	0.008	0.664
Flour	234	28.2	3.96	161.8	796	46.8	11.46	112.3	67.86	-	1.14	0.397	10.06
Bread	20	1.56	0.14	10.38	49	-	0.22	2.2	-	-	0.014	-	0.14
Bengal gram	15	8.55	2.65	30.45	180	18.65	2.3	101	94.5	0.15	0.075	0.34	1.5
Red gram	83	1.85	0.14	4.78	28	2.36	0.224	6.005	10.59	-	0.003	0.015	0.240
Black gram	8.3	1.99	0.11	4.94	29	3.30	0.315	12.75	3.95	-	0.03	0.015	0.165
Rice	8.3	0.56	0.04	6.49	29	-	0.05	0.83	-	-	0.004	0.004	0.157
Peas	48.3	3.47	0.04	7.67	45	3.30	0.31	12.75	3.15	-	0.03	0.015	0.161
Onion	40	0.48	0.04	4.44	20	1.6	0.24	18.46	-	0.8	0.032	0.008	0.2
Tomato	33.3	0.29	0.06	1.19	7	4.28	0.214	15.98	116.52	8.964	0.038	0.018	0.132
Potato	5	0.08	0.005	1.13	5	0.55	0.024	0.5	1.2	0.85	0.005	0.0005	0.06
Cucumber	33.3	0.13	0.03	0.83	4	3.39	0.23	3.33	-	2.33	0.009	-	0.066
Cauliflower	57	1.46	0.22	2.26	17	29.94	0.69	18.64	16.95	31.64	0.022	0.05	0.56
Carrot	23.3	0.20	0.04	2.46	11	8.29	0.239	18.64	440.3	0.699	0.009	0.004	0.139
Palak	50	1	0.35	1.45	13	29.25	0.57	146	2790	0.015	0.13	0.25	14
Milk	25	0.8	1.025	1.1	17	35	0.025	30	45	0.05	0.012	0.04	0.02
Curd	33.3	1.03	1.33	0.99	20	10.62	0.066	49.46	33.86	0.332	0.016	0.04	0.03
Sugar	16.6	0.01	-	16.5	66	-	0.025	1.99	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
Soyaflour	50	21.6	9.75	10.45	216	-	5.2	120	213	-	0.365	0.195	7.6
		77.35	45.11	282.23	1833	186.86	25.43	369.92	3832	46.28	1.975	1.389	29.7

PATIENT-7

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Flour	266	32.24	4.52	186	910	53.2	13.03	127.68	79.14	-	1.303	0.508	11.43
Redgramdal	16.6	3.7	0.28	9.4	56	4.73	0.448	12.11	21.91	-	0.074	0.031	0.481
Rajamh	66.6	15.2	0.86	40.34	2.30	-	3.39	173.16	-	-	-	-	-
Blackgramdal	16.6	3.98	0.22	9.88	58	6.606	0.63	25.5	6.30	-	0.06	0.03	0.33
Cabbage	33.6	0.58	0.02	1.52	10	-	0.26	1.404	40.32	41.66	0.020	0.030	0.13
Tomato	44	0.38	1.84	1.54	8	5.67	0.28	21.2	154.44	11.88	0.052	0.026	0.176
Brinjal	33.3	0.46	0.08	1.32	8	0.99	0.126	5.99	24.64	3.99	0.013	0.036	0.299
Onion	50	0.6	0.04	5.54	26	0.2	0.30	23.45	-	5.5	0.04	0.065	0.2
Carrot	33.3	0.28	0.06	3.50	16	11.85	0.345	26.64	629.37	0.999	0.013	0.006	0.188
Cauliflower	50	1.30	0.2	2	16	26.5	0.615	16.5	15	28	0.02	0.5	0.5
Palak	33.3	0.66	0.22	0.56	8	19.48	.379	24.3	1858.14	9.32	0.009	0.086	0.166
Mustard leaves	33.3	1.32	0.18	1.06	12	-	5.42	5.11	873.12	10.98	0.009	-	-
Potato	33.3	0.52	0.02	7.5	32	3.652	0.158	3.32	7.968	5.644	0.032	0.002	0.298
Cucumber	66.6	0.26	0.06	1.66	8	6.78	0.46	6.66	-	4.66	0.018	-	0.132
Milk	60	1.92	2.46	2.64	40	15.36	0.12	722	108	2.4	0.03	0.114	0.06
Curd	66.6	2.06	2.66	1.99	40	21.24	0.132	98.92	67.72	0.664	0.032	0.08	0.064
Sugar	20	0.02	-	19.8	80	-	0.031	2.4	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
Soyaflour	50	21.6	9.75	10.45	216	-	5.2	120	213	-	0.365	0.195	1.6
		87.08	48.47	306.7	1999	176.25	31.321	768.66	4082	125.69	2.076	1.648	16.06

PATIENT-8

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Bread	13.3	1.03	0.09	6.90	32.58	-	0.182	1.826	-	-	0.011	-	0.11
Flour	256	31	4.36	178	876	512	12.54	122.8	74.24	-	1.254	0.43	11.008
Redgramdal	25	5.5	0.42	14.4	84	7.125	0.675	18.25	33	-	0.11	0.045	0.725
Rice	6.6	0.44	0.03	5.16	23	-	0.04	0.66	-	-	0.003	0.003	0.25
Onion	8.3	0.09	0.008	0.92	4	1.332	0.04	3.89	-	0.913	0.006	0.0008	0.033
Tomato	33.3	0.29	0.06	1.19	7	4.28	.212	15.92	116.52	8.964	0.038	0.018	.132
Cauliflower	50	1.3	0.2	2	15	26.5	.615	16.5	0.15	28	0.02	0.5	0.5
Carrot	8.3	0.07	0.01	0.87	4.9	2.96	0.085	6.66	157.34	0.249	0.003	0.001	0.049
Cabbage	33.3	0.59	0.03	1.53	9	-	0.26	1.404	40.32	41.66	0.02	0.03	0.13
Palak	50	1	0.35	1.45	13	29.2	0.57	146	2790	0.015	0.13	0.25	14
Raddish	16.6	0.11	0.16	0.56	3	6.3	0.06	6	0.5	3	0.012	0.004	0.1
Cucumber	33.3	0.13	0.03	0.83	4	3.39	0.23	3.33	-	2.33	0.009	-	0.066
Milk	48.3	2.07	3.13	2.41	57	7.72	0.096	57.96	86.94	0.966	0.024	0.091	0.048
Sugar	13.3	0.01	-	13.2	53	-	0.020	1.596	-	-	-	-	-
Curd	58.3	1.8	2.33	1.74	35	18.65	0.116	86.86	59.46	0.58	0.029	-	-
Oil	50	-	50	-	450	-	-	-	-	-	-	-	-
Soyaflour	50	21.6	9.75	10.45	216	-	5.2	120	213	-	0.365	0.195	1.6
		67.03	70.95	223.45	1885	619.50	20.94	609.65	3571	90.56	31.917	1.6428	26.2

INDIVIDUAL MEAN NUTRIENT INTAKE OF CONTROLLED GROUP BEFORE SOYAFLOUR INCORPORATION

PATIENT - 1

Ings	Amt g.	Protein g	Fat g	CHO g	Cals KCal	Na mg	Fe mg	Ca mg	Vit.A ug	Vit.C mg	Thia mg	Ribo mg	Niacin mg
Flour	220	26.55	3.73	157.85	750	44	10.78	105.6	63.8	-	1.078	0.37	9.46
Red gram	50	11	0.84	28.8	167	14.25	1.35	36.5	66	-	0.22	0.09	1.45
Bengal gram	16.6	3.98	0.23	9.89	58	6.606	0.63	25.5	5929.6	-	0.66	0.03	0.33
Bengal gram	16.6	3.44	0.92	9.92	62	6.19	0.76	33.5	-	0.49	0.04	0.02	0.48
Onion	84	0.98	0.08	9.22	52	3.36	0.50	39.39	140.4	9.24	0.06	0.008	0.33
Tomato	40	0.36	1.44	0.08	8	5.16	0.25	19.2	27.6	10.8	0.048	0.024	0.16
Peas	33.3	2.39	0.03	5.29	31	2.59	0.49	6.66	-	2.99	0.08	0.003	0.266
Cucumber	33.3	0.1	0.02	0.66	4	3.39	0.23	3.33	-	2.33	0.009	-	0.066
Bottlegourd	66.6	0.12	0.06	1.66	8	2.15	0.3	13.32	19.98	-	0.019	0.006	0.133
Cauliflower	66.6	1.29	1.98	0.18	15	35.2	1.007	21.9	270	37.29	0.026	6.66	0.666
Milk	150	4.8	6.14	6.6	100	210	0.3	180	-	3	0.075	0.285	0.15
Sugar	33.3	0.02	-	33	132	-	0.05	3.99	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		55.03	40.47	257.18	1612	332.89	16.64	488.89	65.23	66.14	1.73	7.496	13.49

PATIENT - 2

Ings	Amt g.	Protein g	Fat g	CHO g	Cals KCal	Na mg	Fe mg	Ca mg	Vit.A ug	Vit.C mg	Thia mg	Ribo mg	Niacin mg
Flour	280	33.88	4.76	194.32	954	56	13.72	134.4	81.2	-	1.372	0.476	12.04
Bread	16.6	1.29	0.11	8.61	41	-	0.182	1.826	-	-	0.011	-	0.11
Peas	58.3	4.19	0.05	9.26	54	4.54	0.874	11.66	48.38	5.247	0.145	0.005	0.466
Red gram	16.6	3.7	0.28	9.56	56	4.73	0.448	12.11	21.19	-	0.074	0.031	0.481
Bengal gram (w)	50	8.55	2.65	30.45	180	18.65	2.3	101	94.5	0.15	0.075	0.34	1.5
Onion	48.3	0.57	0.04	5.36	24	1.93	0.289	22.65	-	5.313	0.038	0.004	0.193
Tomato	31.6	0.28	0.06	1.13	6	4.07	0.202	15.16	110.9	8.53	0.037	0.018	0.126
Potato	16.6	0.26	0.01	3.75	16	1.826	0.079	1.66	3.984	2.822	0.016	0.001	0.199
Palak	33.3	0.66	0.23	0.96	9	19.48	0.379	24.3	1858.14	9.32	0.009	0.086	0.166
Cauliflower	50	1.3	0.2	2	15	26.5	0.615	16.5	15	28	0.02	0.5	0.5
Milk	20	0.64	0.82	0.88	13	5.12	0.04	24	36	0.8	0.01	0.038	0.02
Sugar	13.3	0.01	-	13.2	53	-	0.02	1.59	-	-	-	-	-
Curd	16.6	0.51	0.66	0.49	10	5.31	0.033	24.73	16.93	0.166	0.008	0.02	0.016
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		55.84	34.86	279.52	1656	147.37	19.89	381.58	2286.94	60.34	1.815	1.99	15.81

PATIENT - 3

Ings	Amt g.	Protein g	Fat g	CHO g	Cals KCal	Na mg	Fe mg	Ca mg	Vit.A ug	Vit.C mg	Thia mg	Ribo mg	Niacin mg
Bread	60	4.68	0.42	31.14	147	-	0.66	6.6	-	-	0.042	-	0.42
Flour	280	33.84	4.74	194	954	56	13.72	134.4	81.2	-	1.372	0.476	12.04
Red gram	16.6	3.7	0.01	9.56	56	4.73	0.443	12.11	21.91	-	0.074	0.031	0.481
Bengal gram	8.3	1.99	0.11	4.94	29	3.303	0.315	12.75	3.15	-	0.03	0.015	0.165
Peas	16.6	1.19	0.01	2.63	15	1.295	0.245	3.33	13.8	1.495	0.04	0.001	0.133
Carrot	33.3	0.29	0.06	3.52	16	11.85	0.342	26.64	629.37	0.99	0.013	0.006	0.199
Onion	8.3	0.09	0.008	0.92	5	1.332	0.04	3.89	-	0.913	0.006	0.0008	0.033
Tomato	16.6	0.14	0.03	0.59	3	2.14	0.106	7.96	58.26	4.482	0.019	0.009	0.066
Cauliflower	108.3	2.81	0.43	4.33	33	57.39	1.33	35.73	32.49	60.64	0.043	0.108	1.083
Milk	45	3.68	4.71	5.06	77	18.4	0.23	138	207	2.3	0.057	0.218	0.115
Curd	66.6	2.06	2.66	1.99	40	21.24	0.132	98.92	67.72	0.664	0.032	0.08	0.064
Oil	50	-	50	-	450	-	-	-	-	-	-	-	-
Rice	8.3	0.56	0.04	6.49	29	-	0.05	0.83	-	-	0.004	0.004	0.157
		55.05	63.22	286.67	1923	177.68	17.65	483.75	909.97	71.49	1.732	0.520	14.95

PATIENT - 4

Ings	Amt g.	Protein g	Fat g	CHO g	Cals KCal	Na mg	Fe mg	Ca mg	Vit.A ug	Vit.C mg	Thia mg	Ribo mg	Niacin mg
Flour	266	32.24	4.52	186	910	53.2	13.03	127.68	77.14	-	1.303	0.508	11.43
Red gram	16.6	3.7	0.28	9.4	56	4.73	0.448	12.11	21.91	-	0.074	0.031	0.481
Rajmah	66.6	15.2	0.86	40.34	230	-	3.39	173.16	-	-	-	-	-
Black gram	16.6	3.98	0.22	9.88	58	6.606	0.63	25.5	6.3	-	0.06	0.03	0.33
Cabbage	33.6	0.58	0.02	1.52	10	-	0.26	1.404	40.32	41.66	0.020	0.03	0.13
Tomato	44	0.38	1.84	1.54	8	5.67	0.28	21.12	154.44	11.88	0.052	0.026	0.176
Brinjal	33.3	0.46	0.08	1.32	8	0.99	0.126	5.99	24.64	3.99	0.013	0.036	0.299
Onion	50	0.6	0.04	5.54	26	0.2	0.30	23.45	-	5.5	0.04	0.005	0.2
Carrot	33.3	0.28	0.06	3.50	16	11.85	0.342	26.64	629.37	0.999	0.013	0.006	0.199
Cauliflower	50	1.30	0.2	2	16	26.5	0.615	16.5	15	28	0.02	0.5	0.5
Palak	33.3	0.66	0.22	0.56	8	19.48	0.379	24.3	1858.4	9.32	0.009	0.086	0.166
Mustard leaves	33.3	1.32	0.18	1.06	12	-	5.42	511	873.12	10.98	0.009	-	-
Potato	33.3	0.52	0.02	7.5	32	3.652	0.158	3.32	7.968	5.644	0.032	0.002	0.298
Cucumber	66.6	1.26	0.06	1.66	8	6.78	0.46	6.66	-	4.66	0.018	0	0.132
Milk	60	1.92	2.46	2.64	40	15.36	0.12	72	208	2.4	0.03	0.114	0.06
Curd	66.6	2.06	2.66	1.99	40	21.24	0.132	98.92	67.72	0.664	0.032	0.08	0.064
Sugar	20	0.02	-	19.8	80	-	0.031	2.4	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		65.48	38.72	296.25	1783	176.25	26.121	648.66	3869	125.69	1.72	1.453	14.46

PATIENT - 5

Ings	Amt g.	Protein g	Fat g	CHO g	Cals KCal	Na mg	Fe mg	Ca mg	Vit.A ug	Vit.C mg	Thia mg	Ribo mg	Niacin mg
Bread	80	2.06	0.18	13.8	66	-	0.88	8.88	-	-	0.056	-	0.56
Flour	214	25.6	3.61	147.8	728	42.8	10.48	102.72	55.64	-	1.048	0.36	9.84
Rajmah	16.6	3.8	0.21	10.08	58	-	0.84	43.29	-	-	-	-	-
Red gram	16.6	3.7	0.28	9.4	56	4.73	0.448	12.11	21.91	-	0.074	0.031	0.481
Onion	16.6	0.19	0.01	1.84	8	2.664	0.08	7.78	-	1.826	0.012	0.001	0.066
Cauliflower	66.6	1.29	1.98	10.18	15	35.2	1.007	21.9	19.98	37.29	0.026	6.66	0.666
Tomato	25	0.22	0.04	0.9	5	3.22	0.16	12	78.75	6.75	0.03	0.015	0.1
Brinjal	16.6	0.23	0.04	0.66	4	0.495	0.63	2.99	12.32	1.99	0.006	0.018	0.149
Carrot	16.6	0.14	0.03	1.75	8	5.92	0.171	13.32	314.68	0.499	0.006	0.003	0.099
Potato	16.6	0.26	0.01	3.75	16	1.826	0.079	1.66	3.984	2.822	0.016	0.041	0.199
Cabbage	33.3	0.58	0.03	1.52	9	-	0.26	1.404	40.32	41.66	0.02	0.03	0.13
Milk	233	7.4	9.56	10.26	150	326.2	0.3	180	419.4	4.66	0.116	0.44	0.23
Curd	33.3	1.03	1.33	0.99	20	10.62	0.066	49.46	33.86	0.332	0.016	0.04	0.032
Sugar	23.3	2.3	-	23.1	93	-	0.036	2.79	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
Cucumber	33.3	0.13	0.03	0.13	0.83	3.39	0.23	3.33	-	2.33	0.009	-	0.066
		54.56	40.97	236.62	1526	437.06	15.1	463.55	1072	103.26	1.435	1.56	12.68

PATIENT - 6

Ings	Amt g.	Protein g	Fat g	CHO g	Cals KCal	Na mg	Fe mg	Ca mg	Vit.A ug	Vit.C mg	Thia mg	Ribo mg	Niacin mg
Bread	20	1.56	0.14	10.38	49	-	0.22	2.2	-	-	0.014	-	0.14
Flour	133.3	16.1	2.26	92.5	455	12.39	6.53	63.98	38.65	-	0.653	0.22	5.73
Red gram	25	5.57	0.43	14.4	84	7.125	0.675	18.25	33	-	0.11	0.045	0.725
Peas	16.6	1.19	0.01	2.63	15	1.295	0.245	3.33	13.8	1.495	0.04	0.001	0.133
Bengal gram	50	8.55	2.65	30.45	180	18.65	2.3	101	94.5	0.15	0.075	0.34	1.5
Black gram	8.3	1.99	0.11	4.94	29	3.30	0.315	12.75	3.95	-	0.03	0.015	0.165
Carrot	16.6	0.14	0.03	1.75	8	5.92	0.171	13.32	314.68	0.499	0.006	0.003	0.099
Cucumber	33.3	0.13	0.03	0.83	4	3.39	0.23	3.33	-	2.33	0.009	-	0.066
Onion	50	0.6	0.05	5.55	25	0.2	0.30	23.45	-	5.5	0.04	0.005	0.2
Tomato	25	0.22	0.05	0.9	5	35.2	1.007	21.9	19.98	37.29	0.026	6.66	0.660
Cauliflower	50	1.3	0.2	2	15	26.5	0.615	16.5	0.15	28	0.02	0.5	0.5
Palak	50	1	0.35	1.45	13	29.25	0.57	146	2790	0.015	0.13	0.25	14
Raddish	20	0.14	0.02	0.68	3	6.6	0.08	7	0.6	3	0.012	0.004	0.1
Milk	138	5.94	8.98	6.91	162	22.08	0.414	165.6	248.4	2.76	0.069	0.26	0.138
Curd	100	3.1	4	3	60	32	0.2	149	102	1	0.05	0.16	0.1
Sugar	23.3	0.09	-	23.1	92.7	-	0.036	2.79	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		47.62	44.31	201.47	1425	203.90	13.90	750.4	3658.9	81.03	1.28	8.46	23.66

PATIENT - 7

Ings	Amt g.	Protein g	Fat g	CHO g	Cals KCal	Na mg	Fe mg	Ca mg	Vit.A ug	Vit.C mg	Thia mg	Ribo mg	Niacin mg
Flaked rice	16.6	1.09	0.19	12.83	57.4	1.80	3.32	3.32	-	-	0.034	0.008	0.664
Flour	234	28.2	3.96	161.8	796	46.8	11.46	112.3	67.86	-	1.14	0.397	10.06
Bread	20	1.56	0.14	10.38	49	-	0.22	2.2	-	-	0.014	-	0.14
Bengal gram	15	8.55	2.65	30.45	180	18.65	2.3	101	94.5	0.15	0.075	0.34	1.5
Red gram	83	1.85	0.14	4.78	28	2.36	0.224	6.005	10.59	-	0.003	0.015	0.240
Black gram	8.3	1.99	0.11	4.94	29	3.30	0.315	12.75	3.95	-	0.03	0.015	0.165
Rice	8.3	0.56	0.04	6.49	29	-	0.05	0.83	-	-	0.004	0.004	0.157
Peas	48.3	3.47	0.04	7.67	45	3.30	0.31	12.75	3.15	-	0.03	0.015	0.161
Onion	40	0.48	0.04	4.44	20	1.6	0.24	18.46	-	0.8	0.032	0.008	0.2
Tomato	33.3	0.29	0.06	1.19	7	4.28	0.214	15.98	116.52	8.964	0.038	0.018	0.132
Potato	5	0.08	0.005	1.13	5	0.55	0.024	0.5	1.2	0.85	0.005	0.0005	0.06
Cucumber	33.3	0.13	0.03	0.83	4	3.39	0.23	3.33	-	2.33	0.009	-	0.066
Cauliflower	57	1.46	0.22	2.26	17	29.94	0.69	18.64	16.95	31.64	0.022	0.05	0.56
Carrot	23.3	0.20	0.04	2.46	11	8.29	0.239	18.64	440.3	0.699	0.009	0.004	0.139
Palak	50	1	0.35	1.45	13	29.25	0.57	146	2790	0.015	0.13	0.25	14
Milk	25	0.8	1.025	1.1	17	35	0.025	30	45	0.05	0.012	0.04	0.02
Curd	33.3	1.03	1.33	0.99	20	10.62	0.066	49.46	33.86	0.332	0.016	0.04	0.03
Sugar	16.6	0.01	-	16.5	66	-	0.025	1.99	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		52.75	35.36	271.78	1617	186.86	20.23	249.92	3619	46.28	1.60	1.19	18.49

PATIENT - 8

Ings	Amt g.	Protein g	Fat g	CHO g	Cals KCal	Na mg	Fe mg	Ca mg	Vit.A ug	Vit.C mg	Thia mg	Ribo mg	Niacin mg
Bread	18.3	1.03	0.09	6.90	32.58	-	0.182	1.826	-	-	0.011	-	0.11
Flour	256	31	4.36	178	876	512	12.54	122.8	74.24	-	1.254	0.43	11.008
Red gram	25	5.5	0.42	14.4	84	7.125	0.675	18.25	33	-	0.11	0.045	0.725
Rice	6.6	0.44	0.03	5.16	23	-	0.04	0.66	-	-	0.003	0.003	0.125
Onion	8.3	0.09	0.008	0.92	4	1.332	0.04	3.89	-	0.913	0.006	0.0008	0.033
Tomato	33.3	0.29	0.06	1.19	7	4.28	0.212	15.92	116.52	8.964	0.038	0.018	0.132
Cauliflower	50	1.3	0.2	2	15	26.5	0.615	16.5	0.15	28	0.02	0.5	0.5
Carrot	8.3	0.07	0.01	0.87	4	2.96	0.085	6.66	157.34	0.249	0.003	0.001	0.049
Cabbage	33.3	0.59	0.03	1.53	9	-	0.26	1.404	40.32	41.66	0.02	0.03	0.13
Palak	15	1	0.35	1.45	13	29.25	0.57	146	279.0	.015	0.13	0.25	14
Raddish	16.6	0.11	0.16	0.56	3	6.3	0.06	6	0.5	3	0.012	0.004	0.1
Cucumber	33.3	0.13	0.03	0.83	4	3.39	0.23	3.33	-	2.33	0.009	-	0.066
Milk	48.3	2.07	3.13	2.41	57	7.72	0.096	57.96	86.94	0.966	0.024	0.091	0.048
Sugar	13.3	0.01	-	13.2	53	-	0.023	1.596	-	-	-	-	-
Curd	58	1.8	2.33	1.74	35	18.65	0.116	86.86	59.46	0.58	0.029	0.093	0.58
Oil	50	-	50	-	450	-	-	-	-	-	-	-	-
		45.43	61.20	231	1669	615	15.74	489.65	3358	90.56	1.552	1.4478	24.60

Patient 1

- INDIVIDUAL MEAN NUTRIENT INTAKE OF CONTROLLED GROUP AFTER SOYAFLOUR INCORPORATION

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Bread	80	6.24	0.64	41.52	196	-	0.88	8.8	-	-	0.056	-	0.56
Flour	113.3	13.7	1.92	78.6	386	22.66	5.55	54.38	32.85	-	0.55	0.192	4.87
Redgramdal	50	11	0.84	28.8	167	14.25	1.35	36.5	66	-	0.22	0.09	1.43
Blackgram	33.3	7.96	0.46	19.96	116	13.21	1.26	51.0	12.6	-	0.12	0.06	0.66
Peas	66.6	4.78	0.06	10.58	62	5.18	0.98	38.4	280.8	21.6	0.096	0.048	0.32
Potato	50	0.8	0.05	11.3	49	5.50	0.24	5.0	12	8.50	0.050	0.004	0.6
Onion	58	0.69	0.05	6.47	29	2.32	0.348	27.20	-	1.16	0.046	0.005	0.29
Tomato	58	0.52	0.11	2.09	12	7.48	0.371	27.84	203.5	15.66	0.06	0.03	0.232
Palak	100	2	0.70	2.9	26	58.50	1.14	292	5580	0.030	0.26	0.50	28
Cauliflower	100	26	0.4	4	30	53.0	1.220	33.0	30	56	0.04	1.0	1.0
Cabbage	66.6	1.18	0.06	3.06	18	-	0.52	1.808	80.64	83.32	0.020	0.060	0.26
Milk	100	2.08	1.48	6.48	48	140	0.2	120	180	2	0.048	0.16	0.08
Sugar	33.3	0.02	-	33	132	-	0.05	3.99	-	-	-	-	-
Curd	91.6	1.28	1.65	1.23	3	13.31	-	-	42.43	0.416	0.02	0.066	0.041
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		54.85	33.42	249.99	1499	335.41	14.109	699.918	6520.82	188.186	2.532	2.215	38.34

Patient 2

INDIVIDUAL MEAN NUTRIENT INTAKE OF CONTROLLED GROUP AFTER SOYAFLOUR INCORPORATION

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Bread	66.6	4.12	0.36	27.6	132	-	0.91	9.13	-	-	0.055	-	0.55
Flour	188	23.6	3.34	136.4	670	37.6	9.212	90.24	54.52	-	0.92	0.319	8.084
Blackgram	66.6	11.4	0.66	3.54	174	26.24	2.52	102	25.2	-	0.24	0.12	1.32
Redgram	50	11	0.84	28.8	167	14.25	1.35	36.5	66	-	0.22	0.09	1.43
Peas	66.6	4.78	0.06	10.58	62	5.18	0.98	38.4	280.8	21.6	0.096	0.048	0.32
Onion	50	0.6	0.04	5.54	2.5	0.2	0.30	23.45	-	5.5	0.04	0.005	0.2
Cauliflower	100	2.6	0.4	4	30	53	1.22	33	30	56	0.04	1	1
Palak	66.6	1.33	0.46	1.93	17	38.96	0.758	48.6	3716.28	18.64	0.018	0.172	0.332
Carrot	33.3	0.21	0.03	3.5	16	11.85	0.342	26.64	629.37	0.999	0.013	0.006	0.199
Cucumber	33.3	0.13	0.03	0.83	4	3.31	0.23	3.33	-	2.33	0.009	-	0.066
Milk	115	3.68	4.71	5.06	77	18.4	0.23	138	207	2.3	0.057	0.218	0.115
Sugar	16.6	0.01	-	16.5	66	-	0.025	1.995	-	-	-	-	-
Curd	8.3	0.25	0.33	0.24	5	2.655	0.016	12.365	8.465	0.083	0.004	0.01	0.008
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		63.71	36.26	243.63	1671	211.64	605.43	613.65	5017.63	107.37	1.712	1.988	12.624

Patient 3

INDIVIDUAL MEAN NUTRIENT INTAKE OF CONTROLLED GROUP AFTER SOYAFLOUR INCORPORATION

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcals	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Flour	228	28.3	3.75	157.8	543	45.6	11.17	109.4	66.12	-	1.117	0.38	9.80
Bread	80	6.24	0.56	41.56	196	-	0.88	8.8	-	-	0.056	-	0.56
Red gramdal	33.3	3.70	0.28	9.56	112	9.46	0.896	24.22	43.82	-	0.198	.062	0.962
Black gramdal	33.3	7.96	0.44	19.12	116	13.212	1.26	51.0	12.60	-	0.12	0.06	0.66
Onion	50	0.6	0.04	5.54	25	0.2	0.30	23.45	-	5.5	0.04	0.005	0.2
Tomato	50	0.44	0.1	1.8	10	6.44	0.32	24	157.50	13.50	0.06	0.03	0.2
Raddish	33.3	0.22	0.02	1.12	6	12.6	0.12	15	1.0	6	0.024	0.008	0.2
Cucumber	13.2	0.04	0.01	0.32	2	1.69	0.03	3	0.25	1.5	0.06	0.002	0.05
Bottlegourd	66.6	0.12	0.06	1.66	8	2.15	0.3	13.32	-	-	0.019	0.006	0.133
Carrot	33.3	0.28	0.06	3.5	16	11.85	0.342	26.64	629.37	0.999	0.013	0.006	0.199
Cauliflower	100	2.6	0.4	4	30	53	1.22	33	30	56	0.04	1	1
Milk	80	2.56	3.28	3.52	54	20.48	0.16	96	144	3.2	0.04	0.152	0.08
Sugar	33.3	0.02	-	26.4	106	-	0.04	1.18	-	-	-	-	-
Curd	33.3	1.03	1.33	0.99	20	10.62	0.066	49.46	33.86	0.332	0.016	0.04	0.032
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		53.74	34.86	276.54	1561	354.64	17.104	475.47	1143.27	87.031	1.753	1.751	14.076

Patient 4

INDIVIDUAL MEAN NUTRIENT INTAKE OF CONTROLLED GROUP AFTER SOYAFLOUR INCORPORATION

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcals	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Bread	60	4.68	0.42	31.14	147	-	0.66	6.6	-	-	0.042	-	0.42
Flour	280	33.84	4.74	194.1	954	56	13.72	134.4	21.2	-	1.372	0.476	12.04
Red gramdal	17	3.2	0.01	9.56	56	4.73	0.448	12.11	21.91	-	0.074	0.031	0.421
Black gramdal	8	1.99	0.11	4.94	29	3.303	0.315	12.75	3.15	-	0.03	0.015	0.165
Peas	17	1.19	0.01	2.63	15	1.295	0.245	3.33	13.8	1.495	0.04	0.001	0.133
Carrot	33	0.29	0.06	3.52	16	11.85	0.342	26.64	629.37	0.999	0.013	0.006	0.199
Onion	33	0.09	0.008	0.92	5	1.332	0.04	3.89	-	0.913	0.006	0.0008	0.033
Tomato	17	0.14	0.03	0.59	3	2.14	0.106	7.96	58.26	4.482	0.019	0.009	0.066
Cauliflower	108	2.81	0.43	4.33	33	57.31	1.33	35.73	32.49	60.64	0.043	0.108	1.083
Milk	115	3.68	4.71	5.06	77	18.4	0.23	138	207	2.3	0.057	0.218	0.115
Curd	33	2.06	2.66	1.99	40	21.24	0.132	98.92	67.72	0.664	0.032	0.08	0.064
Sugar	22	0.02	-	21.4	86	-	0.033	2.59	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
Rice	8	0.56	0.04	6.49	29	-	0.05	0.83	-	-	0.004	0.004	0.154
		55.05	38.22	286.67	1698	167.01	17.65	483.68	1114.9	71.493	1.732	0.9488	14.956

Patient 5

INDIVIDUAL MEAN NUTRIENT INTAKE OF CONTROLLED GROUP AFTER SOYAFLOUR INCORPORATION

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcals	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Flour	220	26.55	3.73	157.85	750	44	10.78	105.6	63.8	-	1.078	0.37	9.46
Red gramdal	50	11	0.84	28.8	167	14.25	1.35	36.5	66	-	0.22	0.09	1.45
Black gramdal	16.6	3.98	0.23	9.89	58	6.606	0.63	25.5	6.30	-	0.06	0.03	0.33
Bengal gramdal	16.6	3.44	0.92	9.92	62	6.19	0.76	33.5	5929.6	0.49	0.04	0.02	0.48
Onion	84	0.98	0.08	9.22	52	3.36	0.50	39.39	-	9.24	0.06	0.008	0.33
Tomato	40	0.36	1.44	0.08	8	5.16	0.25	19.2	140.4	10.8	0.048	0.024	0.16
Peas	33.3	2.39	0.03	5.29	31	2.59	0.49	6.66	27.6	2.99	0.03	0.003	0.266
Cucumber	33	0.1	0.02	0.66	4	3.39	0.23	3.33	-	2.33	0.009	-	0.066
Bottlegourd	67	0.12	0.06	1.66	8	2.15	0.3	13.32	-	-	0.019	0.006	0.133
Cauliflower	67	1.29	1.98	0.18	15	35.2	1.007	21.9	19.98	37.29	0.026	6.66	0.666
Milk	15	4.8	6.14	6.6	100	2.10	0.3	180	270	3	0.075	0.285	0.15
Sugar	33	0.02	-	330	132	-	0.05	3.99	-	-	-	-	-
Curd	66.6	206	2.66	1.99	40	21.24	0.132	98.92	67.72	0.664	0.032	0.08	0.064
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		57.09	43.13	259.17	1652	354.13	16.77	587.81	6591.4	66.804	1.747	7.206	13.555

Patient 6

INDIVIDUAL MEAN NUTRIENT INTAKE OF CONTROLLED GROUP AFTER SOYAFLOUR INCORPORATION

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcals	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Bread	120	9.36	0.84	62.28	294	–	1.32	1.2	–	–	0.084	–	0.84
Flour	160	19.36	2.72	111	546	32	7.84	76.8	46.4	–	0.78	0.056	6.88
Rice	33.3	2.26	0.16	26	115	–	0.15	2.49	–	–	0.012	0.012	0.471
Red gram dal	50	11.14	0.84	28.8	168	14.25	1.35	36.5	66	–	0.22	0.09	1.45
Peas	58.3	4.19	0.05	9.26	54	4.54	0.814	11.66	48.38	5.247	0.145	0.005	0.466
Rajamh	66.66	15.2	0.86	40.34	230	–	3.39	173.16	–	–	–	–	–
Brinjal	50	0.7	0.15	2	12	1.5	0.19	9	37	6	0.02	0.05	0.45
Onion	33.3	0.38	0.03	3.68	17	3.99	0.12	11.67	–	2.739	0.018	0.002	0.099
Tomato	50	0.44	0.08	1.8	10	6.44	0.32	24	156.50	13.50	0.06	0.030	0.2
Ladies finger	33.3	0.63	0.04	2.13	12	2.29	0.116	21.97	17.31	4.32	0.023	0.03	0.199
Potato	25	0.4	0.02	5.65	24	2.75	0.12	2.5	6	4.25	0.025	0.002	0.3
Cabbage	100	1.8	0.1	4.6	28	–	0.8	39	120	124	0.06	0.09	0.4
Carrot	16.6	0.14	0.32	1.74	8	5.92	0.170	13.32	314.64	0.498	0.006	0.002	0.098
Cauliflower	8.3	0.86	0.13	1.33	20	8.8	0.25	5.47	4.995	9.322	0.006	1.66	0.166
Milk	60	1.92	2.52	2.64	210	15.36	0.12	72	108	2.4	0.03	0.114	0.06
Curd	16.6	0.51	0.66	0.49	20	5.31	0.033	24.73	16.93	0.166	0.008	0.02	0.016
Sugar	40	0.04	–	39.6	160	–	0.06	4.8	–	–	–	–	–
Oil	25	–	25	–	225	–	–	–	–	–	–	–	–
		69.33	34.56	343.25	1983.10	103.16	17.223	530.27	942.155	172.44	1.497	12.082	12.095

Patient 7

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Bread	187	14.54	1.3	96.8	458	-	2.05	458.15	-	-	0.130	-	1.3
Flour	133.3	16.1	2.26	92.5	455	12.39	6.53	63.98	38.65	-	0.653	0.22	5.73
Redgram	33.3	7.42	0.56	19.1	112	9.46	0.896	24.2	43.82	-	0.148	0.062	0.962
Fenugreek leaves	25	1.1	0.22	1.5	12	19.02	0.48	98.75	585	1	0.015	0.012	0.2
Peas	33.3	2.39	0.03	5.29	31	2.59	0.49	6.66	27.6	2.99	0.08	0.003	0.266
Palak	58.3	1.16	0.40	1.69	15	34.10	0.664	42.55	3253.1	16.32	0.017	0.151	0.291
Cauliflower	16.6	0.43	0.06	0.06	5	11.73	0.335	7.3	6.66	12.43	0.008	2.23	0.22
Onion	95	0.54	0.04	9.99	23	1.8	0.27	21.10	-	4.95	0.036	0.004	0.18
Milk	30	.96	1.36	1.32	20	7.68	0.06	36	54	1.2	0.015	0.057	0.03
Sugar	20	0.62	-	19.8	80	-	0.031	2.4	-	-	-	-	-
Curd	16.6	0.51	0.66	0.49	10	5.31	0.033	24.73	16.93	0.166	0.008	0.02	0.016
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		45.17	31.89	243.54	1446	110.08	11.83	1243.99	4025	37.35	1.11	2.749	9.195

Patient 8

Ings	Amt g	Pro g	Fat g	CHO g	Cals Kcal	Na mg	Fe mg	Ca mg	Vit-A ug	Vit-C mg	Thia mg	Ribo mg	Niacin mg
Flour	226	26.55	3.73	151.85	750	44	10.78	105.6	63.8	-	1.078	0.37	9.46
Redgramdal	50	11	0.84	28.8	167	14.25	1.35	36.5	66	-	0.22	0.09	1.45
Blackgram	16.6	3.98	0.23	9.89	58	6.606	0.63	25.5	6.30	-	0.06	0.03	0.33
Bengalgram (w)	16.6	3.44	0.92	9.92	62	6.19	0.76	33.5	5929.6	0.49	0.04	0.02	0.45
Onion	85	0.98	0.08	9.22	52	3.36	0.50	39.39	-	9.24	0.06	0.008	0.33
Tomato	40	0.36	1.44	0.08	8	5.16	0.25	19.2	140.4	10.8	0.048	0.024	0.16
Peas	33	2.39	0.03	5.29	31	2.59	0.49	6.66	27.6	2.99	0.08	0.003	0.268
Cucumber	33	0.1	0.02	0.66	4	3.31	0.23	3.33	-	2.33	0.009	-	0.066
Bottlegourd	66.6	0.12	0.06	1.66	8	2.15	0.3	13.32	-	-	0.019	0.006	0.133
Cauliflower	66.6	1.29	1.98	0.18	15	35.2	1.007	21.9	19.98	37.29	0.0026	6.66	0.66
Milk	150	4.8	6.14	6.6	100	210	0.3	180	270	3	0.075	0.285	0.15
Sugar	33.3	0.02	-	33	132	-	0.05	3.99	-	-	-	-	-
Oil	25	-	25	-	225	-	-	-	-	-	-	-	-
		55.03	40.47	257.18	1612	332.89	16.647	488.89	6523.68	66.14	1.614	7.496	13.485

APPENDIX - II

ZAK'S METHOD

Estimation of Cholesterol:

Principle : Cholesterol reacts with Ferric Chloride ($FeCl_3$) in the presence of conc. Sulphuric acid (H_2SO_4) to give a pink colour. The intensity of the colour developed is directly proportional to the amount of cholesterol present and is read at 540 in a spectrocolorimeter.

Reagents:

1. **Stock Ferric Chloride ($FeCl_3$) reagent**: 840 mg of pure dry Ferric Chloride ($FeCl_3$) was weighed and dissolved in 100 ml of glacial acetic acid.
2. **Ferric Chloride ($FeCl_3$) precipitating reagent**: 10 ml of stock Ferric Chloride ($FeCl_3$) reagent was placed in a 100 ml standard flask and made upto the mark with pure glacial acetic acid.
3. **Ferric Chloride ($FeCl_3$) diluting reagent**: 8-5 ml of stock ($FeCl_3$) Ferric Chloride was diluted to 100 ml with pure glacial acetic acid in a 100 ml standard flask.
4. **Standard Cholesterol Solution**: 100 mg of pure dry cholesterol was placed in a clean dry 100 ml standard

flask and dissolved in glacial acetic acid. Then made upto the mark with pure glacial acetic acid.

5. **Working Standard Solution**: 10 ml of stock standard was placed in a 100 ml standard flask containing 0.85 ml of ($FeCl_3$) Ferric Chloride stock reagent, then made upto the mark with pure glacial acetic acid.

PROCEDURE : 0.5 - 2.5 ml of the working standard solution was pipetted out into a clean dry test tubes. The total volume of each tube was made upto 0.5 ml with Ferric Chloride (FeCl), diluting reagent. To 0.1 ml of serum added 4.9 ml of Ferricl Chloride ($FeCl_3$) precipitating reagent and mixed well. Allowed to stand for a while and centrifuged. Transferred 2.5 ml of the supernatant into a dry test tube and added 2.5 ml of Ferric Chloride ($FeCl_3$) diluting reagent, mixed well. The tubes were kept in cold water and to each tube added 4.0 ml of concentrated Sulphuric acid (H_2SO_4) drop by drop. The solutions were mixed well. The tubes were allowed to come to room temperature. A blank was also simultaneously prepared by taking 5.0 ml of diluting reagent and 4.0 ml of concentrated Sulphuric acid (H_2SO_4). After 30 minutes the intensity of the colour developed was read at 540 using a reagent blank.

APPENDIX - III

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE

AND EDUCATION FOR WOMEN (Deemed University)

COIMBATORE - 641 043

1991-92

QUESTIONNAIRE TO STUDY DIETARY PATTERN OF CARDIO-VASCULAR PATIENTS

1. Name : _____
2. Address : _____
   _____
   _____
3. Age and sex : _____
4. Height _____ : Weight _____
5. Occupational Status : _____
6. Income : _____
7. Are you a

   Vegetarian [ ] Non Vegetarian [ ]

   Ovo Vegetarian [ ]
8. Meal Pattern : 3 meals/day [ ]

   2 meals/day [ ]

1 meal /day | |

Any other specify : _____

9. Meal Pattern for 3 days

	Breakfast	Lunch	Tea	Dinner
Ist day				
2nd day				
3rd day				

10. What is your approx consumption of fat/oils per day :-

100 g (4 tb sp) | |

75 g (3 tb sp) | |

50 g (2 tb sp) | |

25 g (1 tb sp) | |

11. Name of the fat/oil used for cooking :-

(a) _____

(b) _____

(c) _____

12. What are your likes and dislikes regarding food items :-

LIKES	DISLIKES
(a) _____	(a) _____
(b) _____	(b) _____
(c) _____	(c) _____
(d) _____	(d) _____

13. What are your habits?

(a) _____

(b) _____

(c) _____

14. Do you smoke?

Yes | ____ | No | ____ |

If yes, How much per day

3 Cigerates/day | ____ |

5 Cigerates/day | ____ |

7 Cigerates/day | ____ |

15. Do you consume alcohol

Yes | ____ | No | ____ |

If yes, specify

daily ☐

Once in 2 days ☐

Weekly ☐

16. Do you take

Pan ☐

Beetle Nut ☐

Tabacco ☐

Any other specify _____

17. How much cups of tea/coffee you take daily

2 Cups ☐

3 Cups ☐

4 Cups ☐

Any other specify _____

18. Do you take food outside

Yes [ ] No [ ]

If yes, specify the frequency and type of food

_____

_____

19. When did you come to know about your disease?

20. Who else in your family has heart disease?

If yes at what age of the family members, developed the disease.

21. Do you under go any mental stress

Family Problems [ ]

Office Problems [ ]

22. Do you exercise to maintain your weight

Yes [ ] No [ ]

23. Do you visit any health club

Yes [ ] No [ ]

24. What are the food items you are not taking since your illness :

(a) _____ (d) _____

(b) _____ (e) _____

(c) _____ (f) _____

25. Do you have any idea about the foods to be taken and foods to be avoided in CVD.

Yes [ ] No [ ]

If yes, specify

Avoided	Allowed
(a) _____	(a) _____
(b) _____	(b) _____
(c) _____	(c) _____
(d) _____	(d) _____

26. Did you take food from the family pot or it is prepared especially for you :

Family pot [ ]

Individual [ ]

27. Do you completely avoid the foods which are not allowed

Yes ☐ No ☐

If no, how often do you take them

Once in a week _____

Once in 15 days _____

Once in a month _____

Any other specify _____

28. Are you taking any special food to reduce your cholesterol level

Yes _____ No _____

If yes, what and why

(i) _____

(ii) _____

(iii) _____

29. Do you have any idea about soyaflour/soyabean

Yes _____ No _____

If yes, indicate the source of information

(a) _____

(b) _____

30. How often do you visit the clinic

(a) Daily _____

(b) Thrice a week _____

(c) One in fortnight _____

(d) Any other specify _____

31. Are you suffering from any other disease

Diabetis Melbities _____

Obesity _____

Hypertension _____

Any other, specify _____

32. Are you on a controlled/recommended diet

Yes _____ No _____

If yes, specify the diet

(a) _____

(b) _____

APPENDIX - IV

't'-Test for Cholesterol level of Experimental Group Before and After the Soyaflour incorporation

No.	1st test Before	2nd test After	1st-2nd test 'd'	d^2
1	294	268	-26	676
2	316	279	-37	1369
3	296	270	-26	676
4	284	252	-32	1024
5	282	266	-16	256
6	292	268	-24	576
7	380	342	-38	1444
8	266	262	-4	16

$\Sigma d = 203 \quad \Sigma d^2 = 6037$

$$\bar{d} = \frac{\Sigma d}{n} = \frac{203}{8} = 25.37 = 25.4$$

$$S = \sqrt{\frac{d^2 - n(d)^2}{n-1}} = \sqrt{\frac{6037 - 8(25.4)^2}{7}}$$

$$= \sqrt{\frac{6037 - 5161.28}{7}} = 11.18$$

$$t = \frac{\bar{d}\sqrt{n}}{S} = \frac{25.4\sqrt{8}}{11.18} = \frac{25.4 \times 2.82824}{11.18}$$

$$= \frac{25.4 \times 2.9}{11.18} = 6.58$$

$$t = 6.58$$

't'-Test for LDL value of Experimental Group Before and After the Soyaflour incorporation

No.	1st test Before	2nd test After	1st-2nd test 'd'	d^2
1	196	172	-24	576
2	230	176	-54	2916
3	210	186	-24	576
4	202	174	-28	784
5	216	202	-14	196
6	216	190	-26	676
7	311	272	-39	1521
8	180	175	-5	25

$\sum d=214 \quad \sum d^2=7273$

$$\bar{d} = \frac{\sum d}{n} = \frac{214}{8} = 26.75$$

$$S = \sqrt{\frac{d^2 - n(d)^2}{n-1}} = \sqrt{\frac{7273 - 8(26.75)^2}{7}}$$

$$= \sqrt{\frac{7273 - 5724.5}{7}} = 221.2 = 14.87$$

$$t = \frac{\bar{d}\sqrt{n}}{S} = \frac{26.75\sqrt{8}}{14.87}$$

$$= \frac{26.75 \times 2.9}{14.87} = 5.21$$

$$t = 5.21$$

't'-Test for HDL level of Experimental Group Before and After the Soyaflour incorporation

No.	1st test Before	2nd test After	1st-2nd test 'd'	d^2
1	36	36	0	0
2	28	31	3	9
3	34	34	0	0
4	28	32	4	16
5	32	34	2	4
6	35	38	3	9
7	32	30	2	4
8	35	35	0	0

$\Sigma d=10 \quad \Sigma d^2=42$

$$\bar{d} = \frac{\Sigma d}{n} = \frac{10}{8} = 1.25$$

$$S = \sqrt{\frac{d^2 - n(d)^2}{n-1}} = \sqrt{\frac{42 - 8(12.5)^2}{7}}$$

$$= \sqrt{\frac{42 - 12.5}{7}} = 4.21 = 2.05$$

$$t = \frac{\bar{d}\sqrt{n}}{S} = \frac{1.25\sqrt{8}}{2.05}$$

$$= \frac{1.25 \times 2.9}{2.05} = 1.82$$

$$t = 1.82$$

't'-Test for triglycerides level of Experimental Group Before and After the Soyaflour incorporation

No.	1st test Before	2nd test After	1st-2nd test 'd'	d^2
1	310	302	-8	64
2	284	282	-2	4
3	260	258	-2	4
4	236	236	0	0
5	160	152	-8	64
6	210	206	-4	16
7	184	180	-4	16
8	242	242	0	0

$\Sigma d = 28 \quad \Sigma d^2 = 168$

$$\bar{d} = \frac{\Sigma d}{n} = \frac{28}{8} = 3.5$$

$$S = \sqrt{\frac{d^2 - n(d)^2}{n-1}} = \sqrt{\frac{168 - 8(3.5)^2}{7}}$$

$$= \sqrt{\frac{168 - 98}{7}} = 10$$

$$t = \frac{\bar{d}\sqrt{n}}{S} = \frac{3.5\sqrt{8}}{10}$$

$$= \frac{3.5 \times 2.9}{10} = 1.015$$

$$t = 1.015$$