Fat Consumption Pattern of Selected Families in Coimbatore

BY

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Introduction

I INTRODUCTION

At a time millions of people go hungry from childhood to old age, people of the Western World who number about 1/3 of the world's population eat three fourths of the world's food.

The indisposed suffering from undernutrition, especially in the less developed countries, shown that a large segment of the world's population has not yet escaped the fear of malnutrition and hunger.

Wittwer (1983), states that the real problems are with the distribution and delivery of food, and the available income to buy food. The actual problem confronting the developing countries today, is the energy gap rather than protein and other nutrient gap. Hence briding this gap with energy rich foods is the challenge of the nutritionists of today.

Carbohydrates, fats and proteins are the energy yielding substances. All of an individual's energy is derived from the plant and animal food she or he eats.

Fats are the most concentrated source of energy in foods and often supply two fifths or more of the total energy intake in typical American diets.

The fat consumption pattern varies from country to country. At one end there are people like the Eskimos who get 60 per cent of their dietary calories from fat and at the other end, are many poor people who use no fat at all because they are unable to buy them. Being an expensive food item, fat intake is highly subject to income constraints, but this still leaves open the question of how much is optimal (Achaya, 1987).

According to Robinson et al., (1986) people of the Orient consume diets that provide around 10 per cent or less of the calories from fat whereas, Americans derive about 40 per cent of their calories from fat. Fat consumption in India varies from place to place.

The National Nutrition Monitoring Bureau, Hyderabad, has gathered accurate dietary data in 10 states in India. Fat intake in Gurjarate state is exceptionally high at 28.2 g per day, the states of Madhya Pradesh, Andhra Pradesh and Tamil Nadu show moderate levels of 16.1 - 13.2g and Kerala and Uttar Pradesh are in the low range of 3.6 and 2.3 g daily. Income level markedly influence fat consumption and also the kind of fat eaten in all thesse states. In Gujarat, ghee is consumed at all income levels in fair quantity but is gratest in the high income group. This is also true of Madhya Pradesh and Andhra Pradesh though in much lower quantities at all income levels than in Gujarat. Vanaspati everywhere is practically neligible.

Achaya (1987) has found out that fat consumption varies among the different income groups namely - low, middle and high. High income groups could be at risk

from over-consumption of visible fat when total fat makes a 30 per cent contribution to energy intake. Contributions of just 9 to 11 energy per cent from total fat in low income groups in West Bengal, and in all income groups in Uttar Pradesh, can best be corrected by generate dietary improvement rather than through fat per se. In purely nutritional terms, there is no critical shortage of edible fat that calls for urgent redress.

Upper income groups buy more cooking oil than others. It is also true that a rise in income always leads to greater buying of oil, this being in direct propotion upto a fairly high limit.

Edible oil, raw, refined or hydrogenated is one of the essential constituents of the Indian diet. The average consumption of oil is over one kg per adult per month in a middle class family (Nagarajan, 1975).

Fats are divided into visible and invisible fats. Visible fat is fat or oil used on table or in the preparation of food, Invisible fat is the fat contributed by the food stuff (Hardinge 1988).

Rossell (1987) points out that in today's society we are being encouraged to improve our diet by eating less fat and also by modifying the type of fat consumed.

The dietary fat intake has been shown to have an effect on the serum cholesterol level of individuals. Populations consuming diets high in fat usually have relatively high serum cholesterol levels. Populations with a low fat intake usually have relatively low serum cholesterol levels (Mahan et al.,1984)

Most authorities usually advocate some dietary restriction of toal fat, saturated fatty acids, cholesterol

and sucrose for the prevention of coronary heart disease (Oliver, 1987). Harm could result from severe reduction (10-15 per cent of total calories) of dietary fat both in quantity and in proportion to other nutrients. Prolonged low fat regimes may lead to deficiencies of the essential polyunsaturated fatty acids. Fat consumption should not be too high or too low.

A probe into the literature pertaining patterns of the consumption in different parts of the country shows that such studies are scarce especially in Tamil Nadu. This condition has brought out the need for exploring the fat consumption patterns in different regions, and income groups. Such studies could definitely bring out essential facts regarding fat consumption. Hence the present study has been undertaken in Coimbatore with the following objectives.

A. Study the fat consumption.

patterns of rural and urban populations

B. Find out the difference in the fat consumption patterns among the different income groups.

C. Assess the effect of fat consumption on the blood cholesterol and triglyceride levels of a selected adult population.

Review of Literature

II. REVIEW OF LITERATURE

The literature pertaining to this study on "Fat consumption pattern ofselected Families in Coimbatore" is reviewed under the following headings:

A. Impact of fat consumption on human health

B. Types of fats consumed in India and invisible fat content in foods.

C. Effect of different tyoes of fats on human health

D. Effect of income on the type of fat consumed.

A. Impact of fat consumption on human health:

Harding (1988) states that some fat is essential in the diet, but the trouble is we tend to use too much of it.

Fats have the highest calorie density of any foods and are relatively low in essential nutrients (Sinter et al., 1980)

According to Dliver(1988) evidence of a relation between eating habits and blood lipids and coronary heart disease, did not emerge about 30-35 years ago. The dietary fat intake has shown to have an effect on the serum cholesterol level of individuals. Population consuming high fat diets usually have relatively high serum cholesterol levels (Krause et al., 1984)

Dorney (1987) points that citizens of industrial countries eat more beef, pork and poultry than almost any other society in history. The consumers pay for their meat heavy diet with heart, disease, stroke and certain kinds of cancer, because meat is saturated in fat and cholesterol. People with high cholesterol levels are frequent victims of clogged arteries - heart attacks ar stroke (Grundy et al., 1987)

According to Byke (1975), a dietary containing only saturated fats(Butter, cocount oil, fat and meat) increase the blood cholesterol levels as much as 40-50 mg / 100 ml.

Gurewich et al (1976) states that there is no question that patients with high concentration of low density lipoproteins are at high risk no matter what their HDL concentrations are. A study conducted by Roshanai et al.,(1985) showed that fatty acid intakes tended to be lower in the omnivores. The vegans have less saturated fatty acids and much higher intake of linoleic acid than the omnivores.

According to Gurr et al.,(1975) diabetes, traditionally a disease of carbohydrate metobolism is also associated to a large extent with faulty lipid metabolism. Diabetics frequently suffer from hyperlipidemia and ischaemic heart disease more frequently occurs among diabeticsthan

nob-diabetics.

Sinter et al (1980) state that not all people who consume a diet high in saturated fat and cholesterol have high serum cholesterol level.

The Indian Vegatariam congress (1974) states that by cutting down on saturated fats such as cream, butter, meat and cooking fats and by using vegetable oils for cooking and margarines high in polyunsaturated fat for baking and spreading, a person's cholesterol level could be kept low.

According J.A.D.A (1984) diets with 15 or 75 gm polyunsaturated fatty acides are effectives in lowering serum cholesterol levels.

Studies carried out by Bowman et al.,(1988) showed that a low fat intake resulted in the lowering of total cholesterol and HDL cholesterol than did the usual fat intake.

Grundy (1987) states that diet is the first line of therapy for hypercholesterolemia. The hypocholesterolemic effect of polyunsaturated fats is mainly due to a decrease in LDL cholesterol (LDL) (Mc Namara, 1987). Hence a dietary intake of polyunsaturated fats such as cottonseed oil, safflower oil, sunflower oil effectively lowers serum cholesterol level (Krause et al 1984).

B. Types of fats consumed in India:

Edible oils and fats form a very important part of today's diet (Rossell, 1987).

Studies on fat consumption in India has been carried out by Achaya and co-workers. According to Achaya (1987) the vegetable oil chosen for cooking is generaly a single one, especially in rural areas., and is strongly regional. Groundnut oil is the choice of a broad swathe of the states.

Sesame oil is produced and used all over India, but mostly as a second or speciality oil rather than the mainstay.

Achaya (1987) adds that new oils like the cottonseed, soyabean and edible rice bran are not in general used as such , but do enter the hydrogenated mixture of oils, while palmolein is a recently imported recruit vended naturally through the public distribution system. Ghee is relished everywhere, but only used by the well-to-do for speciality cooking.

Saffola and cottonseed oil have come to common use among the higher strata of educated people who are more aware of the quality and quantity of fat and the health hazards (Ranadive, 1978).

According to Nagarajan (1975) the average consumption of oil is over 1kg/adult/month in a middle class family.

According to Bhattacharya et al.,(1986) Margarines is readily produced from unesterified fat products obtained from palm oil. Soyabeen oil, palomein, rapeseed and ricebran.

According to Berger et al., (1985) palm oil from the flesh of the oil palm fruit is used by most people in developing countries.

Vanaspati is vegetable oil which has been refined, hydrogenated, dedorised and vitaminised. According to Chatrapati (1980), it is a pure nutritious vegetable fat, in a more convenient and more acceptable form-the ideal all purpose food fat for every Indian home Groundnut oil, palm oil, cotton seed oil and sesame oil are used in its manufacture, Giri et al.,(1976)

states that sun flower oil consumption has increased in recent years.

According to Achaya (1978) the vegetable oil component depending on region would consiste of oils with varying per centages of linoleic acid, groundnut (20%) coconut (2%) sesame 40% sunflower 65% vanaspati (8%) and ghee (4%)

INVISIBLE FATS:

Hardinge (1088) states that invisible fat is the fat inherent in the food. Nearly all foods contain some invisible fat (Swaminathan, 1985) By eating freely of food high in fat, visible or invisible, we greatly increase our energy intake (Hardinge, 1988).

A. CEREALS:

The invisible fat content of raw milled rice was found to range from 0.5 - 1gm, that of wheat 1.5 gm, jowar 1-9 gm, sorghum 5 gm, ragi 1.3 gams and maize 3.6gm.

Accurate data are needed for total fat levels in various Indian pulses.

Most green leafy vegetables are stated to carry between 0.3 and 0.7% fat. An average figure of 0.5% has been adopted. The commonest fruit, the banana, is given a lipid of 0.3, papaya o.1, country guava o.3 and apple o.5 An average figure of o.3% for the fat for fruits has been adopted.

Potato lipids only amounted to 0.08% of fresh weight in one study and to 0.08 to 0.13% in two others So a value o.1% has been adopted. A value of 0.1% has been assumed for lipid calculations in onions, potators, Colocasia and yams.

Other food items:

These include a micellaneous group of items ranging from fat-rich prepared foods like biscuits, papads, pickles, halwas and fried snaks to those with little or no fat like tea, coffee and soft drinks. An arbitrary low figure of 0.2% for the average lipid content of foods in this group has been assumed.

Animal Products:

Indian cow milk has a natural fat content of about 5% and buffalo milk of 8%, but the toned milk now distributed in many urban areas is standardised to 3.5% fat.

From compiled figures, Indian goat meat carries 3.6%, chicken 0.6% and eggs 13.3% of fat.

Ghee from cow's milk is 99.5% fat (Manay et al., 1986).

C. Effect of different types of fats on human health;

According to Russell (1987) in today's society we are being constantly encouraged to improve our diet by eating less fat and also by modifying the type of fat consumed.

Saturated fats have shown to raise plasma cholesterol and low density lipoprotein levels and dietary cholesterol increase total plasma cholesterol (IJNU) 1984.

According to Oliver (1987) harm could result from severe reduction (0-15% of total calories) of dietary fat, both in quantity and in propoktion to other nutrients.

Hardinge (1988) states that by consuming animals foods, a persons fat intake will be largely of the saturated type plus considerable cholesterol, which is present in all animals fats. Hard fats of any kind tend to raise blood cholesterol, but not with the same degree (Robinson et al, 1986). High levels of cholesterol in the blood are associated with a high increase in the incidence of coronary artery disease and stroke (Hammond , 1987).

Stand and fat of oil sources, namely hydrogenated fats ghee, palm oil increase the cholesterol level significantly. Oils high in the essential fatty acid linoleic acid, like sun flower oil, safflower oil, corn oil, cotton seed oil lower the cholesterol level. (Durning, 1987) IVC)

E. EFFECT OF INCOME ON THE TYPE OF FAT CONSUMED:

India is a big country with regional peculiarities of food habits, climate and socio-economical conditions which may influence the serum lipid levels (Tiwastar et al, 1981)

a). INCOME AND FAT CONSUMPTION:

It is well recognised that low income is the greatest constraint for obtaining an adequate diet in India. Both protein and calorie levels show high dependence on income. According to Achya (1978) visible fat being an expensive dietary item is no less. He opines that, low income groups spend two thirds of their income on food and high income groups about half. Per capita food expenditure between the high and low income groups stands therefore at a ratio of about 3:5, again, the visible fat consumptions in these groups are also roughtly of this order of magnitude

He states that, the high income groups could be at risk from over-consumption of visible fat. when total fat makes a 30% contribution or more to energy intake.

Achaya (1987) states that estimates based on edible fat supplies that are available in India and the population over which they are spread, show an average fat availability in recent years of 15-16 gm. daily, made up roughly of vegetable oil, 10gm hydrogenated fat (3gm) and ghee (butterfact 2.5.gm).

He states that in both rural and urban areas income has a strong influence on fat intakes. For eg. in Madras city, the consumption figures of toal external fats per se for 5 socio-economic classes viz. HiG, MIG LIG, industrial labourers and slum dwellers, were 40, 28, 16, 24 and 12 gm respectively.

According to Achaya (1987) the LIG, go for the low cost oil like palmolein, groundnut oil, whereas the MIG and HIG go for refined oils, sunflower oil, rice bran oil, butter and ghee.

Methodology

III METHODOLOGY

The methodology pertaining to the present study on 'Fat Consumption Pattern of Selected Families in Coimbatore' is presented under the following headings:

A. Selection of the Area

B. Selection of the sample

C. Conducting the study.

1. Socio-economic and diet survey of the population
2. Quantification of daily food and nutrient intake of the lipid profile of the subsample.
3. Estimation in terms of

    a. Total Cholesterol

    b. HDL cholesterol

    c. LDL cholestard

    D. VLDL

    E. Triglycerdes

    F. Phospholipids.

A. Selection of the Area

As data available on the fat consumption pattern of Coimbatore is meagre, this city was selected as the area of survey for the present study.

To further analyse the difference in the fat consumption pattern of the rural and urban population, Ramnagar, Race Course, R.S.Puram and Gandhipuram areas were selected representing urban population. Vellakinar Idikarai, Pannimadai and Devarayapuram Villages represented rural population. These were selected because they;

Typically represented urban and rural areas, had transport facilities and the people were co-operative.

b. Selection of the samples;

A total number of 180 families were selected for the survey. Ninety families represented urban and ninety

families represented rural areas. In each area, the selected families squally represented the three income groups (high, middle, and low). Thus totally six groups of 30 families each were selected for the fat consumption survey. The guidelines given by H.U.D.C.O. (1987) was followed in classifying income groups and the random sampling produce was used in the selection of the samples.

The dietary fat intake has been shown to have an effect on the serum cholesterol level of individuals, especially, in edults (Krause et al., 1984). Hence to study the effect of fat consumption on the blood lipids of individuals, 18 adults (6 from each income group) living in the urban area were selected.

C. Conducting the Study:

1. Socio-economic and diet Survey of the Population:

The dietary survey is of fundamental importence in the investigation of the dietary pattern and food habits. (ICMR, 1951, Swaminathan 1985 and Pennington 1988) Hence to evaluate the fat consumption pattern of the families a special diet survey schedule was framed by the investigator (Appendix I).

It elicited the name of the interviewee, the composition of the family, their age, income, type of foods used, frequency of use, the type of fats and oils purchased, frequency of purchase and other dietary habits. Using the diet survey schedule the investigator visited the selected 180 families and elicited information through direct interview method.

2. Quantification of the daily food and Nutrient Intake:

The dietary survey is of fundamental importance in the investigation of the dietary pattern and food habits. Recall and weighment method of dietary survey are the most commonly used and they give valuable and reliable data.

To find out the food and fat comsumption pattern of the selected adult population., One day food weightment and 24 hour recall method of diet survey (according to Pennington 1988) were conducted (Appendix-II)

The procedure given by Jelliffe (1966) was adopted for the weightment survey. This method consists of determining the quantity of each food item taken for cooking in the kitchen and also the weight of the cooked food. From these data, the actual quantity of food consumed by each family members and the corresponding

raw equivalents can be calculated. The exact method followed is presented in Appendix II.

The essential fatty acid content of the diet was computed by following the values given by Pyke (1975).

3. Estimation of the lipid profiles of the subsample:

To study the relation between fat consumption and blood lipid profiles, total blood cholesterol, triglycerides, Phospholipide, low density lipoproteine (LDL), very low density lipoproteins (VLDL), and high density lipoproteins (HDL) contents of the selected adults were estimated for the selected subjects.

Blood cholesterol was estimated by Orthokit method.

The produre used and the technique of drawing blood are presented in Appendix. (VI)

Triglyceride was estimated by GPO = PAP method given by Buculo et al., (1981) (Appendix VIII)

LDL cholesterol was calculated from the values of total cholesterol, triglycerides and HDL cholesterol using the formula given by (Teitez, 1980).

LDL = Total cholesterol - HDL - VLDL)mg/dl

VLDL = $\frac{Tg}{5}$ mg/dl

HDL cholesterol was estimated using the Ethino test method (Appendix VII)

Phospholipids was calculated from the formula.

Phospholipids = 68 + (o.89 X cholestrol mg/dl) given by Teitez.

The results obtained were statistically analyzed and discussed.

Results and Discussion

IV - RESULTS AND DISCUSSION

The results of the study on "Fat Consumption Pattern of Selected Families in Coimbatore are discussed under the following headings .

A. Socio economic Background of the Selected Families

1. Literacy level of the heads of the family
2. Type of families
3. Food Expenditure Pattern of the selected Families

B. Food Consumption Pattern of the Selected Families

1. Nature of Food Consumed by the Families
2. Percapita Food Consumption Pattern of the Selected Families
3. Distribution of Famlies according to the type of Oils consumed.
4. Frequency of Preparation of Fried Foods By Selected Families

C. Nutrient Consumption Pattern of the Selected Adults

1. Mean Nutrient Consumption of the Adults

2. Essential Fatty acid Consumption of the Selected Adults

D. Lipid Profile of the Selected Adults.

A. Socio economic Background of the Selected Families

1. Literacy level of the heads of the Selected Families

Educational status is an important aspect of decision-making. Depending upon the knowledge and awareness about the effects of different fats and oils, the type of oil to be used by the family may be decided. For the present study heads of the family were analysed and presented in Table I

TABLE I

Literacy Level of the heads of the Selected Families

(N = 30 in each group)

	URBAN			RURAL		
	L	M	H	L	M	H
ILLITERATE	8	1	1	6	2	1
PRIMARY	7	9	4	2	6	-
SECONDARY	15	15	15	11	19	15
COLLEGE	-	5	14	1	3	10

When the results are analysed income wise, as shown in Table I, 8 of the low income families in the urban area were illiterates compared to 6 in the rural area. The results also showed that 45 percent had secondary school education in both urban and rural area. It was also observed that none were educated upto

college level in the low income group in the urban area as against one in the rural area.

In general, Table I revealed an interesting fact that the literacy level of selected urban and rural populations did not have much variation. That is in urban areas there were 10 illiterates, 20 families with primary education, 45 secondary school and 19 had college level education. In rural area there were 8 illiterates, 18 with primary school education, 45 had secondary level and 14 college educated, which shows an almost equal distribution with regard to educational status of the heads of the families.

2. Type of Families

Table II shows the distribution of the selected families according to the type of family to which they belong, that is, nuclear or joint.

TABLE II

Distribution of the selected Families according to the Type of Family.

TYPE OF FAMILY	URBAN			RURAL		
	L	M	H	L	M	H
NUCLEAR	29	21	20	27	27	22
JOINT	1	9	10	3	3	8

From Table II it is evident that 29 families of the low income group in urban area belonged to nuclear families as compared to 27 families in rural areas.

Like wise 21 families in middle income group in urban area belonged nuclear families as compared to 27 of the same in rural area.

In high income groups in urban and rural areas, the number of nuclear and joint families were almost same. (20, 22, and 10 and 8).

3. Food Expenditure Pattern of the Selected Families

The results of the food expenditure pattern, distributed according to the percentage of money spent on foods in presented in Table III.

TABLE III

Food Expenditure Pattern of the Selected Families

% OF INCOME SPENT ON FOOD	URBAN			RURAL		
	L	M	H	L	M	H
0 - 20	-	1	3	-	-	-
20 - 40	-	4	11	-	3	15
40 - 60	4	12	16	8	10	15
60 - 80	25	12	-	20	16	-
80 - 100	1	1	-	2	1	-

It was seen from table III that as income increased, the percentage of money spend on food decreased. In urban, high income families, about three of them spend below 20 percent of their income on food where as none in the rural area spend this amount on food. But again in urban area, about 25 families in low income group spend 60 to 80 percent of their income on food compared to 12 families in the low income in the same area. In the rural area about 20 families in the low income and 16 families in the middle income spend 60 to 80 percent of their income on food compared to none in high income group in both areas. The highest percentage of 80 to 100 was spend on food ~~one~~ by one family in low income and one family in middle income in the urban and 2 and 1 in the rural area.

Majority of the low and middle income families spend 60 to 80 percent of their income on food in both the areas. The high income families spend only 60 and below 60 percent of their income on food.

B. Food Consumption Pattern of the Selected Families

1. Nature of food consumed by the families-the distribution of the families according to the nature of food consumed is presented in Table IV.

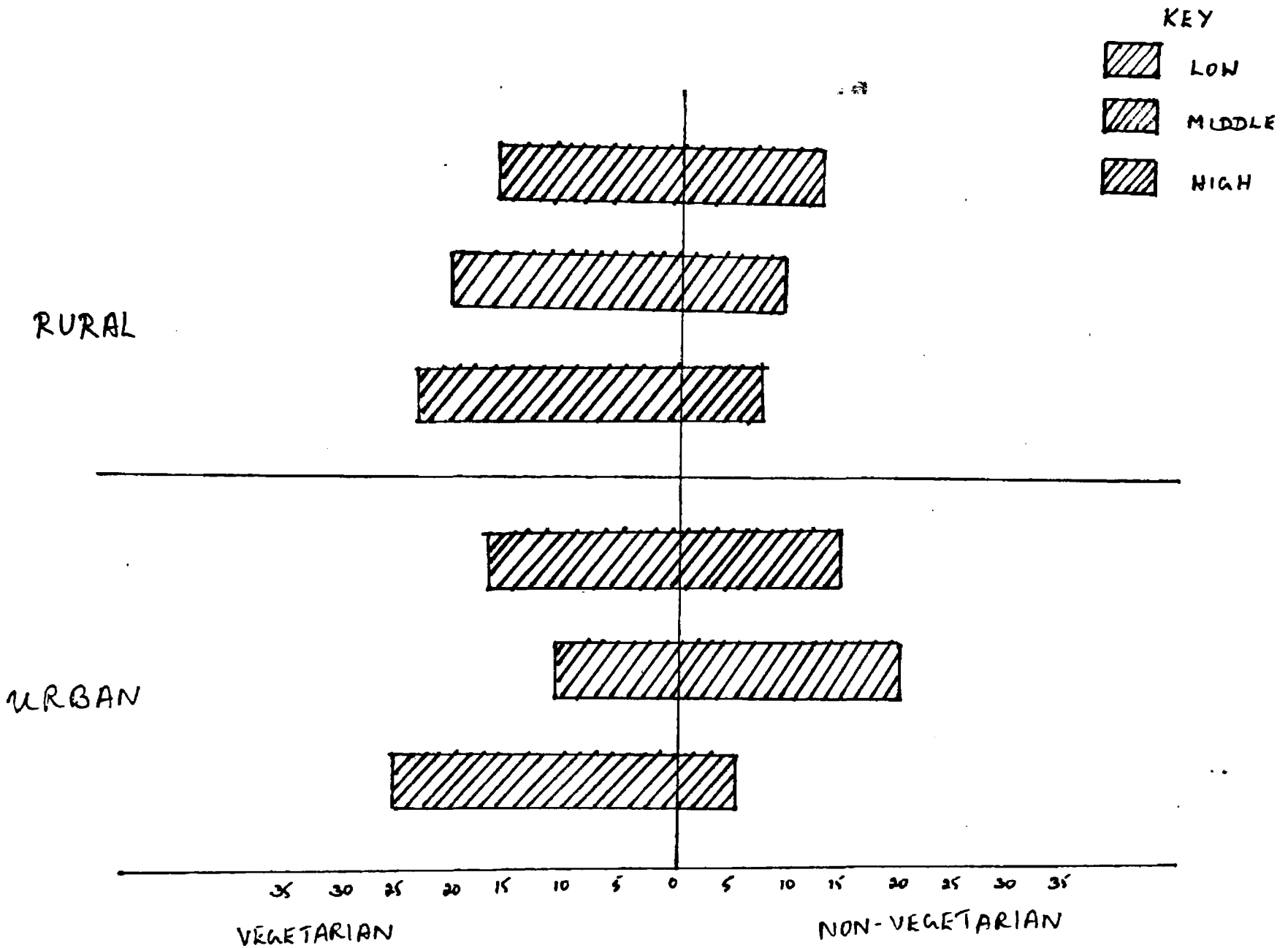
TABLE IV

Nature of food consumed by the selected families

(N = 30 in each group)

TYPE OF FOOD	URBAN			RURAL		
	L	M	H	L	M	H
Vegetarian	25	11	16	23	20	17
Non-Vegetarian	5	19	14	7	10	13

Table IV shows that 25 families in the urban and 23 families in rural low income groups were vegeterians. Among non-vegetarians, the highest number 19 was in the middle income group followed by 14 of high income group both being urban area.



NATURE OF FOOD CONSUMED BY THE SELECTED FAMILIES

FIGURE - 1

Most of the urban middle income families were non-vegetarians and rural middle income families were vegetarians. The number of vegetarians and non-vegetarians in both the areas were almost same (16 and 16 in urban and 17 and 13 in rural) in the high income group. Figure depicts the nature of food consumed by the families.

2. Per Capita Food Consumption Pattern of the Selected Families

Table V shows the per capita food consumption of the selected families.

TABLE V

PER CAPITA FOOD CONSUMPTION PATTERN OF THE SELECTED FAMILIES

(N = 30 in each group)

Food stuff g/day	URBAN			RURAL		
	L	M	H	L	M	H
Cereals						
100 - 200	10	7	5	16	8	5
200 - 300	11	13	14	9	9	11
300 - 400	9	10	11	5	13	16
Pules						
20 - 40	20	5	3	11	5	19
40 - 60	8	10	7	15	13	11
60 - 80	2	15	20	4	12	-
Vegetables						
0 - 100	20	10	3	24	2	2
100 - 200	10	20	27	6	28	28

Sugar						
0-50	19	15	13	26	18	17
50 - 100	11	15	17	4	12	13
Milk 0 - 100	6	-	-	14	1	1
100 - 200	5	1	1	8	3	-
200 - 300	3	2	1	4	1	1
300 - 400	5	2	3	2	2	1
400 - 500	7	8	6	2	10	10
500 - 600	4	6	7	-	7	6
600 - 700	-	4	5	-	4	5
700 - 800	-	5	4	-	4	5
800 - 900	-	2	3	-	1	3
Fats and Oils						
0-20	16	3	1	14	1	-
20-40	13	17	13	16	13	17
40-60	1	10	16	-	10	13
Fresh foods						
0-25	4	6	1	3	-	-
25-50	-	5	2	4	5	-
50-75	-	4	13	-	4	7
75-100	-	3	3	-	1	6

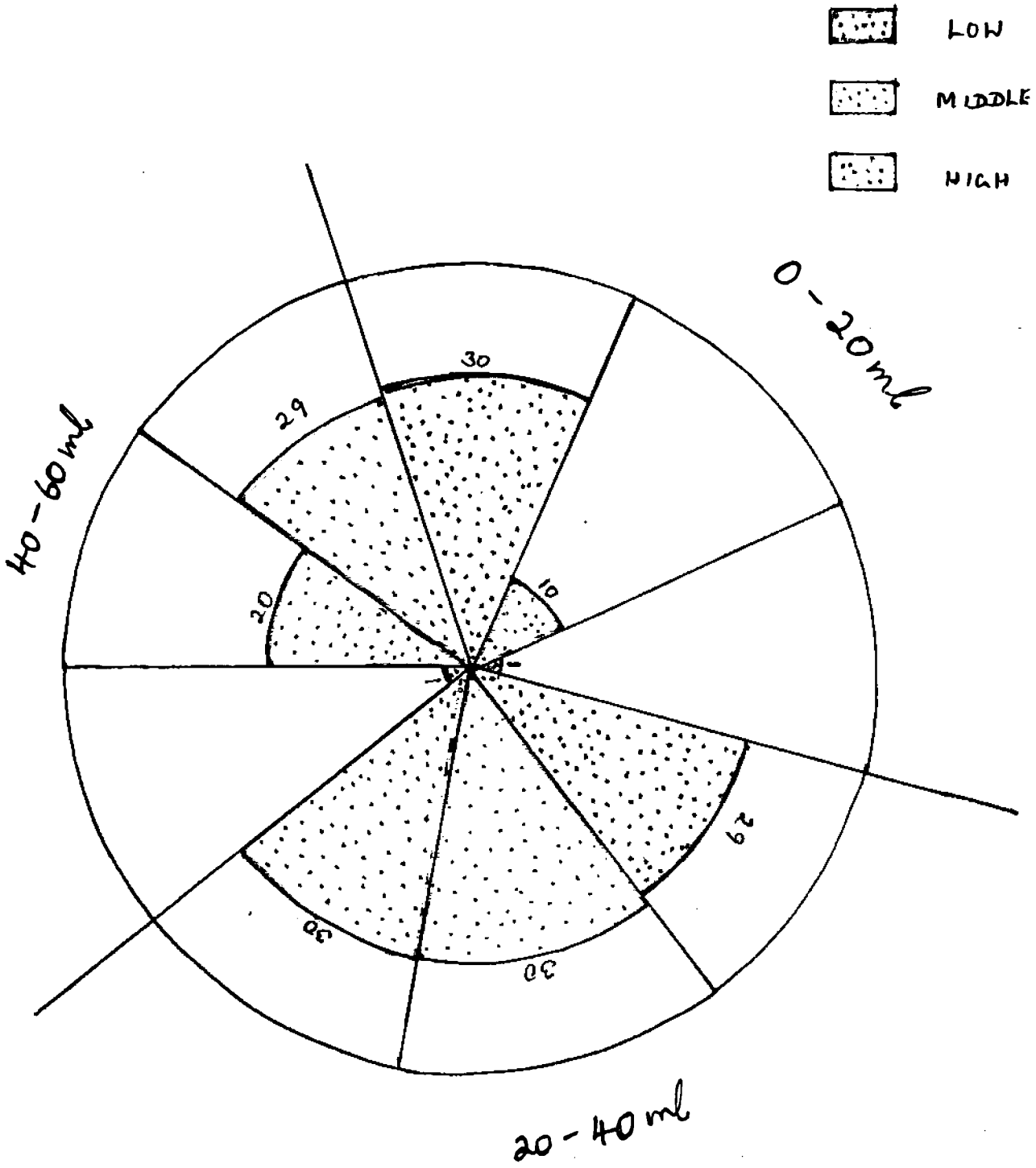
Analysis of Table V shows that in the urban area all the three income groups consumed varying amounts of cereals. In each group about 1/3 of the families consumed 100 to 200 g, 1/3 consumed 200-300 and 1/3 consumed 300-400g of cereals. The same pattern was observed in the rural area also. But here about 50 percent of the low income group consumed only 100 to 200 g of cereals and at the same time 50 percent of the high income consumed 300 to 400g of cereals.

The per capita pulse consumption showed that20 families in the low income in urban area consumed 20 to 40 g pulse and 20 families in high income consumed 60 to 80 g of pulse. Middle income in both areas consumed about 40 to 80 g of pulse.

With regard to vegetables in both areas, the middle and high income consumed more than the low income. The spiralling price rate of vegetables even in rural area might have prevented the purchase of vegetables.

Fats, and Oil consumption showed an interesting observeion that the low income families consumed lasser quantities of fats and oils, where as the middle income and high income groups consumed higher levels of fats and oils (than is, between 40 to 60g) About 50 percent of the middle income families consumed about 20 to 40g of fats and oils.

The flesh food consumption also was high in the case of high income group in both the areas than the low income groups.



PER CAPITA FAT CONSUMPTION OF SELECTED FAMILIES

FIGURE - 2

3. Distribution of Families According to the Type of Oils: Consumed

The results of the analysis of the types of oils consumed are presented in Table VI.

TABLE VI

DISTRIBUTION OF FAMILIES ACCORDING TO TYPE OF OILS CONSUMED

(N = 30 in each group)

OILS USED	URBAN			RURAL		
	L	M	H	L	M	H
SINGLE OILS						
Refined oil	5	4	5	4	8	8
Groundnut oil	9	3	2	10	4	-
Gingelly oil	3	4	3	4	4	2
Palm oil	6	2	2	5	2	2
Sun flower Oil	-	3	4	-	1	3
Coconut oil	-	-	-	-	1	-
COMBINATION OILS						
Refind oil and ghee	2	4	3	-	3	4
Palm Oil and Ghee	3	-	2	2	-	2

Gingelyy Oil & Refined Oil	1	6	3	2	2	3
Gingelly and Grounut Oil	1	1	-	2	-	1
Gingelly & sun flower Oil	-	2	2	-	1	2
Gingelly, ghee & Refined oil	-	1	4	1	4	3

Table V0 indicates that, the majority of families (34) from both areas at all income levels consumed refined oi. followed by groundnut oil (28) and gingelly oil (20)

Palm oil consumption was highest in the low income group in both areas followed by middle income families. Only two families each in the middle and high income group consumed palm oil. Only one family in middle income group used coconut oil

Combination of gingelly oil and refined oil was the most commonly used. Only a very few families used ghee (8 families) with palm oil.

About 17 families used gingelly oil&refined oil. A combination of three oils namely gingelly, ghee and refined oil was used highest in the high income group in urban and both middle and high income goup in the rural area.

4. Frequency of Preparation of Fried Foods by Selected Families:

Table VII shows the frequency of preparation of fried foods in all the families at different income levels in both areas.

TABLE VII

Frequency of Prepar ation of Fried Foods of Selected Families

(N = 30 in each group)

Frequency	URBAN			RURAL		
	L	M	H	L	M	H
Weekly	-	5	10	-	6	8
Fortnightly	7	11	15	6	13	14
Monthly	15	12	4	11	8	5
Occassionally	8	2	1	13	3	3

Table VII a shows that the fried foods were prepared weekly mainly by the high income group in both the areas. A few of the middle income families in urban and rural areas (5 and 6 families) also prepared fried foods weekly. Majority of the families in all the income groups from both the areas prepared fried foods fortnightly or monthly Only 11 families out of 90 in urban area and 19 families out of 90 rural families stated that they fried foods occassionally,. That too the low income group stated so. This may be due to the inadequacy of money to but oils for frying. Where the type of oil used for frying was enquired, the families mentioned that they used refined oil.

C. nutrient consumption pattern of the selected adults:

Eighteen adult subjects in the age range of 35 to 50 years were selected for studying the relation of fat consumption on the blood lipid levels. They represented the three income groups equally. The analysis of the data collected from them is presented and discussed in the following.

Table VIII presents a the results of the nutrient intake pattern of the selected adults.

MEAN DAILY NUTRIENT INTAKE OF SELECTED ADULTS

Group N = 6 in each group	Protein g	Fat g	Fibre g	Carbo-hydrate g	Energy K.cals	Iron mg	Vit.A ug B-Carotene	Thiamine mg	Riboflavin mg	Niacin mg	Vit.C mg
LOW											
MALES	34	30	4	217	1253	18.3	1284	0-9	0.5	8.9	59
FEMALES	22	27	3	170	1009	10.2	244	0.03	0.5	8.2	23
MIDDLE											
MALES	63	47	6	317	1937	25.1	951	1.3	1.2	14.3	47
FEMALES	52	50	7	214	1540	26	2064	1.3	1.2	12.1	26
HIGH											
MALES	69	57	6	268	1850	27.9	1660	1.2	1.1	12.6	57
FEMALES	65	49	8	287	1867	31.4	2889	1.4	1.3	14.4	65
R.D.A											
MALE	55	-	-	-	2800	24	3000	1.4	1.7	19	40
FEMALE	45	-	-	-	2200	32	3000	1.1	1.3	15	40

TABLE IX

MEAN FOOD CONSUMPTION OF SELECTED ADULTS

Group	CEREALS	PULSES	VEGE-TABLES	FATS & OILS	SUGAR	MILK
	g	g	g	ml	g	ml
Low						
MALES	150	40	75	15	20	150
FEMALES	140	30	80	18	25	150
MIDDLE						
MALES	300	60	150	25	30	250
FEMALES	275	50	160	25	35	200
HIGH						
MALES	320	60	175	30	30	450
FEMALES	280	55	125	35	40	400

An analysis of the Table VIII depicting the nutrient consumption pattern of the selected adults showed that the consumption of most of the nutrients was low in the low income family. Calories, Protein, iron, vitamin A and B complex vitamins consumption of the low income group was inadequate. The middle income group consumed adequate amount of protein, iron and B complex vitamins. The energy intake of all the groups were low.

With regard to fat intake also low income families and males consumed only 27 g and 30 g of fat, whereas the other two groups consumed about 47 to 57 g of fats. These results correlate well with the family fat consumption pattern and food expenditure pattern of the families.

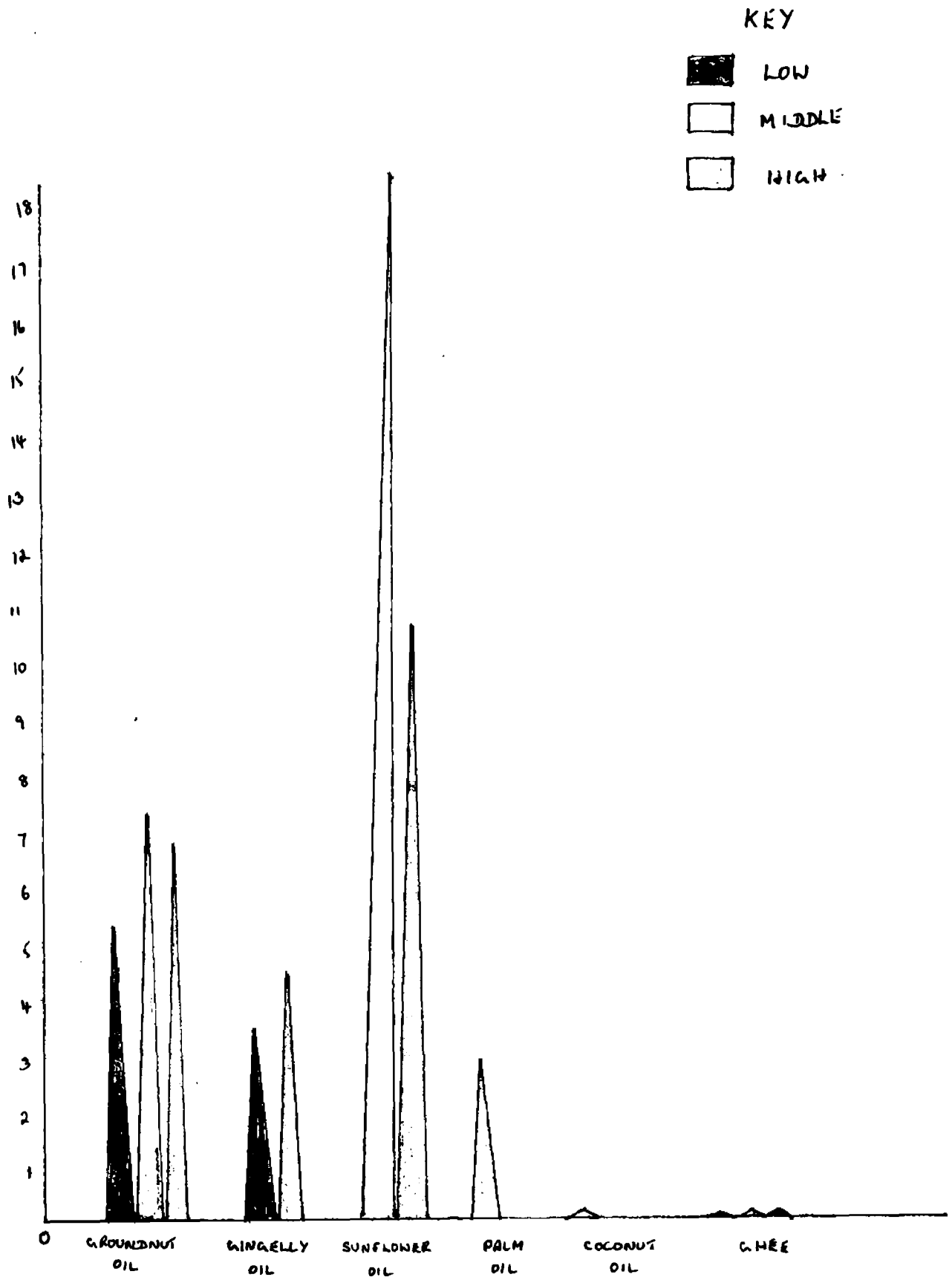
2. Essential Fatty Acid Consumption of the Selected Adults:

Table IX presents the essential fatty and consumption per day of the selected adults.

TABLE IX

Essential Fatty Acid Consumption of Selected Adults Per Day

SUBJECT	TYPE OF OIL CONSUMED	Amount/ day ml	Linoleic Acid g/day
LOW			
1.	Groundnut Oil, ghee	17.5	4.29
2.	Groundnut Oil, Gingelly Oil	20.0	6.34
3.	Groundnut Oil, Gingelly Oil	30.0	9.88
4.	Groundnut Oil	20.0	5.58
5.	Groundnut Oil	20.0	5.58
6.	Groundnut Oil	25.0	6.97
		Mean	6.44
MIDDLE			
1.	Groundnut Oil, Coconut Oil	25.0	5.73
2.	Groundnut Oil, ghee	30.0	7.18
3.	Groundnut Oil, ghee	30.0	7.18
4.	Groundnut Oil	30.0	8.37
5.	Sunflower Oil	35.0	18.2
6.	Groundnut Oil,ghee	35.0	8.58
		Mean	9.20
HIGH			
1.	Palm Oil	30.0	2.7
2.	Gingelly Oil, Palm Oil	25.0	5.65
3.	Groundnut Oil and ghee	30.0	7.18
4.	Sunflower Oil, gingelly Oil	25.0	12.1
5.	Groundnut Oil	25.0	6.97
6-	Sunflower Oil	25.0	13.0
		Mean	7.93



LINOLEIC ACID LEVELS IN DIFFERENT INCOME GROUPS OF SELECTED ADULTS

FIGURE - 3

Table IX shows that in the low income group out of the 6 subjects all of them used groundnut oil, 2 used gingelly oil along with groundnut oul and one used ghee with groundnut oil. The average linoleic acid intake per day was 6.44g.

In the middle income group 3 subjects used a combination of ghee and groundnut oil, one subject used groundnut oil alone One subject used sunflower oil and one subject groundnut oil and counut oil. The average linoleic and intake 9.20g/day.

In the high income group, the subjects used a mixture of oils. The average linoleic acid intake was 7.93 g/day.

The highest linoleic acid intake (9.20g) was by the middle income group followed by high income group (7.93g) and low in come group (6.44g)

D. Lipid Profile of the Selected Adults

The blood levels of the lipid fractions of the aduilts were studied and the results are presented in Table X. The individual values are given in Appendix.

Mean Values of Scrum Lipid Fractions of the Selected Adults

LIPID FRACTION mg	NORMAL VALUES mg/dl	L	M	H	GROUPS	't' VALUE
TOTAL CHOLESTE-ROL	150-250	177.6± 18.48	175.8 ± 7.67	227.5 ± 50.35	L Vs. M L Vs. H M Vs. H	0.23 2.27 2.48 *
HDL CHOLESTE-ROL	30-60	49.5± 9.28	50.3 ± 10.72	45.5 ± 11.25	L Vs. M L Vs. H M Vs. H	0.14 0.06 0.76
LDL	106-178	108.73± 18.67	103.16 ± 6.13	166.2 ± 45.11	L Vs. M L Vs. H M Vs. H	0.69 2.38* 3.88**
VLDL		19.43 ± 0.95	22. ± 3.68	22.4 ± 7.44	L Vs. M L Vs. H M Vs. H	1.65 0.98 0.13
TRIGLY CERIDES	40-165	97.16 ± 4.75	105.66 ± 12.7	112.1 ± 36.91	L Vs. M L Vs. H M Vs. H	1.52 0.98 0.40
PHOSPHO LIPIDS	160-270	226.1 ± 16.4	224.4± 6.87	270.4± 44.81	L Vs. M L Vs. H M Vs. H	0.01 2.26* 2.48

* - Significant at five per cent level (2.228)

** - Significant at oneper cent level (3.169)

Table X shows that the total cholesterol levels of the low and middle income families where almost the same (177.6 and 175.8 mg). The difference was also not statistically significant. The total cholesterol level of the adults in the high income group was 227.5mg. The difference was significant at a five per cent level when compared to the lowest value registered by the middle income group.

The high density lipoprotein (HDL) cholesterol levels of all the three groups of subject were very much low. Their differences were not statistically significant. At the same time the low density Liporotein (LDL) cholesterol levels were very much higher for the subjects in all the income groups. In the case of very low density lipo proteins (VLDL) all the values were between 19.43 to 22.46mg. The lowest triglyceride levels was registered by the low income group (97.16mg) bythe low income group had registered the highest triglyceride leves (112.1mg). Middle income group had registered a value of 105.66mg. But the differences in these values were not statistically significant.

With regard to the phospholipid levels, all the three income groups had registered a value close to the higher border of the normal value. Among the three values, the high income had registered the highest value of 270.4mg same as that of the highest normal value. The lowest value (224.4mg) was registered by the middle income group, and the difference between these two groups were satistically significant at five per cent level. But the difference between the low income group and the high income group were not statistically significant.

The above result on the blood lipid levels of the selected adults could well be correlated with the results of the fat intake and food expenditure pattern of the subjects. The high income group spend more money on food, consumed more fats and oils and at the same time consumption of fried foods was also frequent in the case of high income group. So their blood lipid levels are higher than the other two groups.

But the other two groups have registered low values which could be related to their lower fat and fried food consumption. It can also be noted that in the middke income group two families used sunflower oil which had high amount of linoleic acid. This linoleic acid might have helped in brining down the lipid levels in this group, which is lower than the value registered by the low income group. Though the middle income

consumed more fats & oils, fried foods than the low income group, their better blood lipids picture can be due to inclusion of sunflower oil which has increased the consumption of more essential fatty acid namely linoleic acid. The literature well documents that the essential fatty acid lowers blood cholesteral level, which is in tune with the results of the present study.

Summary and Conclusion

V - SUMMARY AND CONCLUSION

A study into the levels and patterns of fat consumption in India, revealed that there is inadequate researchers available in this field. Hence, the present study was undertaken with the following specific objectives:

1. Study the difference in the fat consumption patterns of rural and urban populations.
2. Find out the difference in the fat consumption pattern of different income groups. and,
3. Study the effect of fat consumption on the blood lipid fractions of a selected adult population.

The study was conducted in Coimbatore. Four urban and four rural areas wereselected for the study. From each area, 90 families were selected. The selection was made in such a way that it represented the three income groups equally, (that is 30 families each). To study the relation of fat intake on blood lipid fractions in adults, a total number of 18 adults subject were selected. These subjects again represented the low, middle and high income groups equally.

A socio- economic and diet survey were conducted in all the 180 families. It elicited the name of the interviewee, c composition of the family, their age, educational status, income, food expenditure pattern, types of food used, frequency of use, the nature and type of fats and oils purchased and frequency of use, the nature and type of fats and oils purchased and frequency of purchase. The information was collected through direct interview method. The food and nutrient consumption pattern of the selected adults was surveyed through weighment and recall methods of diet survey. To study the relation between level of fat intake and blood lipid profile of the selected adults, total blood cholesterol, low density lipoproteins(LDL), very low density lipoproteins (VLDL), high density lipoproteins(HDL), triglycerides and phospholipids levels were estimated. The results obtained were statistically analysed and discussed.

The results revealed that:

1. The literacy level of the selected urban and rural population did not have much variation.

2. Twenty nine families of the low income group in urban area belong to nuclear families as compared within 27 in rural area. In the middle and high income groups also about two-third of the families belonged to nuclear and the rest belonged to joint families.

3. As income increased the percentage of money spent on foods decreased majority of the low and middle income families spend 60 to 80 per cent of their income on food in both the areas. The high income families spend only 60 and below 60 per cent of their income on food.

4. Most of the low income groups in both the areas were vegetarians and urban middle income families were non-vegetarians. But the rural middle income families were vegetarians. The number of vegetarians and non-vegetarians in both areas were almost the same.

5. The low income groups in the two areas consumed less cereals than the high income groups. In the other two income groups, the cereal consumption was gradually high. The same pattern was observed with regard to pulse and vegetables. Consumption also. The low income groups used less sugar compared to middle and high income groups. With regards to consumption of fats and oils, 60 per cent of the low income families consumed below 20g of fats and oils, and the rest consumed below 40g except one family in urban area. Consumption between 40-60g was nil in the low income group.

- A majority of the families in the middle and high income groups consumed about 20 - 60g of fats and oils Consumption of flesh foods also increased as the income increased.

6. Majority of the families (34)consumed refined oil followed by groundnut oil (28) and gingelly oil (20) Palm oil consumption was highest in the low income family used sunflower oil- But the middle and high income families in both areas used sunflower oil. Only one family in the rural area used coconut oil alone for cooking. About 3 to 4 families consumed refined

oil and ghee or palm oil and ghee- About 7 families consumed gingelly oil and sunflower oil.

7. Fried foods were prepared weekly by 18 high income families and 11 middle income families None of the low income families prepared fried foods weekly. Majority of them stated that, they fried foods monthly or occassionally. So the frequency of preparation of fried foods was high in the middle and high income families.

8. Regarding the nutrient consumption of the selected adult population, it was observed that the low income families consumed inadequate amount of calories, protein, iron, vitamin A, and B complex vitamins. The calorie intake of all the three income groups studied, were below the recommended daily allowances but protein, iron and other vitamins consumption of middle income and high income groups were adequate.

9. The total fat consumption of the selected adult population ranged from 27g to 57g. The adults from low income group consumed only about 30g of total fat whereas the middle and high income groups consumed much higher amounts.

10. The highest linoleic acid intake was by the middle income group (9.20g/per day) followed by high income group (7.93g/ per day) and low income group (6.44g per day)

11. The blood lipid profile of the selected adults showed that the values registered for total cholesterol, HDL, LDL, VLDL cholesterol, triglycerides and phospholipids were within the normal range of values. The statistical analysis of the difference in the values.registered by the high income group and low income group for cholesterol was significant at 5 per cent level. LDL cholesterol was significant at 1 per cent level and

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Appendix

APPENDIX-I

QUESTIONNAIRE TO ELICIT BACKGROUND INFORMATION AND DIETARY HABITS

I BAckground information :

1. Name of the interviewer :

2. Name of the interviewee :

3. Age (completed years)

4. Address :

5. Sex: Male ☐ Female ☐

6. Occupation :

7. Education qualification of the subject:

   literate ☐ Illitterate ☐

   If yes, Primary ☐

   Secondary ☐

   College level ☐

8. Marital status : Single ☐ Married ☐

9. Type of family : Nuclear ☐ Joint ☐

10. Sample menu usually followed for:

    Breakfast

    Lunch :

    Tea :

    Dinner :

11. Composition of the family:

Age (years)	Sex	Occupation	Income per month
Infants			
1 - 3			
4 - 6			
7 - 9			
10 - 12			
13 - 15			
16 - 18			
Adults			
Middle age			
Old			

Income from other sources, if any -

Total income:

Total monthly per capital income:

II Food consumption pattern:

1. What is the amount of income spent in food?
2. Vegetarian /_____/ Non-vegetarian /_____/

If vegetarian,

Foot stuff	Amount used per day
Cereals:	
Rice	
Wheat	
Sorghum	
Maize	
Rava	
Maida	
Ragi	

Food stuff	Amount used per day
Pulses:	
Red gram dal	
Black gram dal	
Bengal gram	
Bengal gram dal	
Green gram	
Green gram dal	
Roasted Bengal gram	
Horse gram	
Vegetables:	
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
Fruits:	
1.	
2.	
3.	
Milk:	
Sugar:	

Foot stuff	Amount used per day
Fats and oils:	
Gingelly oil	
Groundnut oil	
Cocount Oil	
Sunflower oil	
Rice bran oil	
Palm oil	
Mustard oil	
Dalda	
Ghee	
Butter	
Margarine	

3. If non-vegetarian:

   Mutton

   Chicken

   Fish

   Beef

   Any other

4. Frequency of preparation of fried foods -

   How often do you prepare?

5. For subject:

	Food likes	Food dislikes
Sweets		
Fried foods		
Milk foods		
Pickles		
Others		

6. Do you take meals outside? How often?

Yes ☐ No ☐

Daily ☐ Frequently ☐

occassionally ☐

APPENDIX II

Family and Individual Food Consumption Survey - Weighment Method

Name of the Investigator:

Door No :

Name of the head of the family:

Address :

Name of the subject :

Age of the subject :

FOOD SONSUMPTION

Date :

Name of the Meal	Menu	Weight of the total raw ingredients used by the family (g)	Weight of the total cooked food consumed by the family (g)	Amount of cooked food consumed by the individual (g)	Raw equivalments consume by the indivi dual (g)
Breakfast					
Lunch					
TEA					
DINNER					
BED TIME					

APPENDIX III

24 HOUR RECALL DIET SURVEY

NAME :

AGE :

ADDRESS :

SCHEDULE FOR RECALL METHOD 1 DAY

NAME OF THE MEAL	MENU	RAW EQUIVALENTS CONSUMED BY THE INDIVIDUAL
BREAKFAST		
LUNCH		
TEA		
DINNER		
BED TIME		

APPENDIX-IV

NUTRIENT INTAKE OF SELECTED ADULTS

Income GROUP	PROTEIN gm	TAT gm	FIBRE gm	CARBO HYDRATE	ENERGY K.CALS	IRON mg	V.I.T.A. (B.CAROTENE)	TAIAMINE mg	RIBOFL AVIN/mg	NIA CIN mg	V.I T.(mg
LOW											
1	29	35	3	210	1212	12.4	344	0.8	0.5	9.2	48
2.	34	31	2	191	1184	19.2	2833	0.8.	0.3	6.1	11
3	38	24	4	251	1367	23.4	674	1.04	0.7	11.5	18
4.	26	32	3	203	1205	11.1	285	0.8	0.6	15.1	15
5.	18	24	1	139	1115	8.6	148	0.5	0.4	5.0	19
6	22	25	3	169	979	11.0	298	0.5	0.4	4.7	34
MIDDLE											
1	68	53	6	214	2055	29.4	1059	1.4	1.4	14.6	49
2.	56	41	4	218	1869	21.7	844	1.3	1.1	11.0	44
3.	47	44	6	235	1525	26.0	734	1.0	1.0	8.5	59
4.	51	55	6	206	1643	27.0	3203	1.5	1.2	14.2	39
5.	58	55	5	208	1563	25.7	3419	1.5	1.6	16.2	108
6.	51	45	7	204	1425	26.3	815	1.2	1.1	11.4	59
HIGH											
1.	57	44	6	285	1768	28.3	1912	1.2	1.2	13.5	59
2.	57	44	8	272	1767	28.3	1961	1.3	1.2	13.3	70
3.	80	58	9	305	2064	37.3	1495	1.6	1.5	16.3	154
4.	79	40	5	267	1720	28.3	1005	1.1	0.8	9.8	48
5.	47	46	6	262	1652	21.1	1879	1.1	1.0	10.6	69
6.	80	84	7	275	2178	34.4	1496	1.5	1.4	19.5	55

APPENDIX V

COLLECTION OF BLOOD SAMPLES:

With the help of a trained technician, 5 ml of blood was drawn ffom the antecubital vein of each of the adults from the subsample of 18 adults. The blood samples were allowed to stand undisturbed for two hours for the separation of serum. Then the samples were centrifuged and the serum was separated. The serum samples thus obtained were used for the estimation of lipid profile.

From the results obtained from the analysis of blood samples, the lipid profile was studied.

APPENDIX- VI

ESTIMATION OF CHOLESTEROL USING ORTHO CHOLESTEROL KIT

PRINCIPLE:

Cholesterol free or esterified reacts in the presence of ferric irons with a combined reagent, composed of ethyl acetate and sulphuric acid to give a purple coloured complex. The final colour absorbs maximally at 560nm. The intensity of the final colour complex is measured colorimetrically between 560nm to 600nm. The measured intensity is proportional to the concentration of total cholesterol in the specimen under test.

PROCEDURE:

1. Pipetted 50 ml of ortho cholestrol reagent into three tubes labelled (T) standard (S) and Blank (B)
2. Diluted serum under test and ortho cholesterol standard (250 mg/dl) 1 to 20 with distilled water on the reagent in tube (B) (contact between the layered specimen in standard with regent shoula not exceed 5 minites)
3. Mixed the contents of each tube simultaneously for 10 seconds and immediately placed them in a boiling water bath for exactly 90 seconds.
4. Cooled immediately in running water (or cold water) for 5 minutes. Removed dried exterior of the tubes and mixed their contents.
5. Measured the optical density (O.D) of each solution at 560nm (range 560 nm to 600nm) against reagent blank.

CALCULATION:

$$\frac{O.D.T}{O.D.S} \times 250 = \text{Cholesterol concentration mg/dl}$$

Where O.D. is the optical density.

APPENDIX VII

ESTIMATION OF HDL-CHOLESTEROL (ERBA DIAGNOSTIC) PRINCIPLE:

The HDL cholesterol fraction is separated (from the other lipoprateins present in the serum) by precipitation using a precipitating reagent. The precipitate contains chylomicrons, VLDL and LDL which are removed by certrifugation. The precipitate contains HDL cholesterol which is estimated by HDL-cholesterol colour reagent which gives a purple coloured complex which is measured colorimetrically at 560 nm (560 - 600nm). The intensity of the colour developed is proportional to the concentration of HDL -cholesterol in the specimen under test.

REAGENTS:

1. HDL - Cholesterol, Reagent I; Precipitating reagent
2. HDL - Cholesterol Reagent II ; colour Reagent
3. Cholesterol standard (250 mg/dl)

PRODEDURE:

1. Mix o.5 ml of the HDL - cholesterol, Reagent I 0.5 ml of the test serum.
2. Keep at room temperature (25° ± 5°c) for 10 minutes
3. Centrijuge at 2000 x g for 20 minutes to a clear supernatant.
4. Use a 1 to 2 dilution (with distilled water) of the supernatant for the estimation of HDL - cholesterol using HDL-Cholesterol reagent III (0.5ml of supernatant ± 0.5ml of distilled water)
5. NOTE: The test serum has to undergo 1 to 4 Dilution
6. Dilute cholesterol standard (250 mg/dl) 1 to 20 with glacial acetic acid (Analar) To 0.5ml Cholesterol standard 250 mg/dl add 9.5 ml of glacial acetic acid (Analar). This corresponds to a HDL-Cholesterol concentration of 50 mg/dl.

CALCULATIONS:

$$\frac{O.D\ (T)}{O.D.(S)} \times 50 = \text{HDL - Cholesterol Concentration T (mg/dl)}$$

When 50 mg/dl cholesterol standard is used then factor 50 is used as in the above formula for calculating HDL-cholesterol concentration in the test specimen.

APPENDIX VIII

ESTIMATION OF TRIGLYCERIDES IN SERUM (GPO-PRP) METHOD

PRINCIPLE:

Serum triglycerides are hydrolyzed to glycerol and free fatty acids by lipase. In the presence of ATP and glycerokinase, the glycerol is convented to glycerol-3 phosphate. The glycerol - 3 phosphate in then oxidised by glycerol - 3 phosphate oxidese to yield hydrogen peroxide. Hydrogen peroxide reacts in the presence of peroxidese with ESPAS (N ethyl - N - sulfopropyl - m - aniridine and 4 aminopyrine to form a coloured complex. The intensity of the colour developed is proportional to trigycerides concentration and is measured photometrically at 546 nm (530 to 570 nm) or with Green filter.

$$\text{Triglycerides} + H_2O \xrightarrow{\text{Lipoprotein lipase}} \text{Glycerol} + \text{fatty acids}$$

$$\text{Glycerol} + \text{ATP} \xrightarrow{\text{Glycerokinase}} \text{Glycerol - 3 phosphate} + \text{ADP}$$

$$\text{Glycerol - 3 - Phosphate} + O_2 \xrightarrow{\text{Glycerol - 3 Phosph Oxidese}} H_2O_2 + \text{Dihydroxy acetone phosphate}$$

$$H_2O_2 + \text{Aminoantipyrine} + \text{ESPAS} \xrightarrow{\text{Peroxidese}} \text{Quinaminine} + H_2O$$

REAGENTS:

REAGENT 1 : Buffer

Store at 2° to 8°c : Active ingredrents

Pipes suffer

ESPAS

REAGENT 2 : Enzymes

Store at 2° to 8°c : Active ingredients

: lipoprotern lipase

: glycerokinase

: Glycerol - 3 - Phosphate oxidase

: Peroxidase

: 4 - Aminoantiphrine

: ATP

REAGENT 3 Standard

Store at 2° to 8°C : (Triglycerides 200 mg/dl)

Ready to use

WORKING SOLUTION: Dissolve contents of bottle of Reagent 2 with contents of one bottle of Reagent 1 mix well and at 2° to 8°c. This is the chromogen reagent.

PROCEDURE: A. For automated instrument requiring 1ml volume:

Pipette into test tubes:			
	BLANK (B)	STANDARD (S)	TEST (T)
Chromogen Reagent	1.0ml	1.0ml	1.0ml
Standard	-	0.01ml	-
Sample	-	-	0.01ml

Mix and incubate at 37°C for 5 minutes of or at R.T. (25° to 30°C) for 20 minutes. Read absorbance of test (A_T), standard (A_S) and reagent blank (A_B) against distilled water at 546nm wave length (5.30 - 570 nm) or with Green filter.

B. For colorimeters / spectrophotometers requiring 3ml volume:

Pipette into test tubes:			
	Blank (B)	Standard (S)	Test (T)
Chromogen Reagent	1.0ml	1.0ml	1.0ml
Standard	-	0.02ml	-
Sample	-	-	0.02ml
	Mix and incubate at 37°C for 10 mins or at R.T. (25° - 30°C) for 20 mins		
Distilled water	2.0ml	2.0ml	2.0ml

Mix and read absorbance of the test (A_T) standard (A_S) and the reagent blank (A_B) against distilled water at 546nm wavelength (530 to 570nm) or with Green filter.

C. For colorimeters requiring 5.0ml volume:

For use in this procedure, dilute 0.1ml of sample and standard by adding 0.4ml of distilled water or normal saline mix

"Pipette into test tubes:	Blank (B)	Standard (S)	Test (T)
Chromogen Reagent	1.0ml	1.0ml	1.0ml
Distilled Standard	-	0.2ml	-
Distilled Sample	-	-	0.2ml
	Mix and incubate at 37°c for 10 mins or at R.T.(25°-30°c) for 29 mins		
Distilled water	4.0ml	4.0ml	4.0ml

Mix and read absorbance of the test (A_T) standard (A_S) and the reagent blank) (A_B) against distilled water of 546nm wavelength (530 - 570nm) on with Green filter)

The colour developed in table for 1 hour at room temperature, if protected from direct light

CALCULATIONS:

$$\text{Triglycerides concentration (mg/dl)} = \frac{AT - AB}{AS - AB} \times 200$$

Where A_T is absorbance of the test
A_B is absorbance of the reagent blank
A_S is absorbance of the standard.

APPENDIX IX

LEVELS OF SERUM LIPIDS IN 18 HEALTHY ADULTS

(35 - 50 yrs)

INCOME GROUP	S. NO	SERUM CLOVLESTEROL mg/dl	HDL mg/dl	LDL mg/dl	VLDL mg/dl	TRIGLYGERIDES mg/dl	PHOSPHOLIPIDS mg/dl
LOW	1	186	47	119.4	19.6	98	233.54
	2	165	43	101.6	20.4	102	214.85
	3	182	45	118.8	18.2	91	229.98
	4	179	68	92.6	18.4	92	227.31
	5	150	45	85.4	19.6	98	201.5
	6	204	49	134.6	20.4	102	249.56
MIDDLE	1	170	37	111.6	21.6	107	219.3
	2.	180	47	103.4	27.6	113	228.2
	3	163	43	102.4	17.6	88	213.07
	4	180	53	103.8	23.2	116	228.2
	5	179	68	92.6	18.4	92	227.31
	6	183	54	105.2	23.6	118	230.87
HIGH	1.	327	52	241.6	33.6	167	359.03
	2.	227	49	151.6	26.4	132	270.03
	3.	213	32	167.4	13.6	68	257.57
	4.	197	33	148.4	15.6	78	243.33
	5.	210	46	123.8	25.2	126	254.9
	6	191	61	124.6	20.4	102	237.99