

FAT CONSUMPTION PATTERN IN ASSAMESE DIETS

BY
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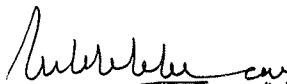
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FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

JUNE 1992

CERTIFICATE

CERTIFICATE

This is to Certify that this thesis entitled **FAT CONSUMPTION PATTERN IN ASSAMESE DIETS**, submitted to the **Avinashilingam Institute for Home Science and Higher Education for Women**, (Deemed University), **Coimbatore**, for the award of the Degree of Doctor of Philosophy in Food Science and Nutrition, is a record of original research work done by **RUMA MONI KHAUND**, during the period of her study in the Department of Food Science and Nutrition, **Avinashilingam Institute for Home Science and Higher Education for Women (Deemed University)**, **Coimbatore**, under my supervision and guidance, and the thesis has not formed the basis of the award of any Degree / Diploma / Associateship / Fellowship or similar title to any candidate of any University.


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DECLARATION

DECLARATION

I hereby declare that the matter embodied in this thesis is the result of investigations carried out by me in the Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women (Deemed University), Coimbatore, under the supervision of Dr. (Mrs.) USHA CHANDRASEKAR, M. Sc., (Madras) Ph. D. (Purdue), Professor and Head of the Department of Food Science and Nutrition and it has not been submitted for the award of any degree, diploma, associateship, fellowship etc.. of any other University or Institute.


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INTRODUCTION

INTRODUCTION

Food and dietary pattern probably are the most cherished possession of any ethnic group. Food reflects the culture of any region much more specifically than any other commodity and food habits are the most difficult ones to change. India with its varied cultural heritage has regional, ethnic and socio-cultural specificity in its food and dietary pattern. However, whatever be the basic adjuncts in the dietary pattern "You are what you eat" and "you eat what you can", meaning the fact that food determines the health and nutritional status of an individual, and the food one eats is based on the availability of the food and his purchasing power. No matter what food one eats - its qualitative and quantitative adequacy determine the growth and development, maintenance of health and resistance against infection., Food thus is the provider of both macro and micro nutrients which is basic to qualitative adequacy. Of the major nutrients, energy perhaps is the foremost for it provides for growth, maintenance and work efficacy.

This energy is derived from three major nutrients namely carbohydrate, protein and fat. Of these energy sources, fat has the highest available energy value,

Hariharan et al., (1989) brings out the fact that lipids serve as a source of essential fatty acid (EFA), source of building material for cellular membrane and also to control plasma lipid level. The cell of the body, except for erythrocytes and those of the central nervous system, can utilize fatty acids directly as a source of energy. Although carbohydrate is the energy source normally used by the nervous system, after a period of starvation the brain can utilize ketone bodies that are formed from fatty acids and ammino acids (Cahill et al., 1966). Most of the fats in food occur as triglycerides. Apart from that food fats contain phospholipids and cholesterol, any excess of energy in the body whether derived from dietary carbohydrate, fat or protein (or alcohol) is stored as fat within adipose cells. Adipose tissue deposits represent a source of energy and also serve to insulate and cushion the body and its organs and offers protection against mechanical stresses (National Academy of Sciences, 1980)

According to National Nutrition Monitoring Bureau (NNMB) (1982) the Indian diets are mainly cereal-pulse based and diets of low income groups contain very low or even no amount of fats. The diet of nearly 70 per cent of the rural poor does not include any edible oil, whereas fat intake in the diet of the top income bracket in the country would provide over 30 per cent of the energy in

the diet (WHO, 1990). Achaya (1989), has stated that rural diets are dominated by vegetable oil with negligible quantities of animal fat. NNMB (1979) has reported that average intake of vegetable oil by rural population ranges from two to 19 grams with an average of 10g. The vegetable oil chosen for cooking is generally a single one, especially in rural areas and is strongly regional. Groundnut oil is the choice of a broad swathe of the states starting from Gujarat down Maharashtra and Karnataka coasts, turning eastwards to embrace Tamil Nadu and Andhra Pradesh and Kerala in the far south uses coconut oil. Another long-sweep from Punjab, Haryana across Uttar Pradesh Bihar and then into West Bengal and Orissa prefers rape-mustard oil. Sesame oil is produced and used all over India, but mostly as a second or speciality oil rather than the mainstay. Pockets in North Karnataka and southern Maharashtra prefer safflower and nigerseed oils and areas around Nagpur go in for linseed oil. Sunflower oil is another recent entrant that is earning its own preference in South India (Achaya, 1987). The study conducted in 10 states of India by NNMB (1979) has shown that daily intake visible fat varied from three to 20 g per day per consumption unit in rural India. In many states as much as quarter of population might not have any visible fat at all in their diets. The report of the expert group of ICMR (1989) points out that in urban areas middle and upper

REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

The literature pertaining to this study entitled "Fat consumption pattern in Assamese diets" is reviewed under the following heads:

- A. Role of fat in human diet.
- B. Production trends and availability of fats and oil seeds in India.
- C. Nutritional significance of unconventional edible oils.
- D. Fat consumption pattern in India.
- E. Health implications of fat consumption.
- F. Assessment of nutritional status.

A. Role of Fat in Human Diet

Fat is an important component of human diet and fulfils several nutritional functions. It is a concentrated source of energy and helps to increase the calorie density of diets. This is particularly important in diets of young children to ensure adequate intake of energy without making the diet bulky. Dietary fat is a carrier of fat soluble vitamins and facilitates their absorption and mobilisation. Its contribution to flavour and palatability of the diet is important from the point of satiety value (Ghafoorunissa, 1989).

The fats and oils are mostly triglycerides, glycerol backbones with fatty acid attached. Those that are fully loaded with hydrogen are the saturated fats. Those that have double bonds are unsaturated (commonly polyunsaturated). To add to the picture a fat or oil may contain any combination of fatty acid. It includes edible oils which constitute an integral component of diet (Williams, 1985).

Hariharan et al., (1989), mentioned that lipids serve as a source of essential fatty acids (EFA), source of building material for cellular membranes of EFAs are being widely recognised in the area of infant nutrition particularly because, the absence of essential fatty acids causes deficiency diseases which can be recognised by skin changes, dermatitis and also a wide range of biochemical abnormalities. Thus one of the important functions of dietary fat is to provide to the body EFA, which are the dietary precursors of prostaglandins, prostacyclins and thromboxanes (Willis, 1981). The essential fatty acid plays an important role in pathogenesis of a number of diseases (Rivers and Franke, 1981). Observations made during the past few years emphasize that a relative deficiency of essential fatty acid could contribute to coronary heart disease mortality through a greater thrombogenic tendency (Oliver, 1981).

Severe essential fatty deficiency retards growth, increases water loss, causes scaly skin and reduces fertility. The proportion of infants with essential fatty acid deficiency increased with age unless dietary linoleic acid (18:2n-6) was provided. Respiratory distress syndrome and broncho pulmonary dysplasia were more common in infants with low levels of linoleate (Rosenberg, 1989).

Human and other mammals obtain their fatty acid not only from the diet but also from biosynthesis within the body. The body can make all the fatty acids it requires except for linoleic acid (18:2n-6) and linolenic acid (18:3n-6). These two must be obtained directly from plant foods or indirectly by consuming foods (meat, fish etc.) from animals whose food chain include plant foods (Fogerty, 1989). Transfatty acids in human tissues are of dietary origin. In the diet, they are found in partially hydrogenated fats and oils and foods prepared from these products (Roberts, 1984). The trans acids and prostaglandins are present in human milk. The reported quantities of trans isomers in milk vary from two to 18 per cent. These amounts respond to the quantities in the diet.

Nosswhitutely et al., (1970) stated that obesity and overweight are major malnutrition problems in the

affluent society. Overweight and underweight both result from unbalanced energy budgets. The overweight person has consumed food energy in excess expenditures and has banked the surplus in body fat. The underweight person has not consumed enough fat energy and so has depleted body stores and possibly lean tissues as well.

There is considerable evidence that habitual consumption of diet high in fat contributes to the development and maintenance of excess body weight (Danforth, 1985; Sumner, 1990). The simplest explanation of this relationship is based on the high calorie density of fat compared with other macronutrients and ad libitum consumption of high fat foods lead to chronic excess energy intake and deposition of adipose tissue (Lissens et al., 1987). However, there are differences in metabolism of fats that may also contribute to their relationship with adiposity. Dietary fat has less thermogenic effect than does protein or carbohydrate (Ealt and Danforth, 1987) and can thus be stored as adipose tissue with much higher metabolic efficiency (Flatt, 1985). Body weight may thereby be associated with the proportion of energy consumed from fat independent of its association with energy balance. The relative importance of these two mechanisms underlying the relationship of high fat diets with adiposity in human is unknown. Alternation in the quality and quantity of fat intake influences the blood

lipids, lipoprotein metabolism as well as platelet reactivity in vascular thrombosis (Sharma and Rukmini, 1987). Depending on the type of fat in the diet the amounts and types of fatty acids in the diet will vary enormously. The fatty acid composition of adipose tissue however has often been used as an index of long term dietary consumption of fatty acid particularly of linoleic acid (Field et al., 1985).

B. Production Trends and Availability of Fats and Oilseeds in India

The challenge of food for the future is two fold-to provide food for very much larger populations in the future and to feed present population more adequately (Agricultural situations in India, 1990). It has been estimated that India's population in the year 2000 would cross 900 million. This would necessitate an increase in food supplies at the present level of consumption (Kissan World, 1991). Lands (1986) stated that the average consumption of fats and oils by a given population reflects the combined effects of the average supply and demand.

India occupies a significant place among the major oil producers in the world next to USA, China and Brazil. It also enjoys the unique distinction of having a large base in oilseed sector with a variety of oil yielding

varieties. Cropwise, India is the world's largest producer of groundnut, sesamum and niger, the second largest producer of castor and sunflower and the third largest producer of rapeseed, mustard, linseed and coconut. The important states producing oilseeds are Gujarat, Andhra Pradesh, Madhya Pradesh, Maharashtra, Karnataka, Uttar Pradesh and Rajasthan (Mukdinamani, et al., 1991).

In the year 1965 India was an exporter of oilseeds and oils, when the annual oilseeds production far exceeded the domestic demand. The latter is based on the three major additive components, namely population increase, rise in average income or purchasing power and elasticity of oil purpose. Gradually these three determinants forged ahead while the production of oilseeds slipped and imports of oils became necessary to meet surging demand. Imports kept rising from year to year (Achaya, 1989).

Thus due to rising population the demand for edible oils has grown necessitating imports to bridge the gap between the demand and supply. India imports over one million tonnes of vegetable oil per annum, to meet its demands (Kurien, 1987).

Achaya (1990) points out that, shortage of edible oils in India has led to substantial imports from Malaysia

of palm oil and palmolein. Chong (1990) indicates that palmolein is now being imported on a fairly large scale and is being widely consumed in India. In 1988-89 the imports of edible oils were cut by almost half. Since then, production of oil seeds has been looking up but imports of edible oils have not been further cut because of rising demand caused by expanding incomes and population. Another exotic entry in the field of fats and oils is the hydrogenated edible oil - vanaspati. More than 110 factories in the country are manufacturing the colourless and odourless edible oil vanaspati. In 1970 the production of vanaspati was of the order of 512,275 tonnes. By 1990, it has surpassed the level of a million tonnes (Market Survey, 1991).

The Union Government has approved an integral policy on oilseed production, import, distribution and pricing aimed at accelerating self reliance in edible oils and set up a Technology mission on oilseed (1989) as a Task Force of all concerned Government agencies.

The Kharif oilseeds production was about 155 lakh tonnes in 1988-89. This would be an increase of 22 per cent over 1987-88 estimated at 123 lakh tonnes. The present indications are that with about 57 lakh tonnes of groundnut and 17 lakh tonnes of soyabean, the kharif

oilseeds production may touch 88 lakh tonnes mark against the target of 85.5 lakh tonnes. The production of groundnut, soyabean and sesame seed recorded spectacular jumps in production of 90,100 and 120 per cent respectively. Castor and niger seed production improved by 33 per cent (Farmer's Journal, 1989). As many as 40 new oil seed varieties have been developed in recent years.

According to Ministry of Agriculture the output of oilseeds, in 1980-81 was 9.37 million tonnes. It was largely stagnant till 1987-88 when output was of the order of 12.66 million tonnes. A major breakthrough came in 1988-89 when production of oilseeds increased to 17.89 million tonnes. The latest estimates put the output at 19.23 million tonnes in 1990-91 (Market Survey, 1991).

According to the press release of Government of India, in January 1992 in New Delhi, the Government will import three lakh tonnes of edible oils by the end of March, 1992, even though bumper crops of mustard and rapeseed are expected. Despite this import and the expected bumper crops, the country would still have a shortfall of about four lakh tonnes. The output of edible oils is likely to touch 5.8 million tonnes as against the total requirements of about 6.2 million tonnes. The

shortfall in production of groundnut and soyabean in the 1991-92 oil year, due to adverse weather conditions in parts of Gujarat and Madhya Pradesh, is likely to offset to a greater extent with the harvesting of bumper rapeseed and mustard crops in the rabi season. Following an increase in the yield of sunflower seeds and the better use of cotton seeds and rice bran, the output of minor oils is being raised substantially. However, the demand for edible oils is rising steadily and the gap has not been bridged even with an increase in production by 40 per cent (The Hindu, 1992).

C. Nutritional Significance of Unconventional Edible Oils

Edible oils constitute an integral component of our diet. Vegetable oils are the only dietary source of linoleic acid, one of the essential fatty acids (EFA). Vegetable oil consumption varies according to the demand and availability of edible oils in the country. India's demand for vegetable oil is continuing to increase faster than production rates necessitating a slowly rising level of imports of vegetable oils (Rukmini, 1985). The current estimated deficit level of 3.6 million tonnes is likely to widen further to 7.7 million tonnes by 2000 A.D. (Nutrition News, 1985). There are several alternative sources for edible oil but these have not been fully explored and exploited (Nagarajan, 1975).

The byproducts of cotton and rice processing, namely cotton seed and rice bran make handsome contribution to oil supply and have great potential to meet edible oil needs (Lakshminarayana, 1989). Crushing of only about 60 per cent of available cotton seed provided 2.33lakh tonnes of oil. Technologies are available for scientific and efficient extraction of oil from cotton seed (Rao, 1986).

Oils and fats obtained from unconventional sources are already being used for human consumption in limited areas where they are grown. These are commonly referred to as minor oils. The available minor oil seed potential of India includes castor, linseed, neem, kokum, mango, dhupa, sal, mahua, phulwarah and karanja. Besides these oils from shrubs like hibiscus, sabdariffa (mesta) and Okra are also available. Oils from rice bran and weeds like cleome viscosa have recently been found to be valuable for their hypocholesterolemic action (Nutrition News, 1985).

There are a number of unconventional lesser known less exploited oil bearing seeds that arise as byproducts from:

- i) Forest trees - tamarind, teak, karpok
(Rukmini and Rao, 1986).
- ii) Crops or plantations - jute, tobacco, coffee
(Rukmini et al., 1982).
- iii) Fruits - mango, watermelon, musk melon, sitaphal,
sweet orange, (Teotia and
Ramakrishna, 1984).

iv) Vegetables - okra, tomato, chilli

(Reddy et al., 1984).

The National Institute of Nutrition (NIN) has done a comprehensive and systemic study of these unconventional minor seed oils including the investigation of chemical analysis, nutritional evaluation and toxicological safety. This vigorous analysis ensures the safe edibility of unconventional sources of oils (Nutrition News, 1985).

Mango kernal oil, *Cleome viscosa* oil and rice bran oil have a very promising future among edible oils. Mango kernal oil is found to be a safe substitute for cocoa butter fat. Presently cocoa butter fat is very much valued in confectionary and baking industry and the government spends a lot of foreign exchange in importing it. India produces 7.8 millions tonnes of mangoes every year. Mango kernal has a fat content of 6.12 per cent on dry weight basis. India has the annual production potential of 30,000 tonnes of mango kernal oil. Hence an attempt is made to replace the expensive cocoa butter fat by mango kernal fat to help the national economy (Rukmini, 1987).

Cleome viscosa oil, is also known as wild mustard oil since it resembles mustard seeds. The whole plant is edible

and the seeds have 20 per cent oil. The oil is rich in linoleic acid (70 per cent) and it has been found to be safe as an edible oil and can bridge the deficit to some extent if properly exploited (Nutrition News, 1985).

India is the second largest producer of rice bran oil in the world. The potential for production of rice bran oil has been estimated at 0.6 million tonnes per annum and there is scope to increase the production further by improved technology (Nutrition News, 1985). Chemically the composition of rice bran oil is very close to that of groundnut oil. Both the oils contain 35 per cent linoleic acid, which is an essential fatty acid (Rukmini, 1987). It can be seen that rice bran oil has highest hypocholesterolemic activity though the linoleic acid content is in the lowest range. Experiments conducted in NIN revealed that liver and serum cholesterol and triglycerides in rice bran oil fed (10 per cent level) group were much lower than those in safflower oil fed (10 per cent level) group, indicating that rice bran oil is even better than safflower oil in lowering the cholesterol (Nutrition News, 1985).

It is quite obvious that in order to reduce import of edible oil, we need to take intensive efforts to augment edible oil supply by producing more of the existing

cultivated seeds like groundnuts. We also need to exploit fully, the under exploited unconventional oils like rice bran and cotton seed. In the interest of the national wealth, employment opportunities for the people and in view of edible oil famine, it is necessary to extract every drop of oil from every source (Lakshminarayana, 1987).

D. Fat Consumption Pattern in India

The human being needs a wide range of nutrients to keep him healthy and active and he must derive most of these nutrients through his daily diet (Rao, 1989). Gopalan et al., (1989), point out that the inclusion of various foods in one's daily diet is based on socio-cultural and economic considerations.

Fat is an important component of human diet and the quantity of fat present in it varies widely in both quantity and quality. Half of the total fat intake in Indian diets is obtained from edible oils (Ghafoorunissa, 1987). Fat in the diet is of two kinds visible and invisible (Gopalan et al., 1989). Visible fats are those which have been separated from animal tissues, milk, oil seeds, nut or other vegetable sources; invisible fats are those which have not been separated from their original source and are therefore

consumed as part of the tissues in the diet, principally as cereals, pulses, meat, fish, poultry and vegetables (FAO/WHO, 1978). Invisible fat exists in three forms in foods as free, bound and structural (Ghafoorunissa, 1989).

National Nutrition Monitoring Bureau (NNMB) Reports (1982) state that the Indian diets are mainly cereal pulse based and diet of low income group contain very low or even nil amounts of visible fats. Achaya (1989) suggests that the optimal level of dietary fat for physiological needs and prevention of atherosclerosis is uncertain and the contribution of invisible fat is important in determining the requirement of fat. 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 15-16g daily made up roughly of vegetable oil (10g), hydrogenated fat (3g) and ghee (25g) (Achaya, 1989).

Visible fat intake in various states vary from 9 to 25g per day; the average is 12 to 14g consisting approximately of vegetable oil 10g, vanaspati 2.5g, ghee 2g. A variable proportion of all families from two to 65 per cent in different states, buy no visible fat at all. The invisible fat content of Indian cereals is substantial with 3.5 per cent in rice and two per cent in wheat. Average 1971 Indian diets in four cardinal states in India carry 15 to 20g per day of invisible fats and even very poor diets

consisting of cereals will supply 10g of invisible fat. The energy contribution of total visible and invisible fat ranges from 13 to 27 per cent with an average of 17 per cent (Achaya, 1986).

The current view of upper limits of energy from total fat is 30 per cent (Achaya, 1989). Gopalan et al., (1989), suggested that during growth, pregnancy and lactation fat specially essential fatty acid requirements are relatively higher. For infants dietary intake of atleast 3 per cent of linolenic acid can be considered as adequate (FAO/WHO, 1978). ICMR(1990) points out that the desirable amount of linoleic acid to be consumed by a normal adult person has been placed at 3 per cent. The requirements of linoleic acid during pregnancy and lactation are higher (i.e.) 4.5 and 5.7 energy per cent respectively.

WHO study group (1990) reported that a striking change in developing countries has been the rapid increase in the proportion of people living in urban areas. There is a change in fat and sugar consumption in urban areas compared with that of rural communities. In addition Ghafoorunissa (1987) pointed out that the intake of edible oils is dependent on income and region.

Achaya (1989) stated that visible fat in rural dietary was predominantly vegetable oil with negligible animal fat and NNMB (1979) reported that the average intake of vegetable oil by rural population ranged from two to 19g with an average of 10g. The study conducted in 10 states of India showed that daily intake of visible fats varied from three to 20g per day per consumption unit in rural India. In many states as much as quarter of population might not have any visible fat at all in their diets. The report of the expert group of ICMR (1989) stated that in urban areas middle and upper income groups had daily intake of visible fat that ranged from 20 to 42g and the average intake of urban dwellers were much higher than those in rural areas. Achaya (1989) mentioned that diets of high income group provide 12 per cent of energy from invisible fat. To keep the calorie from total fat below 30 per cent, visible fat intake in Indian diets should not exceed 18 per cent.

However, the figures for fat consumption which the various surveys reveal sometimes differ considerably even for the same state. Thus the daily consumption of vegetable fat in Gujarat state in three separate studies are 5, 18 and 24g and for Kerala 7, 12 and 5g. Low income group spend 2/3 of their income on foods and high income group about half (NIN, 1975). Achaya (1987) reported that vanaspati tends to be used by upper income groups and more extensively in the north than elsewhere.

Achaya (1990) pointed out that rural Indian diets supply about balanced proportion of saturated fatty acids oleic acid and linoleic acid with about 3 per cent linolenic acid. It is concluded that the pattern of fat intake in rural areas is conducive to good health but that of urban upper income groups is too high in saturated fatty acids and too low in oleic and linoleic acid.

Visible fat is bought and used for cooking means for the entire family. So it is to be expected that high average level of fat consumption or a low one is reflected in the intake of adults (16 years and above), of school children (6-15 years) and even of preschool children (3-5 years) (Achaya, 1978).

The group of preschool children is obviously a nutritionally vulnerable one. Visible daily fat intake of the group over all the 5 years varies from as little as 0.3 to 0.4g for the lowest income group of Tamil Nadu and Karnataka to a high of 16.4g for upper income preschool children in Maharashtra or of 7.9g in Gujarat. Visible intake from only a part of total fat consumption. Invisible fat is derived from breast milk, animal fat, baby foods and few other dietary items (Gopalan et al., 1971). Achaya (1978) reported that Indian infants in various parts of the country received from breast milk as much as 20 to 27g of fat/day in the first year of life.

Thus the studies reveal that the consumption pattern vary from one region to another and an optimum figure for the consumption of fat is still a matter cloaked in uncertainty (Achaya, 1987).

E. Health Implications of Fat Consumption

World Health Organisation (WHO) statistics show that out of twelve million deaths due to heart diseases six million occur in developing countries. In India the death due to heart diseases will be one and a half times more than that due to infectious diseases. The risk in cardiovascular diseases is also linked to life styles - by diets, too rich in fat and in salt, by tobacco and by a lack of regular exercise (Pillai, 1992).

Dietary fat so far was considered to be an important nutrient as a mere concentrated source of energy. However, recent research on fat as a nutrient definitely indicates that both the quality and quantity of fat have important repercussions on health and disease (Georgion, 1992). The amount of fat consumed vary from one region to another and what may be a health implication in one part of the world is not necessarily such in another (Kinsella, 1988). During the past 30 years there has been growing concern that the levels and types of fats in the diet may be related to the chronic

degenerative disease so prevalent in our affluent society such as atherosclerosis, heart disease, cancer, diabetics and arthritis (Fogerty, 1989).

Coronary Heart Disease (CHD) is one of the leading causes of death in the developed countries over the past three decades and developing countries also follow this trend these days due to the pace and pressure of modern life (Devadas, 1989). Chandran (1987) opined that the sharply rising incidence of coronary heart disease is likely to reach alarming proportions by 2000 A.D. Thus the incidence of cardiovascular disease has increased alarmingly in recent years accounting for over 54 per cent of the deaths all over the world (Kurup, 1989).

The risk factors which make a person vulnerable to heart attacks are sex, overweight, diet rich in saturated fats and cholesterol, high blood pressure, heavy smoking, sedentary occupation, organic disease like diabetes, lowered vitality and genetic factors (Nutrition Reviews, 1985; 1986; Bakhrui, 1987 and Chandran, 1987).

The fundamental conditioning factor in all heart diseases, however is the diet. A corrective diet in many cases can reverse degenerative changes which have occurred in

the heart and blood vessels says Bakhru (1987). Juneja and Sharma (1982) and Geer et al., (1980) found that pure vegetarians had a significantly lower cholesterol value than non vegetarians.

The type of diet has an important role in the development and progression of heart disease. Often dietary practices result in directly increased levels of lipids in blood. The critical dietary factors are food, total calories, fat and cholesterol (Devadas, 1989). According to Nutrition News (1986) the amount and type of fat in the diet affect the level of lipids in the blood. An intake of more than 35 per cent of food energy from fat increases the risk of arterial diseases for most people.

Ingestion of excessive calories, the amount and kind of carbohydrate, the amount and source of dietary fat are notable dietary factors leading to the elevation in plasma cholesterol levels (Truswell, 1981; Mahley, 1982; Nutrition News, 1986 and Bakhru, 1987). Consumption of saturated animal fats such as dairy products, rich amounts of meat, beef ham, bacon and egg yolk are the main contributory factors for hypertension.

The association between elevated plasma cholesterol levels and cardiovascular diseases is well established by Rosengberg (1989). The risk of coronary heart disease is

higher in those with elevated cholesterol levels and that lowering plasma cholesterol levels in hyper cholesterolemic individuals may decrease their risk of ischaemic heart disease. Cigarette smoking, obesity, alcohol consumption and oral contraceptive use, all had a significant effect on adult cholesterol levels. Similarly a family history of ischaemic heart disease was correlated with high cholesterol levels in childhood and adulthood. Stehbins (1989) opined that dietary fat is considered as the major environment agent responsible for elevated serum lipids and severe atherosclerosis in technologically advanced populations. Fat intake and cancers such as breast prostate and gastro-intestinal tract have been studied in depth and all of these tend to show most striking dietary associations. Both the quantity and quality of dietary fat appear to influence malignancies (Krishnaswamy, 1986). In addition to cardiovascular disease, the high correlation between fat consumption and the incidence of breast cancer was suggested by Carroll (1986). He mentions that fat consumption might influence the occurrence of breast cancer. Also Awad et al., (1989) reported that high colon cancer incidence is associated with fat intake.

Study of the effect of different edible oils like coconut oil, groundnut oil, safflower oil, sesame oil, rice bran oil, corn oil, butter fat and hydrogenated fat in rats fed cholesterol free and cholesterol containing diets revealed that there was no strict correlation between the

degree of saturation and unsaturation of the fats and their effect on serum and aortic cholesterol. Maximum atherogenic effect in the aorta in rats fed cholesterol diets was observed with hydrogenated fat and butter fat, coconut oil and groundnut oil produced moderate lesions. Generally the more unsaturated fats showed decreased cholesterol and triglycerides in the serum aorta (Kurup, 1989).

Consumption of saturated animal fats is the main contribution factor in hypercholesterolemia which leads to heart disease (Fox, 1977; WHO Chronicle, 1977; Turpeinen, 1979; Refind, 1986 and Etherton et al., 1988). Coconut oil and hydrogenated oils are saturated and they do not lower serum cholesterol (Gopalakrishnan, 1979 and Nutrition News, 1985).

Kinsella (1988) has suggested that since much of the data regarding the hyperlipedemic effects of saturated fatty acids are derived from studies using solely one type of fat usually at 40 per cent of dietary energy requirements, the results are of questionable significance when applied to humans who consume a heterogenous mixture of fatty acids. In the light of current knowledge the recommendation that the diet should include a moderate fat intake (30 per cent) of dietary energy with the fatty acids evenly balanced between saturated, mono unsaturated and polyunsaturated would seem to be a sound advice.

Georgiou et al., (1982) stated that Americans recently consume 37 per cent of their energy from fat. Current dietary recommendations for Americans advise, limiting fat by choosig lower fat meals and dairy produces by replacing some high fat foods (which spreads, fried foods) with high carbohydrate and low fat foods (fruits, vegetables, grains and legumes). They also suggested that individuals can decrease fat intake in two ways - qualitatively by excluding foods that are concentrated fat sources and - quauantitatively by decreasing the amounts of high fat foods consumed.

WHO expert group (1990) revealed that the dietary changes from a high to a low intake of saturated fats and replacing the fat with n-6 polyunsaturated fatty acids (linoleic acid) reduce serum cholesterol by 15 per cent. Also Dyerberg et al., (1980) found that the high intake of n-3 polyunsaturated fatty acid of the Eskimos was associated with their low mortality rate from coronary heart disease.

Study conducted by Hirai et al., (1980) among the Japanese population group revealed that the incidence of low mortality rate from coronary heart disease might be due to the relative high level of fish consumption in Japan. Ganse (1986) found that the mortality rate from coronary heart disease was more than 50 per cent lower for

those population group in Netherlands, who ate 30g of fish per day than those who did not. Also Simosen et al., (1980) and Swanson (1989) stated that there are cumulative evidence that dietary n-3 polyunsaturated fatty acid from fish or fish oils may reduce the risk of both the incidence and fatality of coronary arterial disease.

Fish is an excellent food due to its high content of unsaturated fats (WHO Chronicle, 1977; Shekelec et al., 1981; Kuchi et al., 1985; Teutscher, 1986 and Rice, 1988). Several studies have demonstrated that the consumption of fish and oils seems to lower serum lipids in both human and experimental animals and reduced mortality by 50 per cent (Nutrition Review, 1985). Unsaturated fatty acid of deep sea cold water fish is also known to reduce the risk of Coronary Heart Disease (Harris, 1988). A study in Netherlands report that people who eat 30g or more of fish have mortality less than non eaters (Jeutsher, 1986).

Ghafoorunissa (1983) opined that certain dietary modifications could perhaps prevent the development of vascular diseases. Epidemiological evidence suggests that Greenland Eskimos have strikingly low rate of atherosclerosis and heart attacks. The diet of these Eskimos being rich in fish contain high amounts of eicosapentaenoic acid, therefore this population is better protected from heart attacks.

Rice bran oils and sunflower oil have been proved to be hypocholesterolemic (Nutrition News, 1985). Even the other dietary factors such as protein and carbohydrate influence the serum lipid levels in man and experimental animals. It is generally believed that animal proteins are hypercholesterolemic, while plant proteins show cholesterol lowering action. Administration of the blackgram protein to hypercholesterolemic rats was found to result in significant lowering of serum and aortic cholesterol and triglycerides (Jayakumari et al., 1978). It is known that dietary carbohydrates influence serum lipid levels and most of the reports indicate that sucrose produces higher serum cholesterol when compared to glucose or corn starch (Kurup, 1989).

F. Assessment of Nutritional Status

Nutritional well being of a community or nation is an important determinant of its health status. Nutritional status of a community is the sum of the nutritional status of the individuals who form the community (Park and Park, 1983). It also refers to the health of an individual as it is affected by the intake and utilization of nutrients (Pellet, 1987). It would be used as a proxy for general level of living and welfare and give consideration for a range of development projects such as educational, agricultural or health services (Dowler et al., 1982).

The nutritional status of an individual is the outcome of a complex interaction of a broad range of host and environmental factors like physical, biological and cultural influence. Interaction of a host means maintenance of balance between three factors - dietary intake, physiological requirements and energy expenditure. Thus nutritional status is influenced by two types of factors namely endogenous ones and exogenous ones as presented in Figure 1 (International Children's Conference, ICC, 1984).

The assessment of individual or community nutritional status, involves the use of indicators, when properly analysed and interpreted, these may be used to locate persons or groups whose nutritional status ought to be improved and to decide what strategies to implement or how to orient activities aimed at improving nutritional status (Taylor and Jankin, 1986).

1. Anthropometry

One of the useful criteria for judging nutritional status is physical growth as assessed by anthropometry (Newell et al., 1984). Anthropometry represents the typical and traditional tool of physical anthropology (Indira et al., 1989). Anthropometric measurements are the most common simple and practical means of assessing the growth. The process of

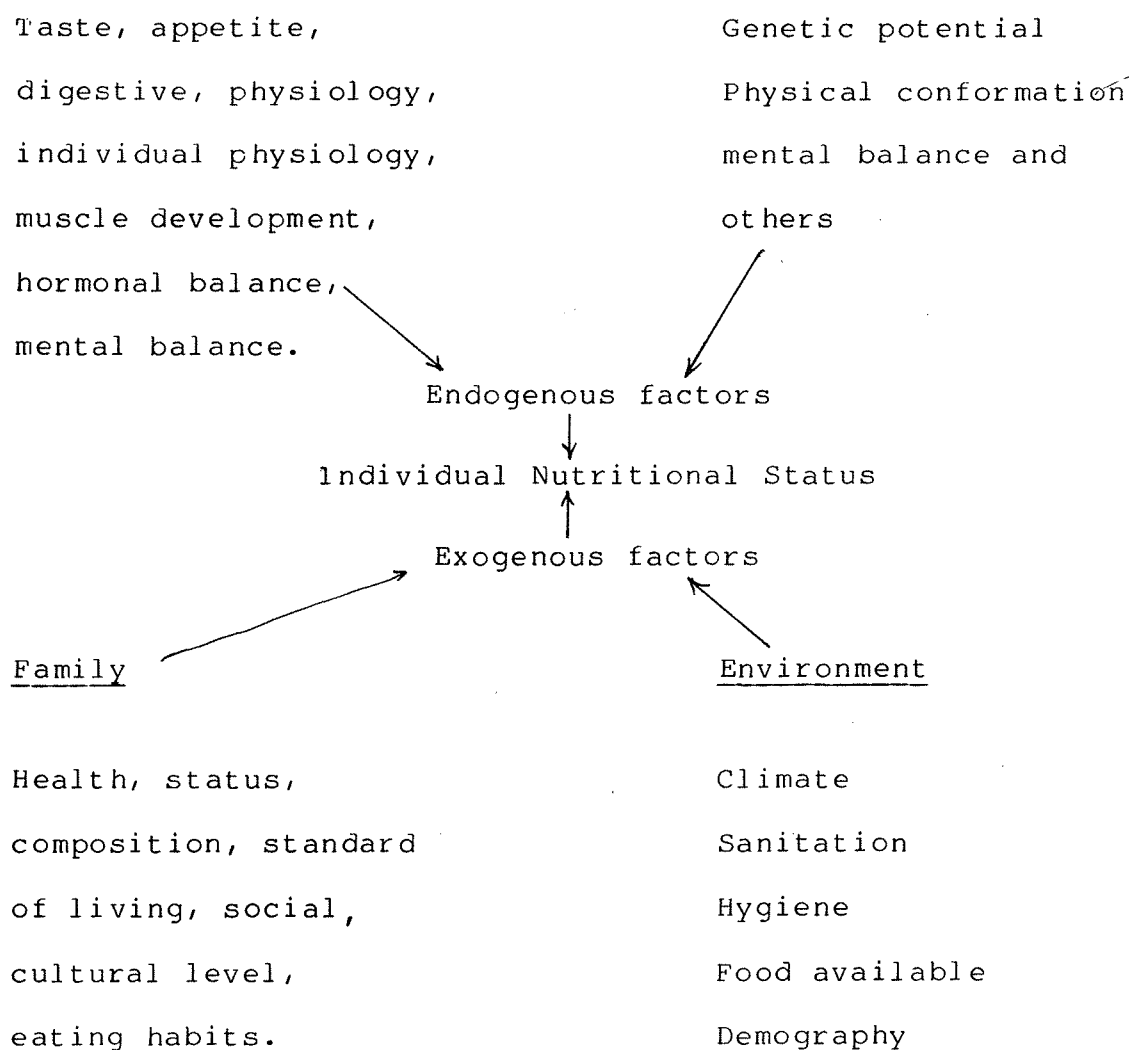


FIG. 1

ELEMENTS CONSTANTLY INFLUENCING INDIVIDUAL
NUTRITIONAL STATUS, ICC, 1984.

normal growth and development is dependent on an adequate and timely supply of essential nutrients needed for growth (Seth, 1981). The growth status of a person is therefore, a useful indicator of his/her nutritional status. Anthropometric measurements have revealed that there exists correlation between body structure, physical characteristic and work capabilities (Sounderaja, 1983) and correlation between body fluids and disease (Indira et al., 1989).

Physical measurements when properly taken provide an inexpensive, non-invasive means of assessing and framing the nutritional status (Mathew, 1986). Body length and gross weight are standard anthropometric measurements to be included in even the minimal nutritional appraisal (Jelliffe and Jelliffe, 1979). Height and weight were found to be adequate to assess the growth and development of an individual (Megabilong, 1983).

Height measurements will not only be helpful in monitoring secular trends in nutrition and economic status, but they will be useful in inter regional and inter class comparisons of nutritional status among different cases within countries (Gopalan, 1989). Height is less sensitive to dietary fluctuations and it is significantly affected by heredity (Wilson et al., 1975). Although height is genetically determined, socio economic deprivation during the period of growth is a leading cause of failure to reach

genetic potential (Robinson et al., 1989). Circumstances which accompany poverty, delay the age at which, complete stature is reached and stunt adult height. Thus height measurements are an indication of socio economic status of a community (Tanner, 1982).

Weight is a measure of total body mass and hence it is sensitive to changes in body fluids, fat muscle mass, the skeleton and other organs. Weight is the simplest measurement of growth and nutritional status and it is the most accurately and easily determined variable (Swaminathan, 1990). It is the most commonly used measure and may be the most significant one. It reflects the level of food intake much more quickly than does height. Weight for height per cent and weight/height m^2 could serve as good indicators for the assessment of malnutrition (Rao et al., 1984).

In case of children mid arm circumference, is an easy and useful measurement for the assessment of nutritional status (Ghosh, 1985). Mid upper arm circumference has been shown to be closely correlated with clinical and other anthropometric parameter of the nutritional status. It is an indication of protein calorie nutrition. When mid upper arm circumference is combined with skin fold thickness an even better assessment of protein and calorie nutriture can be made. The muscle circumference is a good indication of the lean body mass (WHO, 1966 and Krause, 1985).

Head circumference is related mainly to brain size and a small extent to the thickness of the scalp tissues and the skull. Brain size and both the thickness of scalp tissues and the skull can vary with nutritional status, so that head circumference is slightly affected in the second year of a life (Cameron and Yngue, 1983).

Skinfold thickness is another anthropometric measurement that is coming into greater use as health practitioner have become more concerned with preventing obesity. Skinfold thickness measures the amount of subcutaneous fat. The skin fold thickness will be more for female than for males (Krause, 1985).

2. Clinical Assessment

Clinical examination is the most important part of nutritional assessment as we get direct information of the signs and symptoms of dietary deficiencies prevalent among the people (Swaminathan, 1986). Clinical examination is the simplest tool used in the evaluation of human nutritional status since the ultimate objective is to assess the levels of health of individuals and population groups as influenced by the diet they consume (FAO, 1970; Isakson, 1974; Swaminathan 1974; Visweswara Rao, 1977 and Gupta et al., 1978).

Clinical examination serves as a guide for recording the signs known to be related to inadequate nutrition and in detecting other diseases or conditions which commonly influence the nutriture of an individual (Kanawati, 1976). Mason (1979) opines that clinical examination gives indication of the extent to which children are physically malnourished. Shimazona (1970) states that clinical examination is of value for the identification of characteristic nutritional syndromes and an useful way of using clinical data is obtained by correlation analysis with biochemical and dietary data.

According to Jelliffe (1969), this method is relatively inexpensive and rapid and do not require elaborate field equipment or a costly laboratory. Signs of frank deficiency are so widespread, the clinical assessment of malnutrition gained particular importance in India. In spite of the fact that it is sometimes difficult to interpret certain signs, the procedure followed has always proved to be of great value in nutritional evaluation (Visweswara Rao and Prahlad Rao 1975; and Visweswara Rao, 1978).

3. Biochemical Estimation

The most objective means for assessing the nutritional status and to evolve some normal pattern of

deficiency will be based on biochemical analysis of materials such as blood and urine that can be sampled easily (Rao et al., 1969 and Whitehead, 1969).

Haemoglobin is widely used as an index in the assessment of malnutrition partly because it can be easily determined on a small sample which can be obtained from the finger tip and partly because its synthesis is sensitive to a deficiency of several nutrients such as protein, iron, vitamin B12 and folic acid and can therefore be used as a general index of nutritional status (Chandrasekaran, 1970).

With some biochemical task, deficiencies or excess can be detected before symptoms are apparent thus making it possible to institute nutritional corrections early. Some biochemical determinations also help to confirm clinical and dietary data so that diagnosis can be made and nutritional care can be planned and implemented. Whole blood, blood serum, blood-plasma, urine, faeces, hair, biopsy of liver and bone are among the materials used for biochemical studies (Robinson and Lawler, 1986).

4. Dietary Survey

Dietary surveys constitute an essential part of any complete study of nutritional status of individuals or groups

providing essential information on nutrient intake levels, sources of nutrients, food habits and attitudes (Swaminathan, 1974).

Chandrasekaran (1970) reviews that surveys are required to measure the comparative nutritional status of groups and communities. It is essential that the groups to be surveyed must be defined upon the accuracy of this definition and the objectivity with which it can be applied in the field. Rao (1970) opines that dietary intake is a rough guide for the assessment of nutritional status.

Malnutrition in large population is measured primarily by comparing peoples' actual diets with what nutritionists regard as adequate diet (Berg, 1981). Dietary surveys help to identify groups and individuals suffering from malnutrition and rectify the effects of ill balanced diets (Davidson. et al., 1974). Dietary studies not only yield information on the adequacy of existing diets, but also involve collection of information concerning food habits, nutrient allowances, meal preparations, food procurement and distribution, food waste and nutritional adequacy of foods available and those actually consumed (FAO 1976; Gopalan and Rao 1973 and Hegsted, 1972).

Measurements of food intake can be useful in overall assessment of nutritional status (Drunin, 1984). Dietary intake estimation involves the collection of information on food eaten by individuals and computation of energy and nutrient components of these foods by using values from food composition tables (Rao, 1990).

EXPERIMENTAL PROCEDURE

III. EXPERIMENTAL PROCEDURE

The procedure adopted to conduct the present study entitled "Fat consumption pattern in Assamese diets" is presented under the following heads:

- A. Selection of the area and sample
- B. Formulation of the questionnaire
- C. Conducting socio-economic and dietary survey
- D. Assessment of nutritional status
- E. Analysis of the fat content of the diets.

A. Selection of the Area and Sample.

The word Assam is derived from sanskrit word 'asom' meaning peerless, judged by her exquisite natural beauty, cultural richness and human wealth. Being the homeland of different races of men: Austric, Mongolian, Dravidian and Aryan, that came to dwell in hills and valleys at different times since remote antiquity, Assam has developed a composite culture of variegated colours. Assam which is situated in North-East corner of India is surrounded by Bhutan, Tibet, Arunachal Pradesh on North, Nagaland and Manipur on east, Meghalaya and Mizoram on south and Bangladesh, Tripura and West Bengal on west. Geographical area covered by Assam is 78,523 sq.km. comprising 23 districts with a population of 1,98,96,843 in 1981 (Projected) and 22, 294,562 in 1991 (Provisional). The

state's climate is of humid tropical type in the plains and sub-alpine in the hills (India, 1990). Population of Assam is a mosaic of different tribes like Bodokacharis, Rabhas, Karbi, Mishing, Deuri, Chutias, Dimasas, Hmars, Lalung etc. (Statistical Handbook of Assam 1989). Agriculture covers more than two-third of labour force and supports more than 77 per cent of population. Principal food of Assam is rice. Cash crops are jute, tea, cotton, oilseeds, sugarcane, potato etc. Major horticulture items are orange and other citrus fruits, banana, pineapple, arecanut, coconut, guava, lichi, mango, jack fruit, etc., which are grown on small scale. The state has a gross cropped area of about 35 lakh hectare, more than 79 per cent accounting for foodgrains crops (India, 1991).

In order to study the prevailing pattern of fat consumption in the socio-culturally divergent segments of Assamese population, a four staged random sampling procedure was undertaken to select the actual area for the survey work. From among 23 districts of the state of Assam, four districts namely Dibrugarh, Jorhat, Kamrup and Sonitpur were selected to get a representative population of urban, rural and tribal groups. Figure 2 gives the geographic location of Assam with the different districts and four selected districts are indicated specifically. These districts were also within the reach of the investigator and

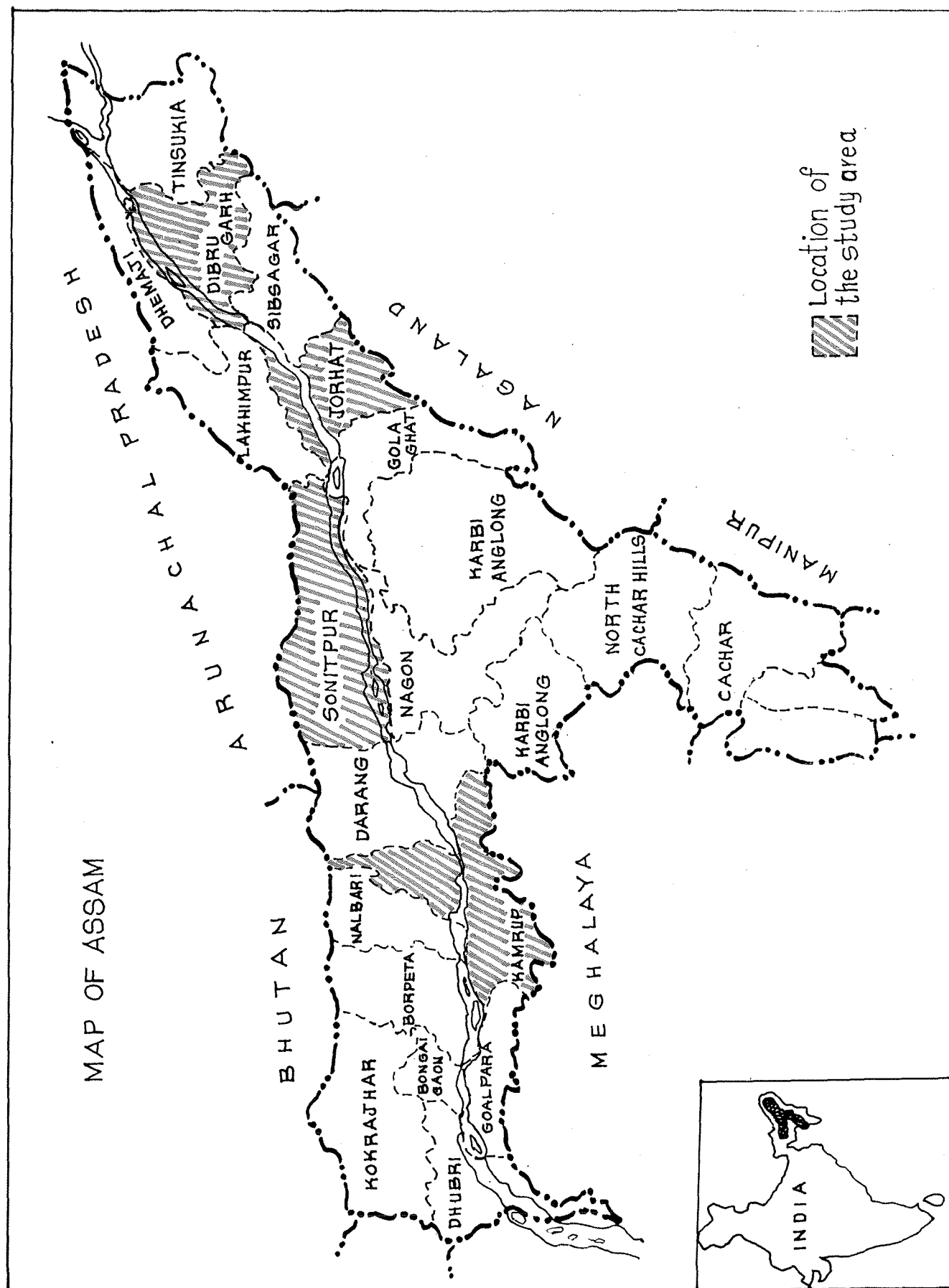


Figure.2

co-operation was forthcoming from the authorities. Eight community development blocks (C.D. Blocks), two from each district were then selected randomly. After selection of the community development blocks, the lists of townships and villages, both tribal and rural, for each community development block was prepared. Later two representative towns and one rural and one tribal village were selected randomly from the list. Thus totally sixteen (16) towns and eight (8) rural and eight (8) tribal villages were selected for the study. From each of the selected area (Town, village - rural and tribal), fifteen (15) households were randomly selected. Thus altogether four hundred and eighty households were selected to conduct the study. Sampling procedure is clearly depicted in Figure 3.

B. Formulation of the Questionnaire.

Food consumption is influenced by various factors like socio-economic status of the family, dietary practices and daily meal pattern (Chandrasekhar et al., 1980). Therefore, a questionnaire was formulated to elicit information on the socio-economic and dietary practices such as income, size and types of the family, educational status, monthly expenditure pattern, daily meal pattern, foods preserved, feeding practices, diet during special conditions and illness. Since the main objective of the study was to

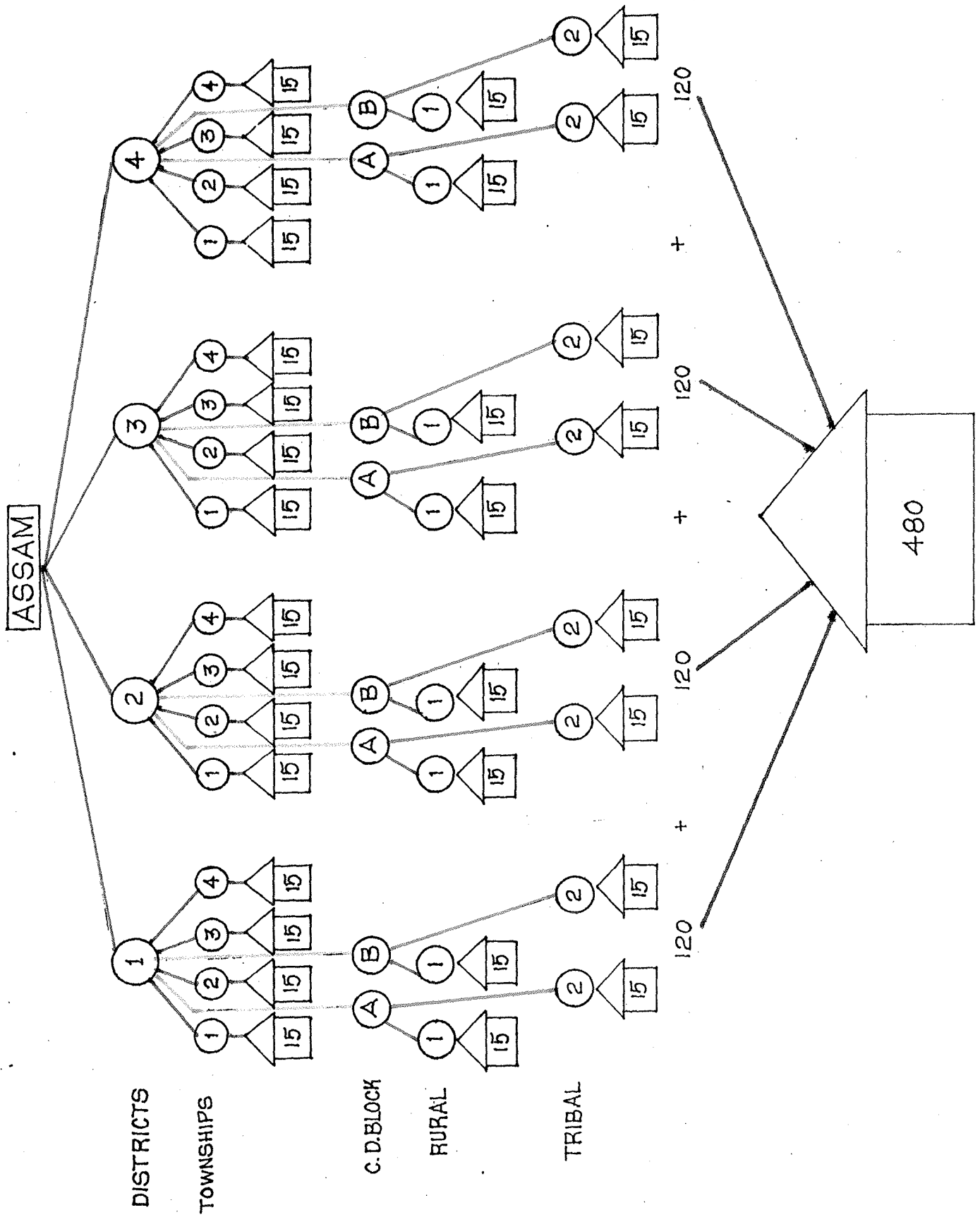


Figure. 3 NUMBER OF HOUSEHOLDS

elicit information on fat consumption pattern, details on fat intake, fat as a medium of cooking, opinion regarding inclusion of fat in the diet and the like were such of the special details called for in the proforma Weighment of foods was part of the study to find out the actual intake of nutrients and hence this also formed part of the formulated schedule. The schedule was then pretested on a sample of 45 households, comprising of 15 household each from rural, urban and tribal population and modified. The schedule thus formulated is given in Annexure I.

C. Conducting Socio-Economic and Dietary Survey.

As indicated under selection of the area and sample, in order to collect background information from the selected urban households the investigator approached District Head Quarters and through their contacts, developed rapport among the urban households to conduct the survey. As far as rural and tribal areas were concerned, the investigattor contacted the concerned Block Development Officer for the rural villages and contacted the Tribal Welfare Officer in the case of tribal areas and established rapport among the households to conduct the survey. The background information and dietary practices of the selected households were then obtained by direct interview using the

formulated questionnaire. The interview method being one of the chief means of collecting data in social research, it was selected and employed successfully to collect a wide range of information.

D. Assessment of Nutritional Status.

1. Food and Nutrient Intake.

Swaminathan (1985) declares that individual food intake can be obtained accurately by actual weighing of food items consumed. So a three consecutive day (2 week days, one weekend day) weighment survey was undertaken to find out the food and nutrient intake of the selected population groups. As already indicated under section A, for this study, 16 townships, 8 rural and 8 tribal villages were selected and surveyed. From each township/village/tribal area, 3 households each were further selected randomly ($32 \times 3 = 96$) making a total of 96 households as sub-sample for the conduct of weighment survey. A food weighing balance was used for taking weights of foods to the nearest of one gram. The amount of raw foods and cooked foods used for the various meals of the days and the amount of cooked foods and other foods consumed by the subjects/family members were recorded in the proforma given (Annexure I). From the records maintained by the investigator the raw equivalents of cooked food consumed by the subjects were found out. Thereafter

the nutrient intakes of the different age group were calculated using the food composition tables (ICMR, 1989). The results obtained were compared with the Recommended Dietary Intake of Indians (ICMR, 1989).

2. Anthropometric Measurement.

Anthropometric measurements are reliable indicators of growth and development and indices for detection of border line to frank malnutrition (Seth, 1981 and Swaminathan, 1986). Hence height and weight of all the subjects in the selected twenty per cent of the sample households (for whom weightment survey was done) were measured using the standard procedure as recommended by Jelliffe (1960).

a. Weight

According to Owen et al., (1984) body weight is the most accurately and easily determined variable. The weights of the family members were recorded in the morning before breakfast with ordinary light clothes on and after removing their footwear. Weight was taken on platform type beam balance capable of reading upto 0.2 kg. The weighing balance was frequently checked for its accuracy with standard weights.

b. Height.

The height of an individual is made up of the sum of four components legs, pelvis, spine and skull. However, in field of nutritional anthropometry the total height is usually measured. Height was measured to the nearest of 1/10th of a centimeter using a vertical metal anthropometer. A fiber glass measuring tape was also used when the subjects did not co-operate with the anthropometer. Under such circumstances, the subject was made to stand on the floor, bare footed, with the feet parallel and with heels, buttocks, shoulders and back of the head touching the wall. The head was held erect comfortably with the arms hanging at the sides in a natural manner. A sturdy wooden board was placed gently on the head perpendicular to the wall and the height was measured using the tape correct to 0.1 centimeter.

E. Analysis of the Fat Content of the Diets.

During weighment, 10 per cent aliquots of all foods consumed by each individual in the selected 96 households were collected and preserved under Hydrochloric acid. The

entire three days' collection was then homogenized, oven dried, powdered and analysed for fat content using soxtec extraction procedure (Tecator, Manual, soxtec HT system). The details of the procedure is given in Annexure II. This analysis gave information on actual total fat intake pattern of each age group from each area.

RESULTS AND DISCUSSION

IV. RESULTS AND DISCUSSION

Present investigation aimed at assessing the fat consumption pattern in Assamese dietaries. In order to have a representative sample of the Assamese population a cross sectional sample of 120 rural households, 240 urban households and 120 tribal households were selected from both upper and lower Assam and studied. The data thus collected are presented and discussed under the following heads:

- A. Socio economic indicators of the representative households.
- B. Dietary habits and food consumption pattern of the representative households.
- C. Dietary practices of vulnerable groups.
- D. Consumption pattern of fats and oils.
- E. Opinion regarding consumption of foods rich in fats and oils.
- F. Nutrient intake pattern of the selected families.
- G. Heights and weights of the selected age groups.
- H. Total fats and oil intake pattern in Assamese diets.

A. Socio economic Indicators of the Representative Households

1. Occupation and Income.

Socio economic indicators like occupation and income of the selected households is given in Table I.

TABLE I
DISTRIBUTION OF SAMPLE HOUSEHOLDS ACCORDING TO
OCCUPATION AND INCOME

Area	Occupation		Income		
	Farming	Non-farming	LIG	MIG	HIG
Rural	115 (95.8)	5 (4.2)	20(16.6)	60(50.0)	40(33.4)
Urban	15 (6.3)	225 (93.7)	60(25.0)	100(41.6)	80(33.4)
Tribal	110 (91.6)	10 (8.4)	20(16.6)	60(50.0)	40(33.4)

Figures in paranthesis denote percentage

LIG = Low Income Group

MIG = Middle Income Group

HIG = High Income Group

Among the surveyed households 95.8 per cent of the rural and 91.6 per cent of the tribal were involved in farming activities to earn their family income, whereas 93.7 per cent of the urban households were engaged in non-farming activities like white collar jobs and business. A minor percentage of the rural and tribal households (4.2 per cent and 8.4 per cent) respectively were working in Primary Health Centres and other business centres as clerks, attenders and watchmen. Among the urban households 6.3 per

cent of the households, even though they were living in urban areas, were working in their own farms in their native places and deriving their family income from their farms.

As far as income is concerned more than 40 to 50 per cent of the households irrespective of the area, belonged to middle income group. In all the three areas surveyed 33.4 per cent of the households came under high income group and 25 per cent of urban and 16.6 per cent of rural and tribal households belonged to low income group.

2. Educational Status .

Table II gives the distribution of the selected households in the three areas as per the educational status of the head of the household.

TABLE II
EDUCATIONAL STATUS OF THE HEAD OF THE
HOUSEHOLDS

Area	Educational Status				
	Primary	Secondary	Higher Secondary	Degree	Illiterate
Rural	48 (40.0)	39 (32.5)	8 (6.7)	4 (3.3)	21 (17.5)
Urban	49 (20.4)	43 (17.9)	50 (20.8)	81 (33.8)	17 (7.1)
Tribal	52 (43.3)	24 (20.0)	11 (9.2)	5 (4.2)	28 (23.3)

Figures in paranthesis denote percentage.

It is evident from the above table that 40 per cent of the rural, 20.4 per cent of the urban and 43.3 per cent of the tribal household heads had studied upto primary school level. A minor percentage (3.3 per cent) of the rural household heads and 4.2 per cent of the tribal household heads had studied upto degree level, whereas 33.8 per cent of the urban household heads had studied upto degree level. The level of illiteracy was more among the tribal households and less among the urban households. This may be due to the educational facilities available in the urban areas.

3. Type and Size of The Family.

Details of type and size of the family is given in Table III.

TABLE III
DISTRIBUTION OF SAMPLE HOUSEHOLDS ACCORDING TO
TYPES AND SIZE OF THE FAMILY

Area	Types of Family		Size of the Family (Number)			
	Joint	Nuclear	1 - 3	4 - 6	7 - 9	10 and above
Rural	30(25.0)	90 (75.0)	14(11.7)	42(35.0)	51(42.5)	13(10.8)
Urban	55(22.9)	185(77.1)	28(11.7)	127(52.9)	67(27.9)	18(7.5)
Tribal	35(29.2)	85(70.8)	13(10.8)	44(36.7)	48(40.0)	15(12.5)

Figures in paranthesis denote percentage

In all the three areas surveyed nuclear family system was predominant, eighty point eight per cent of tribal, 75 per cent of rural and 77.1 per cent of urban households were following nuclear family system and remaining households in the three areas respectively were still in the joint family system.

As far as size of the family is taken into consideration 35 per cent of the rural, 52.9 per cent of the urban and 36.7 per cent of the tribal households had 4 to 6 members in their families and 7 to 9 members were present in 42.5 per cent of the rural, 27.9 per cent of the urban and 40 per cent of the tribal households.

B. Dietary Habits and Food Consumption Pattern of the Representative Households.

Information gathered on the general dietary habits of Assam showed that cent per cent of the tribal and rural household members were non-vegetarians. Among the urban households only 4.2 per cent of the household members were vegetarians and the remaining 95.8 per cent of the urban household members were non-vegetarians. Among the cereals rice and rice products were commonly consumed in all the

three areas surveyed. Among the pulses lentil (masoor dhal) was the common item used by all the families. Mustard oil was the main cooking medium of fat in all the three areas surveyed but the amount of consumption varied with the purchasing power of the families.

Shenolikar (1977) reported that mustard oil forms a source of fat in the dietaries of people in certain parts of India from time immemorial and is widely used in West Bengal and eastern parts of India. In this study also it was observed that mustard oil formed the main oil medium used for cooking. Among the roots and tubers, potato was the common root vegetable used almost in all the meals daily. As far as greens, local variety of fern and colocasia were common items consumed by the households. Banana was the common fruit consumed.

After gathering information on the general dietary habits, it was thought of interest to find out the specific food consumption pattern of the representative households. Details gathered are presented in Table IV.

TABLE IV
PERCENTAGE DISTRIBUTION OF HOUSEHOLDS ACCORDING TO
FREQUENCY OF FOOD CONSUMPTION

Frequency of consumption Food items	Daily			Weekly			Monthly		
	Rural	Urban	Tribal	Rural	Urban	Tribal	Rural	Urban	Tribal
Cereals	100	100	100	-	-	-	-	-	-
Pulses	90	90	95	10	10	5	-	-	-
Roots and tubers	95	95	95	5	5	5	-	-	-
Other vegetables	100	100	100	-	-	-	-	-	-
Green leafy vegetables	100	75	100	-	25	-	-	-	-
Fleshy foods	-	-	-	90	90	67	10	10	33
Egg	10	40	5	53.3	60	50	36.7	-	28.3
Milk	10	80.5	10	33.3	19.5	40	23.3	-	16.7
Sugar and jaggery	100	100	95	-	-	5	-	-	-
Cooking oil									
Mustard oil	97	100	95	3	-	-	-	-	5
Vanaspati	-	75	-	-	25	-	10	-	-

All the households in the three areas were consuming cereals daily. Rice and rice products was consumed commonly in all the three areas, urban households were using wheat and wheat products daily in their breakfast dishes. Ninety per cent of the rural and urban households and 95 per cent of the tribal households were consuming pulses daily and the remaining 10 per cent of rural and urban and 5 per cent of tribal households were using pulses only once a week. The common pulse used by all the households irrespective of the area was lentil (masoor dhal). During festival or some ceremonies rural and tribal households were using blackgram dhal and urban households were using red gram, Bengal gram dhal and other dhals. Ninety five per cent of the households in the surveyed areas were using roots and tubers mainly potato and onion daily and the remaining 5 per cent of the households in all the three areas were using roots and tubers weekly. All the households were consuming vegetables like ridge gourd, bottle gourd, papaya, green banana, banana flower, banana stem, pumpkin, ladies finger, brinjal etc., daily. They were also consuming greens daily. The common greens used by the households were edible fern, colocasia leaves, spinach "manimuni" (Centella asiatica), 'Lofa', 'Babari', 'Doron', 'Brahmi', 'Kolmau', curry leaves, drumstick leaves, tender leaves of pumpkins and bottle gourd and purai leaves' etc.

Some of these special greens are shown in the photograph (Plates 1 to 7).

Ninety per cent of the rural and urban households were including fleshy foods weekly twice or thrice. Sixty seven per cent of the tribal households were including fleshy foods in their meals once in a week; remaining percentage of households were using fleshy foods once in a month. Forty per cent of the urban households were using eggs daily, whereas others were using eggs either weekly or monthly. Milk and milk products were consumed daily by the urban households. Rural and tribal households were not consuming milk and milk products regularly. They may purchase these products on special needs. Milk production as such is less in Assam and due to that cost is very high and many households were not able to procure fresh milk products or spray dried processed milk products. Urban households were using less amount of cow's milk and more milk powders available in the market. All the households irrespective of the area were using sugar and jaggery daily. Mustard oil was the common cooking fat used by the households. Among the urban households vanaspati also finds its place. Negligible quantities of common oilseeds like mustard, coriander, cumin seeds and condiments and spices were used by all the households daily for seasoning. Special condiments like cardamom, cinnamon, cloves were used by the urban households when they prepare non-vegetarian dishes.

LOCAL VARIETIES OF EDIBLE GREENS



PLATE 1



PLATE 2

LOCAL VARIETIES OF EDIBLE GREENS



PLATE 3



PLATE 4

LOCAL VARIETIES OF EDIBLE GREENS



PLATE 5



PLATE 6

LOCAL VARIETIES OF EDIBLE GREENS



PLATE 7

COMMON WEANING FOODS



PLATE 8



PLATE 9

Throughout the households surveyed as is a custom and part of the culture of Assamese, every household offered tea and betel leaves with nut to every guest. Consumption of tea, betel leaves and nut is very regular especially by adult members. Alcoholic drinks were prepared at home in tribal and rural households which was brewed rice beer locally called as "Hanj Pani", "Lau-Pani", "Apang" etc. according to the different tribal areas. Alcohol (home brewed) was favourite amongst tribal and rural households, and consumed frequently and specially during festivals and ceremonies.

Barring some tribes of Kerala and Nilgiris, most tribals are habituated to alcoholic drinks. Studies conducted by several investigators from different parts of India reported similar habit and further revealed that no feast is complete without alcohol. Gupta (1983) has reported that a home brewed undistilled liquor is made from fermented rice by tribes of Bihar and in Assam also such a practice seems to be in vogue.

It was interesting to note that 72 per cent of the rural households were taking three meals a day, 25 per cent of the rural households were consuming two meals a day and three per cent of the rural households were taking four meals a day. As far as urban households were concerned majority (70 per cent) of the households were consuming four meals and the remaining 30 per cent of the households were

taking three meals a day. Three meal pattern was existing in 75 per cent of the tribal households and two meal pattern was followed by the remaining 25 per cent of the tribal households.

The common menu followed by the households for different meals is given in Table V.

TABLE V
COMMON MENU FOLLOWED BY THE HOUSEHOLDS
FOR DIFFERENT MEALS

Meals	Rural	Urban	Tribal
Break-fast	Rice/rice products with pulses and vegetables	Rice Products with milk and banana/wheat/vegetables	Rice/rice products with dhal and greens
Lunch	Rice/pulses/vegetables salad/chutneys along with non-vegetarian items weekly twice or thrice.	Rice/pulses/vegetables curry/mutton/chicken/fish egg/pickle/mashed potato/salad	Rice/pulse/vegetables curry/roasted fish/mutton.
Tea	Puffed rice along with Tea/roasted rice flour with milk or tea	Tea/biscuit/bread puri with vegetable curry suji, flaked rice pulav, pakora/sweets/maggi noodles	Puffed rice along with tea/roasted rice flour with milk or tea.
Dinner	Rice/dhal vegetables non-vegetarian items occasionally	Chappati/rice dhal/vegetable curry/kichedi/fish curry/pappad pickles/chutney	Rice/dhal with vegetables/chutney

In all the three areas, during breakfast rice and rice products were used. Rural and tribal households sometimes used little bit of dhal along with vegetables to prepare a side dish. Wheat and wheat products were used in breakfast items by the urban households. Vegetable curries, found its place along with rice/wheat in the urban breakfast menus.

As far as lunch was concerned cereals mostly rice along with pulses and vegetables curries were used. Weekly twice non-vegetarian item found its place along with the other items. Pickles, pappads were used by the urban households whereas home made chutneys prepared from local greens with green/red chillies along with little condiments and spices were prepared by the rural and tribal households. Flaked rice, puffed-rice, roasted rice flour with sugar and milk were the common tea items for the rural and tribal households; biscuits, bread, poori with vegetable curry, maggi noodles, sweets, s vouries were the common tea items found in urban households. The same menu trend were identified in the dinner for all the three areas surveyed. Occasionally wheat preparation found inclusion as dinner items in the urban households.

C. Dietary Practices of Vulnerable Groups.

Information on special dietary practices of pregnant women, lactating mothers and infants were gathered and the data is presented in the following pages.

1. Foods Specially Consumed and Avoided During Pregnancy.

The details on the opinion of women on foods specially consumed/avoided during pregnancy is given in Table VI.

TABLE VI
SPECIAL FOODS CONSUMED/AVOIDED BY
PREGNANT WOMEN

Foods	Mothers mentioning (Percentage)			Reasons given
	Rural	Urban	tribal	
Consumed.				
Banana flower	60.0	50.0	60.0	Improves blood quality
Green leafy vegetables	50.0	-	50.0	Improves quality of hair of the baby
Fish	-	75.0	-	Good for foetal growth, strength giving
Milk, ghee	10.0	60.0	3.0	Easy delivery, gives strength, good for baby's complexion
Fruits	-	30.0	-	Good for foetal and mother's health
No special food	20.0	25.0	30.0	Large baby leads to difficult labour, cannot afford
Avoided.				
Papaya, "Khar"*	100.0	100.0	100.0	abortive, hot
Brinjal, cucumber	40.0	-	20.0	Skin lesions on baby's body
Mutton, pork	-	-	40.0	Hairy growth on baby
Egg	20.0	-	30.0	Skin patches on baby's body, defective eye
Pineapple	-	85.0	-	Abortive
Salt	-	20.0	-	Swelling in feet in later part of pregnancy

* "Khar" an alkaline pulse + vegetable preparation, consumed as a side dish for rice.

Irrespective of the area, the pregnant women were of the opinion that milk and ghee will give strength and improve baby's complexion. They were also of opinion that banana flower improves blood quality and it was consumed by all the households in all the three areas. Tribal and rural women opined that green leafy vegetables improve colour and texture of baby's skin. Urban women expressed that fish and fruits are good for foetal growth and maternal health. Twenty per cent rural, 25 per cent tribal and 30 per cent of urban women were of the opinion that no special food is necessary and they were also scared that if any special foods like fruits, tonics, meat, fish etc. are consumed by the pregnant women the foetus will become large and delivery will be difficult.

All the women irrespective of the area expressed that papaya and "Khar" (alkaline preparation normally consumed) be avoided during pregnancy because these food items will cause abortion. Brinjal, egg and cucumber were avoided by tribal and rural women, because they believe that these foods will produce skin problems in the new borns. Apart from the above foods, tribal women also avoided mutton and pork because they were scared that this food items may induce hairy growth on baby's skin. Urban mothers were of the opinion that pineapple may cause abortion and they were not consuming pineapple during pregnancy.

2. Foods Specially Consumed/Avoided During Lactation

The details on the opinion of women on foods specially consumed during lactation is given in Table VII.

TABLE VII
SPECIAL FOODS CONSUMED BY LACTATING WOMEN

Foods specially consumed	Percentage of mothers			Reasons given
	Rural	Urban	Tribal	
Black pepper, garlic	100.0	100.0	100.0	Pain killer, anti- septic, warmth producing, galacta- gogue
Lean fish	50.0	100.0	41.6	Strength giving, re- places the lost blood, wound healing galactagogue.
Indigenous green leafy vegetables	85.0	100.0	91.0	Galactagogue, good for health, improves blood quality, re- places the lost blood
*Jhal	100.0	100.0	100.0	Pain killer, Early healing and contrac- tion of uterus, gala- ctagogue, traditional practice before in - take of regular meal
Parboiled rice	55.0	-	21.6	Strength giving
Sago	50.0	50.0	-	Galactagogue
Jaggery	--	-	25.0	Galactagogue

* Jhal = A typical curry prepared with colocasia (green or black) stem, pigeon meat, black pepper and garlic, and given to mother on third day of postpartum.

Irrespective of the area all women expressed that black pepper and garlic, lean fish, indigenous green leafy vegetables like colocasia leaves and sage will help in milk production and also these foods are helpful as pain killers, as antiseptic helps in wound healing and replaces loss of blood during delivery. "Jhal" - a typical curry prepared with colocasia stem (green or black variety), pigeon meat, black pepper and garlic is normally given to the mothers on the third day of their delivery. This preparation is believed to bring about early and easy contraction of the uterus, removes pain, helps in quicker wound healing. Apart from these beliefs, they give normal family diet to the mothers after delivery. Parboiled rice is the common cereal given in the rural and tribal areas to the lactating women and they feel that it gives strength to the women for successful lactation. In the urban households lentil and papaya are included in the lactating women's diet since they think lentil along with papaya act as a galactagog. In various regions of India, certain traditional foods are customarily fed during lactation. Murthy et al., (1975) reported that special attention is given to diet during lactation than that during pregnancy. Chandrasekar (1990) reported that Kotas (tribe) of Nilgiris included an extract of a green leafy vegetable called "Pulichar~~k~~eerai" during lactation which they believe enhances milk secretion.

Details regarding the foods avoided by lactating mothers is given in Table VIII.

TABLES VIII
FOODS AVOIDED BY LACTATING WOMEN

Foods avoided	Percentage of mothers			Reasons given
	Rural	Urban	Tribal	
Pulses	50	-	66.7	gas producing, have septic effect
Mutton	53.3	-	83.3	difficult to digest harmful for baby
Fatty fish	53.3	50.0	-	difficult to digest not good for baby
Fruits	88.3	66.7	16.6	cold producing
Green leafy Vegetables	-	66.7	-	gas producing difficult to digest
Chillies and hot spieces	-	58.3	-	Causes stomach irritation in baby
Lime	33.3	-	-	Cold and septic producing

Irrespective of the area all the women expressed that pulses, mutton and fatty fish be avoided during lactation as they were difficult to digest, gas producing and not good for the infants. Fruits in general and sour-fruits in particular was avoided by the lactating mothers as they thought these foods are cold producing and have septic effect on mothers. Green leafy vegetables and chillies and spices were avoided by urban mothers during lactation as these foods are believed to induce gas and stomach irritation in the new born.

3. Infant Feeding Practices:

Poor infant feeding practices and their consequences are one of the world's major problems and serious obstacles to social and economic development. Infant feeding practices are still influenced by social and cultural factors. There are regional and ethnic differences in infant feeding practices.

Among the areas of Assam investigated it was noticed that breast feeding was exclusively done in rural and tribal areas surveyed. Prior to breast feeding, as a prelacteal feedd, honey or sweetened water was given to the new born as governed by tradition. While, in urban areas, exclusive breast feeding was done by 60 per cent of the mothers, forty per cent of the urban mothers intriduced spray dried infant milk powders as advised by the maternity homes or due to insufficient secretion.

The age at which the mothers weaned their infants is presented in Table IX.

TABLE IX
AGE AT WEANING

Age in months	Percentage distribution of mothers		
	Rural	Urban	Tribal
0 - 1	25.0	10.0	35.0
1 - 3	75.0	50.0	65.0
3 - 6	-	40.0	-

Thirty five per cent of the tribal, 25 per cent of the rural and 10 per cent of urban mothers weaned their infants within one month. A few tribal mothers weaned their infants as early as five to nine days of delivery while the earliest time for rural mothers to wean their infants was after 18 days of delivery. Reasons given by the mothers for early weaning was that the breast milk was not enough to meet child's hunger. It is also evident that weaning was completed in tribal and rural areas within three months. As far as urban mothers were concerned weaning was completed by three to six months.

It was quite interesting to observe that the mothers were introducing some mashed cereal items of the family diet apart from breast feeding their infants even at an early stage. Hence, the term weaning here implies the starting of solid foods for their infants. Otherwise they normally breast feed their infants as long as possible, some mothers may even feed their babies till 4 years.

Table X gives the infant weaning foods of the area.

TABLE X
INFANT WEANING FOODS OF THE AREA

Common weaning foods	Percentage distribution of mothers		
	rural	urban	Tribal
1. * Bhimkol" with cow's milk and sugar	83.3	36.6	73.3
2. "Bhimkol", Soft rice and sugar	60.0	-	46.7
3. Cow's milk. "pithaguri" ** and sugar	26.7	50.0	18.3
4. Sago, milk and sugar	10.0	16.6	-
5. Soft rice, milk and sugar	-	16.6	-
6. Pulse-rice-vegetable mixed Khicedi (with or without butter)	-	66.7	3.3
7. Commercial baby food	5.0	100.0	-

* Bhimkol - Local name for a seeded local variety of banana commonly used as weaning food

**Pithaguri - Roasted rice flour

Irrespective of area, the common weaning foods were "Bhimkol" (a seeded local variety of banana, *Musa* sp. Plates 8 and 9) with cow's milk and sugar and 'Pithaguri' (roasted rice flour) with cow's milk and sugar. "Bhimkol" with soft cooked rice and sugar was also given to infants as weaning food by rural and tribal mothers. A minor percentage of rural and urban mothers also weaned their infants with "sago" along with milk and sugar. However, 66.7 per cent of urban mothers weaned their infants with Khicedi (Pulse-rice-vegetable mixed preparation) with or without butter. As far as the use of commercial baby food is concerned cent per cent of urban mothers and a minor percentage of (5%) rural mothers weaned their infants with commercial baby foods like Cerelac, Farex etc. whereas none of the tribal mothers used commercial baby foods to wean their infants. All the urban mothers were giving commercial baby foods in between the solid supplements. This may be due to their exposure to attractive advertisements given by the manufacturers of commercial baby foods, whereas tribal mothers were not affected by such advertisements.

Introduction of adult diet to the infants is presented in Table XI.

TABLE XI
AGE OF ADOPTION OF FAMILY DIETS TO
INFANTS

Age of adoption (months)	Percentage of mothers introducing		
	Rural	Urban	Tribal
6 - 12	75	-	80
After teething	15	60	17
12 - 18	10	30	3
18 - 24	-	10	-

Data presented in the table denotes that the usual family diet (made into a softer consistency) was given to infants not earlier than 6 months but not later than 12 months by 80 per cent of tribal, and 75 per cent of the rural mothers. Sixty per cent of the urban mothers introduced family diet to their infants only after teething which may be any where from 8 to 10 months.

Several authors in India have reported that a religious ceremony called "Annaprasana" is celebrated among urban affluent or middle income group of Indians, in many

parts of India. This ceremony is celebrated in Assam in between 7 to 9 months (odd-months) in case of girls and 6 to 8 months (even months) in case of boys, by feeding the baby with rice for the first time. A sweet preparation called "Payash" (sweet dish) made out of rice with milk and sugar is the usual form in which rice is being formally introduced for the first time. Observation of such ceremonies were limited to urban section only.

Information gathered on duration of breast feeding is presented in Table XII.

TABLE XII
DURATION OF BREAST FEEDING

Duration of breast feeding (age in years)	Percentage of mothers		
	Rural	Urban	Tribal
0 - 1	20	70	16
1 - 2	75	30	76
2 - 3	4	-	7
3 - 4	1	-	1

Seventy six per cent and 75 per cent of tribal and rural mothers and 30 per cent of urban mothers respectively continued breast feeding until two years of age. Seventy per cent of the urban mothers usually breast fed their babies till one year, seven per cent and four per cent of tribal and rural mothers respectively breast fed their infants till three years and only one per cent of tribal and rural mothers reported to breast feed till three to four years of age.

D. Consutmpion Pattern of Fats and Oils

1. Frequency of Consumption of Foods Rich in Fats.

Since the main aim of the study was to assess the fat consumption pattern in Assamese dietaries, the major source of food items which supply fat in the dietaries of the selected households were evaluated. Hence, the consumption frequency of certain foods like nuts and oil seeds, fleshy foods, milk and milk products and fats and oils was studied and the results are presented in Table XIII.

It is evident from the table that 38 per cent of the urban high income households consumed nuts and oil seeds daily, whereas cent per cent of the high income rural and tribal households consumed nuts and oil seeds only weekly. The middle income rural, urban and tribal households consumed nuts and oil seeds either weekly or monthly while the low income rural, urban and tribal households consumed it occasionally. The commonly consumed nuts and oil seeds were groundnuts, coconut, sesame and mustard seeds in all the selected households. Sesame was usually consumed by the selected households during harvest festivals and on Assamese New Year's day or "Bihu" celebrations. Mustard seeds were used commonly as a seasoning by all the households, and sparingly as a spice in the form of a ground paste in curries and chutneys. However irrespective of the area, people in general consumed negligible quantities of nuts and oil seeds. This may be attributed to its high cost and as opined by Achaya (1989) while groundnut, sesame and mustard seed are widely used in Indian cooking, only rarely do they figure in significant amounts in daily diets.

Fish, mutton, chicken and egg were the different fleshy foods commonly consumed by the selected families in Assam. Twenty five per cent of the high income urban households consumed it daily. Those who can afford in

2. Consumption of Food Rich in Fat During Special Occasions

Food consumption during special occasions by different categories of people in Assam was studied during the survey period. The special occasions referred to here are festivals of the different population groups like "Bihu", "Id", "Christmas", and ceremonies like "Puberty attainment", "Wedding", "Shradh" etc.

a. Special Foods Consumed During Festivals

Information gathered on special foods consumed during festivals is presented in Table XIV.

TABLE XIV

SPECIAL FOODS DURING FESTIVALS

Festivals	Special food items	% of families	Rural type of oil used	Quantity (g/kg)	% of families oil used	Urban Type of oil used	Quantity (g/kg)	% of families oil used	Tribal Type of oil used	Qty (g/kg)
Bihu	*Toopa pitha	83.3	mustard oil	250-500	83.3	mustard oil	3000	58.3	mustard oil	250
	**Ghila pitha	83.3	- do -	250	62.5	-do-	500	50.0	-do-	200
	Puri	3.3	dalda	100-150	41.6	Dalda	250	-	-	-
	Gobm - laddu	-	-	-	50.0	"	250	-	-	-
	Diamond cuts	-	-	-	66.6	"	150	-	-	-
	Khurma	-	-	-	41.6	"	150	-	-	-
	Cake	2.5	Dalda	100	41.6	"	300	-	-	-
	Sweet potato-jamun	-	-	-	41.6	"	100	-	-	-
	Besan Barfi	-	-	-	33.3	"	200	-	-	-
Id	Pulav	-	-	-	4.2	"	250	-	-	-
	Korma	-	-	-	4.2	"	200	-	-	-
	Halwas	-	-	-	4.2	"	150	-	-	-
	Seyai	-	-	-	4.2	"	100	-	-	-
	Cake	-	-	-	4.2	"	300	-	-	-
Christmas	Cake	-	-	-	1.6	"	200	-	-	-
	Cookies	-	-	-	1.6	"	150	-	-	-

* Toopa pitha = traditional assamese snacks made out of rice flour and jaggery to a pour batter consistency and deep fried in mustard oil.

** Ghilapitha = traditional snacks made out of rice flour and jaggery to a tight dough, given round shape and shallow fried in mustard oil.

"Bihu" is the biggest of all festivals in Assam and is celebrated with traditional gaiety and ardour. Every household irrespective of caste, creed and income status, will be preparing special foods to celebrate the festival. Products namely "Toopa Pitha" and "Ghila Pitha" were common amongst all the households surveyed in rural, urban and tribal areas of Assam. Equal percentage of rural and urban families (83.3 per cent) and 58.3 per cent of tribal families consumed "Pitha". The type of oil used for frying the pitha was mustard oil. The approximate amount used depending upon the amount prepared and economic considerations, ranged from 250 g to 3 Kg. In urban households, different preparations made out of wheat flour, like puri, gom-laddu, diamond cuts, khurma, cake, sweet potato - gulabjamun, besa - Barfi, etc., were prepared. Dalda (vanaspati) was used for the preparation of these items and the amount ranged from 100 to 300 g depending upon the type of item prepared. In urban areas surveyed 4.2 per cent prepared pulav, kurma, halwa, sevai, cake, etc., during "Id" celebrations and the type of fat used was dalda and the amount used ranged from 100 to 300 g. The christian households (1.6 per cent) prepared cake and cookies during "Christmas" and dalda was the choice of fat for preparation and amount used was approximately 150 to 250g.

b. Special Foods During Ceremonies

Table XV gives the special foods consumed during ceremonies.

TABLE XV

SPECIAL FOODS DURING CEREMONIES

Special food items		% of families	Rural type of oil used	Quantity (g/kg)	% of families	Urban type of oil used	Quantity (g/kg)	% of families	Tribal Type of oil used	Quantity (g/kg)
<u>Ceremonies</u>										
Puberty attainment	Mutton curry	83.3	Mustard oil	750	-	-	-	66.6	Mustard oil	500
	Duck curry	83.3	- do -	500	-	-	-	83.3	- do -	350
	Blackgram dhal	62.5	- do -	100	-	-	-	83.3	- do -	100
	Pumpkin curry	79.2	- do -	100	-	-	-	75.0	- do -	100
	Puri	-	-	-	41.6	Dalda 3kg	1000 to	-	-	-
Wedding	Vegetable curry	-	-	-	41.6	Mustard oil	2000	-	-	-
	Sweets	-	-	-	41.6	Dalda	2 kg	-	-	-
	Puri	41.6	Dalda	3 kg	83.3	Dalda	5-15kg	25.0	dalda	1.5kg
	Vegetable curry	41.6	Mustard oil	1000	83.3	Mustard oil	10 g	25.0	Mustard oil	1000
	Tomato/mango chutny	-	-	-	83.3	-do-	2kg	-	-	-
Shradh	Mutton curry	58.3	Mustard oil	1.5kg	83.3	-do-	5-8 kg	58.3	Mustard oil	1 kg
	Fish curry	58.3	- do -	1 kg	83.3	-do-	5-8 kg	50.0	- do -	1 kg
	Pickles	-	-	-	72.9	-do-	3 kg	-	-	-
	Vegetable fry	-	-	-	75.0	-do-	5 kg	-	-	-
	Sweets	66.6	Dalda	5 kg	83.3	Dalda	8-10 kg	25.0	Dalda	3 kg
	Bengal gram dhal	25.0	Mustard oil	1000	83.3	Musated oil	3 kg	25.0	Mustard oil	300
	Puri	-	-	-	83.3	Dalda	8 Kg	-	-	-
	Vegetable curry	-	-	-	83.3	Mustard oil	4 kg	-	-	-
	Bengal gram dhal	-	-	-	58.3	-do-	1 kg	-	-	-
	Sweet	-	-	-	75.0	Dalda	5 kg	-	-	-

1	2	3	4	5	6	7	8	9	10	11
	Blackgram dhal	66.6	Mustard oil	250	-	-	-	50	Mustard oil	250
	Duck curry	50.0	- do -	500	-	-	-	41.6	- do -	450
	Mutton curry	-	-	-	62.5	mustard oil	5kg	-	-	-
	Fish curry	41.6	Mustard oil	400	83.3	"	3-5kg	37.5	- do -	350

The most commonly observed ceremonies in rural and tribal areas were "Puberty attainment" ceremony. During this ceremony a "community feast" was given by the girl's family. Along with rice, the side dishes were mutton/duck curry, black-gram dhal, and pumpkin or any available vegetable curry. Mustard oil was the single oil source used for these preparation and quantity used ranged (approximately) from 100-750g.

In urban households (41.6 per cent) puri, vegetable curry and sweets were the items prepared during puberty attainment ceremonies. The fats and oils used for preparation was mustard oil (for curry) and dalda (for puri and sweets) and the approximate amount used were 2 kg of mustard oil and 3 to 5 kg of dalda respectively.

The special items prepared during wedding ceremonies were puri, vegetable curry, Bengal gram dhal, tomato/mango chutney etc., for evening tea; and rice accompaniments for dinner were, mutton curry, fish curry, vegetable curry, "fish-head" curry (Muri ghanto), fried brinjals, pickles and sweets. These elaborate item for tea or dinner/lunch were mostly common in urban areas. Pickles and vegetable fry were not prepared in rural and tribal areas. For preparation of "Puri" and "Sweets", "Dalda" was used and the quantity used ranged 1.5 kg to 15 kg in rural and urban

areas. For other curries (vegetable/non vegetarian curries), the source of fat used for preparation was mustard oil and the amount used was approximately 500 mg to 1.5 kg in tribal and rural areas and 2 kg to 10 kg in urban areas.

"Shradh" or the death ceremony usually takes place as 10th day 13th day celebrations. On 10th day the special items prepared along with rice and rice products, were puri, vegetable curry, Bengal gram dhal, and sweets. These preparations were common in urban households (88.3 percent) only. The rural and tribal households preferred rice products like flaked rice, soft rice (Komal chawl), puffed rice, roasted rice flour, along with curd, jaggery etc. In urban household the type of fat used were dalda (for puri and sweets) and mustard oil for vegetable curry, dhal etc. The amount of mustard oil used ranged from one kg. to four kg. On the 13th day, "feast" was arranged amongst the near relatives and neighbours by giving lunch with items like black gram or bengal gram dhal, duck or mutton currtty, fish curry occasionally, vegetable curry etc., along with rice. Duck curry and black gram dhal were mostly prepared by rural (50 to 66 percent and tribal (41.6 to 50 percent) households. Fish curry was also a commonly prepared item during this ceremony and was prepared by 83.3 per cent urban followed by 41.6 per cent rural and 37.5 per cent of tribal

households. Mutton curry was prepared by 62.5 per cent of the urban households. The choice of oil was mustard oil and the amount used for various preparations ranged from 250 g to 5 kg.

3. Mode of Use of Fats and Oils in Daily Food Preparations

Smearing, seasoning, adding, shallow fat frying and deep fat frying were the different modes of using fats and oils in the selected households of rural, urban and tribal areas and the practices are tabulated in Table XVI.

preparation) along with ghee or butter was a delicacy for the high and middle income group urban households. Boiled and mashed potato with mustard oil (few drops to 2 tea spoon fulls) as a side dish along with rice at breakfast, lunch or dinner was consumed customarily throughout Assam. Though comparatively less number of the low income group rural, urban and tribal households consumed it, still it was in use everywhere. "Khar" (an alkaline vegetable and pulse preparation) was invariably consumed by adding raw mustard oil to it. It was usually prepared as a side dish along with rice during lunch. The results obtained in the present study regarding the use of ghee and butter among the middle and high income households is on par with the information available in the literature. In the present study only among urban middle and high income group consumption of ghee and butter was observed. Studies conducted by National Nutrition Monitoring Bureau (1988) in various parts of India and studies of Achaya (1978) (1989), have revealed that use of ghee and butter fat was income dependent. It was also observed by Achaya (1989) that in Gujarat and Rajasthan ghee and butter was consumed daily by the high income households, compared to other parts of the country.

The commonly consumed shallow fat fried food items were Paratha, Omlet, Cutlet, "Panipitha", etc. Paratha,

Omlet and Cutlet were commonly consumed by high income and middle income urban households, may be due to urbanisation and choice of fatty fried foods were varied and increasing in quantities in urban areas. "Pani Pitha" (pan cake) is a typical Assamese snacks out of rice flour commonly consumed by the rural households. In the present study 75 per cent of the rural and urban; and 50 per cent of the tribal low income households consumed pani pitha. Very less amount (1 to 2 tea spoonfull) of oil is required for this preparation. Therefore that may be the cause of its popular use by all the low income households. Omlet was prepared by 100 per cent of the rural and 50 per cent of the tribal high income families followed by 66.7 per cent of rural and 50 per cent tribal middle income households.

Puri, 'Pitha', pakoda, 'Bor' etc., were the deep fat fried items usually prepared and consumed by the selected households. The deep fat fried foods consumption was found to be income dependent and was more in urban areas than tribal and rural areas except for pitha and "Bor" (Vadas).

4. Reasons for Using Different Fats and Oils in the Diet

Information gathered on reasons for using different fats and oils in the diet by the representative households is presented in Table XVII.

TABLE XVII
REASONS FOR USING DIFFERENT FATS AND OILS

Fats and oils used	Rural						Urban						Tribal					
	LIG	AV	FP	NAS	AV	FP	LIG	MIG	HIG	NAS	AV	FP	LIG	MIG	HIG	NAS	AV	FP
Mustard oil	50	25	25	100	-	-	100	-	-	100	-	-	50	50	-	83	17	-
Dalda	-	-	-	33	50	-	17	17	-	40	40	10	100	-	-	17	25	-
Refined oil	-	-	-	-	-	-	-	-	-	10	10	10	13	13	13	-	-	-
Butter	-	-	-	50	50	-	-	-	-	30	30	-	88	13	-	-	17	33
Ghee	-	-	-	17	50	33	50	25	25	8	-	8	10	20	20	38	38	25

NAS	=	Necessity	LIG	=	Low Income Group
AV	=	Availability	MIG	=	Middle Income Group
FP	=	Family practice	HIG	=	High Income Group

All the rural (100%) and urban high and middle income and tribal high income households respectively opined that mustard oil is used because it is a necessity for them. Dalda was used mainly by the urban households and cent percent of the urban high income households opined that the use of dalda in their diet is a necessity, while 40 per cent of urban middle income families expressed that use of dalda is dependent upon market availability, Fifty per cent of the rural and tribal high income households opined that use of dalda is a necessity. Use of dalda in the diet was expressed as status symbol by 25 percent of rural and 13 per cent of tribal high income families followed by 10 per cent of the urban middle income households. Refined oil was another choice of oil exclusively used by the urban households. Ten per cent of urban middle income households and 13 per cent of the high income households used refined oil for necessity, availability and family practice. The use of butter and ghee was not found in tribal, rural and urban low income families. Eighty per cent urban 75 per cent rural and 50 per cent tribal high income households used butter as they were used to take butter with the rice.

While the rural, urban and tribal middle income families opined that whenever they felt the need for butter they were using it. Reasons listed by rural, urban

and tribal households who can afford ghee in their diet, were necessity, availability and family practices. On the whole it was revealed that use of particular fats and oil source in the diet was due to necessity and to certain extent fats like ghee and butter were used because of family practice and or availability.

5. Modification in Fat intake During Specific Disease Condition

When the investigator was collecting information on the type and quantity of fats and oils used in the various preparation it was also observed that under specific disease conditions diets have been modified for its consistency and nutrients especially fats and oils have been restricted in almost all diets given under various disease conditions. Table XVIII gives the details regarding the dietary fat modifications during specific disease conditions.

TABLE XVIII
MODIFICATION OF FAT INTAKE DURING SPECIFIC
DISEASE CONDITION

Conditions	Rural	Urban	Tribal	Modifications	Recommended by	
					Self	Doctor
Cardiovascular diseases	4	19	-	Fat and Salt restricted	-	Doctor
Hypertension	8	25	3	Fats like, vanaspati, butter, ghee and fleshy foods restricted		Doctor
Diabetes	4	25	-	Sugar, potato, cereals (like rice) and fats restricted	-	Doctor
Kidney disease	4	13	2	Hot foods avoided, fleshy foods restricted, salt restricted	-	Doctor
Liver ailments	8	24	13	Fried foods and fat restricted	-	Doctor
Peptic and gastric ulcers	17	33	4	Hot, spicy, fried food, tea restricted	Self	Doctor
Diarrhoea	33	8	25	Fat fried foods avoided; soft rice, dal water, lemon, salt and green plantain given	Self	
Dysentery	20	4	23	Hot, fried, spicy and fleshy foods restricted	Self	
Constipation	4	13	6	Boiled or ripe papaya given	Self	
Cough and cold	25	29	38	Hot spicy foods, pigeon meat, ginger-tea, chapati given	Self	
Chickenpox Measles	13	7	11	Fleshy foods restricted, fried foods avoided, normal diet given	Self	
Mumps	17	15	8	Rice flour with milk and sugar given, fleshy foods avoided	Self	
Whooping Cough	29	4	25	Rice banana, ladies-finger, black-gram dhal, duck's egg restricted	Self	
Diphtheria	3	-	4	Normal diet	-	Doctor

Different diseases reported in the families off the survey area were cardiovascular disease, hypertension, diarrhoea, dysentery constipation, cough and cols, kidney disease, chichkenpox and measles, mumps, whooping cough, dyptheria etc. Among the urban households surveyed 33 percent of the households reported that during peptic and gastic ulcer, tea and hot spicy foos were avoided and they followed such reestrictions as advised by the doctors. Twenty five per cent of the urban households reported the presence of hypertension and diabetes among the family members and they modified the diet regarding specific nutrients like, fats, cerealls etc., as advised by the physician. Diabetes was not reporrted by the tribal families and 4 per cent of the rural families suffered from it. As far as the rural and tribal households are concerned, diarrhoea episode, dysentery, common coughs and colds and whooping coughs were reported commonly. Thirty three per cent of rural and 25 per cent of tribal households opined that during diarrhoeal episodes family diet was modified by themselves, by giving soft cooked rice, dhalwater, lemon, salt and boiled mashed green banana etc. In the case of dysentery hot fried foods, fleshy food and spicy items were restricted. The common self remedial measures during coughs and colds undertaken by rural, urban, and tribal households were hot spice foods, pigeon meat and goat

meat with chapati, ginger tea etc. Fleshy foods and fried foods were avoided by the households during chickenpox, measles and mumps and normal diet was given to the patient. As customary of Assamese community during mumps patients were given raw rice flour mixed with milk and sugar to eat and also apply upon the affected area. During whooping cough patients were forbidden to take ripe banana, ladies finger, blackgram dhal, ducks, egg etc. and during diphtheria, normal diet is provided. These observations clearly bring out the fact that Assamese community in general were aware of the need to restrict fat and foods rich in fat during specific disease conditions like cardiovascular disease, hypertension, diabetes, diarrhoea etc. and this seems to be an age old practice in most of the areas.

b. Opinion Regarding the Adequacy of Fats and Oils in the Diets

Information gathered on opinion regarding adequacy of oils and fats in the diet is presented in the Table XIX.

TABLE XIX
OPINION REGARDING THE ADEQUACY OF OILS AND FATS
IN THE DIET

Reasons	Rural			Urban			Tribal		
	LIG	MIG	HIG	LIG	MIG	HIG	LIG	MIG	HIG
Adequate	20	67	88	17	60	94	-	67	88
Inadequate	80	33	13	83	40	6	100	33	13
<u>Reasons for adequacy :</u>									
Better Purchasing power	-	25	50	-	30	63	-	22	50
No taste without oils and fats	20	33	38	12	25	25	-	33	25
Availability	-	8	5	5	6	6	-	12	13
<u>Reasons for inadequacy,</u>									
Poor purchasing power	80	33	13	83	40	6	100	33	13

LIG = Low income group
MIG = Middle income group
HIG = High income group

It is evident from the table that 93 per cent of high income urban followed by 88 per cent of rural and tribal households viewed that the oils and fats consumed by them was adequate. Sixty seven per cent of rural and tribal households and 60 per cent of urban middle income households expressed that fats and oils consumption was adequate. Inadequacy of oils and fats consumption in the daily diet was expressed by cent per cent tribal, 83 per cent urban and 80 per cent of rural low income households. The reasons given for adequate consumption oils and fats by the surveyed households were better purchasing power, no taste without oils and fats in the diet, and availability. Data presented in the table reflects that 63 per cent urban, 50 per cent rural and 50 per cent tribal high income households had better purchasing power which enabled them to have adequate oils and fats in this opinion, while 38 per cent rural, 25 per cent urban and tribal high income households expressed that oils and fats in the diet provides taste. Availability of fats and oils was also one of the reasons given by 13 per cent of tribal high income 8 per cent rural middle income and 6 per cent of urban high income households for adequacy of oils and fats in their diet. As far as inadequacy of oils and fats in the diet is concerned, cent per cent tribal, 83 per cent urban and 80 per cent rural low income groups expressed poor purchasing power as the reason.

E. Opinion Regarding Consumption of Foods Rich in Fats and Oils.

Opinion of families regarding the consumption of fats and oils as such and foods like deep fat fried foods, shallow fat fried foods, nuts and oil seeds, milk and milk products and fleshy foods which are rich sources of fat were gathered in order to assess their views regarding their use. The most common expressions were with regard to palatability of the diets and that of health aspects. Hence the information obtained with regard to this aspect of the study were consolidated as opinion of usage of foods rich in fat for palatability reasons and opinion of usage of foods rich in fat for health reasons and their responses are presented and discussed in this section.

1. Opinion Regarding Usage of Foods Rich in Fat for Palatability Reasons

a. Consumption of Fats and Oils

The details regarding the opinion of families on of various oils and fats for palatability reasons is presented in Table XX.

TABLE XX

RESPONSE REGARDING CONSUMPTION OF FATS AND OILS FOR PALATABILITY

	Rural (%)			Urban (%)			Tribal (%)		
	LIG	MIG	HIG	LIG	MIG	HIG	LIG	MIG	HIG
Mustard Oil	100	100	100	100	100	100	100	100	100
Refined Oil	-	-	-	-	22	38	-	-	-
Dalda	-	50	63	-	85	100	-	17	50
Ghee	-	42	50	-	10	31	-	25	63
Butter	-	17	37	-	45	50	-	17	63

LIG = Low Income Group

MIG = Middle Income Group

HIG = High Income Group

It is evident from the Table that cent per cent of the rural, urban and tribal households, irrespective of their income opined that inclusion of mustard oil in their diet is a must to enhance the palatability. Refined oil was used only by the urban households and 22 per cent and 38 per cent of the urban middle income and high income groups respectively opined that inclusion of refined oil is desirable to improve palatability. Cent per cent of urban high income and 85 per cent of middle income households and over 50 per cent of middle and high income groups in all the three areas were of the opinion that use of dalda enhanced palatability of the food. Low income groups in all the three areas had no opinion. As for ghee and butter as fat in diet, 10 to 63 per cent of middle and high income groups were of the opinion that these fats enhance palatability and can be included occasionally in the diets.

b. Consumption of Food Rich in Fat

Information gathered on opinion regarding consumption of foods rich in fat like deep fat fried foods, shallow fat fried foods, nuts and oil seed, milk and milk products and fleshy foods because of their ability to enhance the palatability of diet or add variety to the diet were

tabulated as whole and the range in the percentage of families mentioning the same is given in Table XXI.

TABLE XXI

RESPONSE REGARDING CONSUMPTION OF FOODS RICH IN FAT FOR PALATABILITY

	Rural			Urban			Tribal		
	LIG	MIG	HIG	LIG	MIG	HIG	LIG	MIG	HIG
Deep fat fried foods	30 to 100	33 to 100	100	50 to 83	30 to 70	13 to 88	25 to 75	25 to 75	25 to 75
Shallow fat fried foods	50	33 to 67	25 to 100	25 to 75	20 to 60	13 to 94	50 to 67	50 to 67	25 to 75
Nuts and Oil seeds	25 to 100	25 to 75	25 to 75	25 to 75	15 to 80	38 to 63	75 to 100	8 to 67	25 to 75
Milk and curd	50 to 100	33 to 100	50 to 100	25 to 75	5 to 96	38 to 100	25 to 100	50 to 100	12 to 88
Cheese/panner cream	-	-	-	-	25 to 75	25 to 75	-	-	-
Fleshy foods	25 to 100	15 to 83	25 to 75	17 to 83	15 to 75	13 to 100	50 to 100	25 to 75	25 to 100

LIG = Low Income Group

MIG = Middle Income Group

HIG = High Income Group

While 33 to 100 per cent of rural and 13 to 88 per cent of urban families irrespective of income expressed usage of deep fat fried foods to enhance palatability and add variety; 25-75 per cent of tribal families irrespective of income had the same opinion. It may be mentioned here that "Puri", "Pakoda", "Pitha" and "Bor" were the most common deep fat fried items consumed in all the areas and while Puri was a favorite in urban area irrespective of income, in rural and tribal area consumption of these items though was agreed by them to enhance palatability could not always be consumed for economic and other reasons.

Similar observations were made for shallow fat fried foods as well. "Panipitha" was the favorite traditional item prepared by all but income limited its frequency. Other items like Paratha, Omlet and Cutlets though a favourite of urban area were seldom used in rural and tribal areas.

Again, as for nuts and oilseeds though most of them agreed it enhanced palatability, its usage was limited due to economic reasons. Groundnuts, coconuts, cashewnut, sesame and poppy seeds were the common nuts and oilseeds used and the usage was more common among the urban high income groups.

As for milk and its products, milk and curds were commonly used by 25-100 per cent of the families in rural and urban areas and 12 to 88 per cent in tribal areas irrespective of income whereas other foods like cheese, paneer and cream was used only by the middle and high income urban groups. Again if we look about the opinion on fleshy foods though a wide range of people (13-100%) in all areas and groups agreed that it added to palatability, opinion regarding the variety of meat, fish, pork, egg, etc. according to region and usage varied much more so with income. It is evident that though population of all the areas and income groups in general did not differ in their opinion regarding palatability of foods rich in fat, their usage was not wide especially in tribal area and low income rural and urban areas.

2. Opinion Regarding Consumption of Foods Rich in Fat for Health Reasons..

a. Consumption of Oils and Fats.

The details regarding the opinion on consumption of various oils and fats with regard to their effect on health is presented in Table XXII.

TABLE XXII

OPINION REGARDING CONSUMPTION OF FATS AND OILS FOR HEALTH REASONS

Oils and Fats	Rural						Urban						Tribal				Reasons given		
	LIG		MIG		HIG		LIG		MIG		HIG		LIG		MIG			HIG	
	H	NH	H	NH	H	NH	H	NH	H	NH	H	NH	H	NH	H	NH		H	NH
Mustard Oil	-	100	-	100	-	100	-	100	6	94	-	100	-	100	-	100	-	100	Harmful for heart and stomach
Refined Oil	-	-	-	-	-	-	-	-	65	94	-	-	-	-	-	-	-	-	
Dalda	-	-	-	100	13	63	-	100	30	60	25	75	-	-	-	83	-	100	Causes gastric trouble and harmful for heart ailments
Ghee	-	-	-	67	-	100	-	10	80	13	88	-	-	-	95	-	100	Harmful for health, high consumption leads to high pressure	
Butter	-	-	-	83	-	100	-	100	25	75	13	88	-	-	-	100	-	100	Leads to high body fat and heart trouble

LIG = Low Income Group
 MIG = Middle Income Group
 HIG = High Income Group
 H = Harmful to health
 NH = Not harmful to health

It is evident from the table that cent per cent of rural, tribal and 94 per cent of urban households opined that consumption of mustard oil is not harmful for health. Only six per cent of the urban high income household opined that mustard oil is harmful for heart and stomach. Refined oil was not in use in rural and tribal areas. Ninety eight per cent and 75 per cent of high and middle income group urban households respectively opined that refined oil consumption is not harmful for health. Cent per cent of middle income and 63 per cent high income families from rural areas viewed that dalda consumption was not harmful to health. Cent per cent of urban low income, 75 per cent high income and 60 per cent of middle income households opined that dalda consumption is not harmful to health. The tribal households belonging to middle income and high income group, 83 per cent and cent per cent respectively opined that, dalda is not harmful to health. Thirteen per cent of rural high income, 30 per cent of urban middle groups expressed that consumption of dalda regularly may lead to gastric upset and is also harmful for heart. Cent per cent of tribal and rural families belonging to high income bracket and cent per cent of urban low income group families were of the opinion that consumption of ghee is not harmful for health. Ten per cent and 13 per cent of urban middle income and high income group households opined that consumption of ghee in high amounts

may lead to heart ailments. As far as butter consumption is concerned, it was revealed that, cent per cent of households from rural and tribal high income and cent per cent of tribal middle income, urban low income categories opined that butter consumption is not harmful to health, while, 15 per cent and 13 per cent of middle and high income group households from urban areas expressed their view that butter consumption leads to increase in body weight and cause heart troubles. In general it was observed that the urban middle and high income group families were more concerned about the consumption of various sources of fats and oils and their health implications.

b. Consumption of Foods Rich in Fat.

Information gathered on opinion regarding consumption of foods rich in fat and its effect on health is presented in Table XXIII.

TABLE XXIII
RESPONSE REGARDING CONSUMPTION OF FOODS RICH IN FAT FOR HEALTH REASONS

	Rural						Urban						Tribal					
	LIG		MIG		HIG		LIG		MIG		HIG		LIG		MIG		HIG	
	H	NH	H	NH	H	NH	H	NH	H	NH	H	NH	H	NH	H	NH	H	NH
Deep Fat	-	100	-	100	-	100	-	83 to 100	5	95 to 100	20 to 25	75 to 100	-	50 to 100	-	100	25	75 to 100
Fried Foods	-	100	-	100	-	100	-	100	-	100	-	100	-	100	-	100	-	100
Shallow fat	-	100	-	100	-	100	-	100	-	100	20	80 to 100	-	100	-	100	-	100
Fried Foods	-	100	-	100	-	100	-	100	-	100	-	100	-	100	-	100	-	100
Nuts and Oil	75 to 100	75 to 100	-	75 to 100	-	100	-	75 to 100	-	75 to 100	5 to 10	90 to 100	-	100	-	75 to 100	-	63 to 100
Seeds	-	100	-	100	-	100	-	100	-	100	-	100	-	100	-	100	-	100
Milk and curds	-	100	-	100	-	100	-	100	-	100	-	100	-	100	-	100	-	100
Cheese/Paneer	-	-	-	-	-	-	-	-	-	100	-	100	-	-	-	-	-	-
Cream	-	-	-	-	-	-	-	-	-	100	13	87	-	-	-	-	-	-
Fleshy foods	-	100	-	83 to 100	-	100	8	92 to 100	5 to 10	95 to 100	5 to 10	90 to 100	-	100	-	100	-	100

LIG = Low Income Group
 MIG = Middle Income Group
 HIG = High Income Group
 H = Harmful to health
 NH = Not harmful to health

It is evident from the table that cent per cent of the rural households, irrespective of their income status opined that consumption of deep fat fried items like puri, pakoda, pitha, "bor" etc. were not harmful for health. As far as urban households were concerned it was observed that 83 to cent per cent of low income households, 95 to 100 per cent of middle income households and 75 to 100 per cent of the high income groups were of the opinion that consumption of deep fat fried food does not have any harmful effect on health. However, 5 to 25 per cent of the urban middle income and high income groups expressed that deep fat fried foods can cause gastric and heart trouble when consumed regularly. Among the tribals while majority (50-100%) in all income brackets did not consider deep fat fried foods as harmful to health, 25 per cent of the high income group considered it to be harmful.

As for shallow fat fried items, except for 20 per cent of the high income group urban all were of the opinion that it is not harmful to health. Similarly except for 5 to 10 per cent of the high income urban group majority (75 to 100%) of all other groups did not consider nuts and oil seeds as harmful to health. Milk and curds were not considered harmful by any group. While opinion on cheese paneer and cream was given only by the middle and high income urban groups, it is notable that only 13 per cent of the urban high income group considered cream alone to be harmful by causing

heart diseases and also leading to blood pressure. As for the consumption of fleshy foods none of the rural and tribal groups considered it to be harmful while 8 and 5 to 10 per cent of the low income and middle and high income urban groups believed that some fleshy foods like duck meat, pork and regular consumption of eggs to be harmful as they are rich in fat and can lead to blood pressure, heart attacks etc. and regular consumption of egg may lead to increase in cholesterol levels.

From the foregoing discussion on opinion it is conceivable that rural and tribal people are not much aware of the harmful effect of fat consumption while the urban population especially the educated ones are somewhat aware of the harmful effects of excess fats and oils and foods rich in saturated fats like fleshy foods (pork etc.) and eggs.

F. Nutrient Intake Pattern of the Selected Families.

Nutrient intake of different age groups of the selected households was computed from their daily food consumption data studied using a three day food weighment method. Food intake for the different age groups were then compared with the Recommended Dietary allowances (RDA) of ICMR and the results are presented in the following pages.

1. Mean Nutrient Intake of 1 to 3 year Old Children.

To assess the nutrient intake of the different age groups, three day weighment method was selected. Ninety six (i.e. $1/5$ of the total households surveyed) were selected for weighment survey. From the 96 households, 15 each (rural, urban and tribal) 1 to 3 year old children who were completely weaned were selected for weighment survey. The mean nutrient intake of these children from the selected areas of Assam are presented in Table XXIV.

TABLE XXIV
MEAN NUTRIENT INTAKE OF 1-3 YEAR OLD CHILDREN

Nutrient	Low Income Group						Middle Income Group						High Income Group						*RDA
	Rural		Urban		Tribal		Rural		Urban		Tribal		Rural		Urban		Tribal		
	Mean	%Excess or deficit	Mean	% Excess or deficit	Mean	% Excess or deficit	Mean	% Excess or deficit	Mean	% Excess or deficit	Mean	% Excess or deficit	Mean	% Excess or deficit	Mean	% Excess or deficit	Mean	% Excess or deficit	
Energy (Kcal)	950.06	-23.38	975.35	-21.34	800.05	-35.47	1120.08	-9.67	1175.25	-5.22	1001.35	-19.24	1208.75	-2.52	1218.80	-1.70	1165.86	-5.97	1240
Protein (g)	19.75	-10.22	19.90	-9.54	19.00	-13.63	21.82	-0.81	21.98	-0.09	20.86	-5.18	22.78	+3.54	23.05	+4.77	22.15	-0.68	22
Fat (g)	9.66	-61.36	10.35	-58.6	8.00	-68.0	17.64	-29.44	19.17	-23.32	10.20	-59.20	25.19	+0.76	27.85	+11.4	15.65	-37.4	25
Calcium (mg)	208.07	-47.98	288.59	-27.85	200.36	-49.91	302.50	-24.37	337.44	-15.64	300.22	-24.94	405.39	+1.34	428.40	+7.1	330.71	-17.32	400
Iron (mg)	6.00	-50.0	6.73	-43.9	6.20	-48.33	8.75	-27.08	9.08	-24.33	8.92	-25.66	10.45	-12.91	10.85	-9.58	10.50	-12.50	12
Beta Carotene (mcg)	420.07	-73.74	903.57	-43.52	407.54	-74.52	756.09	52.74	1128.50	-29.46	708.35	-55.72	1307.58	-18.27	1608.91	+0.55	1200.57	-24.96	1200
Thiamine (mg)	0.40	-33.33	0.43	-28.33	0.41	-31.66	0.51	15.0	0.52	13.33	0.51	15.0	0.56	-6.66	0.61	+1.66	0.57	-5.0	0.6
Riboflavin (mg)	0.45	-35.71	0.46	-34.28	0.43	-38.57	0.54	-22.85	0.58	-17.4	0.53	-24.28	0.6	-5.71	0.70	±0	0.62	-11.42	0.7
Niacin (mg)	6.02	-24.75	6.49	-18.87	6.15	-23.12	7.28	-9.0	7.55	-5.62	7.04	-12.0	7.83	-2.12	8.10	+1.25	7.47	-6.62	8.0
Ascorbic acid (mg)	40.80	+2.0	44.07	+10.17	40.56	+1.40	42.33	+5.82	46.57	+16.42	43.40	+8.5	50.21	+25.52	52.70	+31.75	52.00	+30.0	40

* RDA = Recommended Dietary Allowances, ICMR (1989)

Irrespective of area and income, on an average the consumption of energy was deficit for this age group when compared with RDA. The deficit ranged from 1.7 per cent for the urban high income group to 35.47 per cent for the low income tribal group. Thus there was a vast deficit as far as the energy consumption was concerned. As far as the protein intake was concerned it was found to be deficient among low and middle income group children belonging to rural, urban and tribal areas, while the children belonging to high income categories irrespective of area, recorded excess intake of protein in their daily diet. Percentage excess intake of protein over RDA by high income group children were 3.54 per cent 4.71 per cent and 0.68 per cent respectively in rural, urban and tribal. Fat intake by the 1 to 3 year old children in the rural, urban and tribal areas belonging to low and middle income groups were found to be deficient as compared to RDA. Figure 4 depicts the percentage adequacy of fat intake by this age group. Children belonging to high income groups from rural and urban areas had excess intake of fat over RDA. A deficit of 37.4 per cent was observed among tribal high income group.

As far as calcium intake was concerned the 1 to 3 year old children irrespective of area from low and middle income groups registered a deficit intake. When compared

PERCENTAGE ADEQUACY OF FAT INTAKE OF 1-3 YEAR OLD CHILDREN

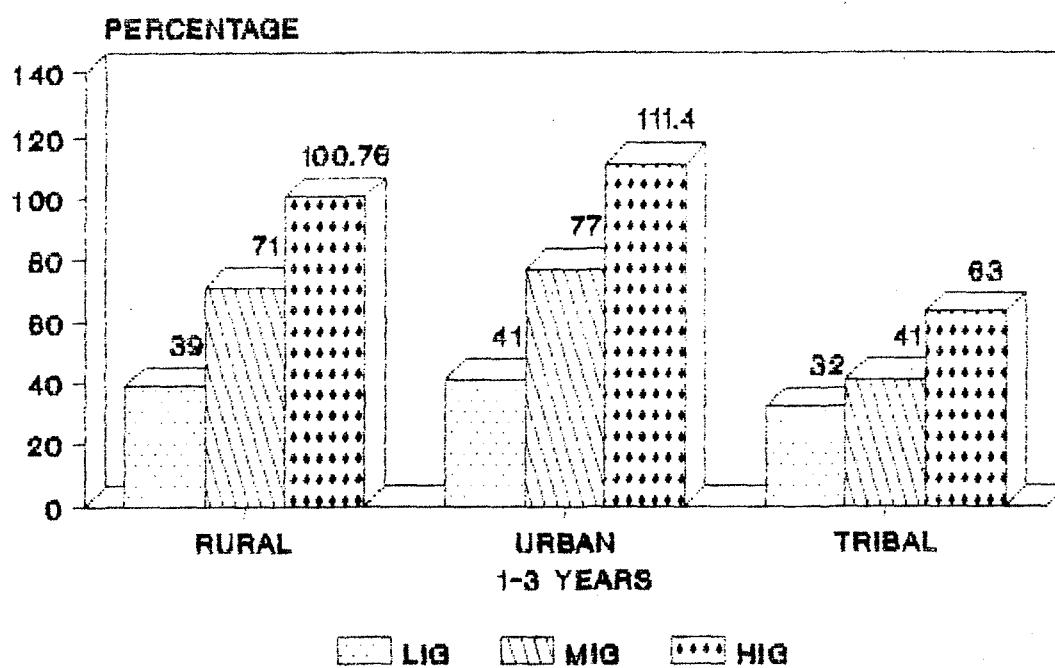


FIG. 4

with RDA percentage excess intake of calcium over RDA was recorded among high income group rural and urban children, which was 1.34 per cent and 7.1 per cent respectively. A deficit of 17.52 per cent intake of calcium was observed among tribal high income group. This corroborates with the information available in the literature. Investigations from different parts of India by Ali (1982) and Gupta et al,. (1980) have reported deficient intake of micro nutrients namely calcium among the tribal pre-school children from Orissa and Maharashtra. Another striking feature of the average nutrient intake among 1 to 3 year old was the gross deficit intake of iron in the diet. Irrespective of area and income categories the 1 to 3 year old could not fulfil their suggested requirements of iron as compared to RDA.

As far as the beta carotene intake, gross deficit was observed irrespective of area and income except urban high income group children. An excess of 0.55 percentage was observed among urban high income group children. The same trend was observed for the thiamine and riboflavin intakes. In the urban high income group an excess intake of 1.66 per cent was recorded for thiamine intake and RDA coincided for riboflavin intake. Niacin intake of all groups was deficient except for the urban high income group

children for whom 1.25 per cent excess intake was recorded over RDA. Ascorbic acid intake was surprisingly surplus over RDA as far as 1 to 3 year old children belonging to different areas and income groups were concerned.

The overall picture of nutrient intake for 1 to 3 year old children reveals that irrespective of the income and area deficient intake of energy, protein, fat, beta carotene, calcium and iron was observed. A small percentage of excess intake with regard to protein and fat was observed among the rural high income groups. Excess protein, fat, calcium, thiamine and niacin intakes was observed among urban high income groups. Ascorbic acid intake was more than the RDA for all the children irrespective of area and income.

2. Mean Nutrient Intake of 4 to 6 Year Old Children.

The mean nutrient intake of the 4 to 6 year old children in the selected areas of Assam are presented in Table XXV.

TABLE XXV
MEAN NUTRIENT INTAKE OF 4-6 YEAR OLD CHILDREN

Nutrient	Low Income Group						Middle Income Group						Higr Income Group						* RDA
	Rural		Urban		Tribal		Rural		Urban		Tribal		Rural		Urban		Tribal		
	Mean	% Excess or Deficit	Mean	% Excess or Deficit	Mean	% Excess or Deficit	Mean	% Excess or Deficit	Mean	% Excess or Deficit	Mean	% Excess or Deficit	Mean	% Excess or Deficit	Mean	% Excess or Deficit	Mean	% Excess or Deficit	
Energy (Kcal)	1048.35	-37.56	1111.47	-34.23	817.05	-51.65	1555.86	-7.93	1601.87	-5.21	1047.29	-38.03	1650.0	-2.36	1680.8	-0.54	1402.9	-16.98	1690
Protein (g)	22.77	-24.1	22.41	-25.3	19.46	-35.13	30.89	+2.96	28.06	-6.46	29.58	-1.4	33.95	+13.15	35.27	+17.56	30.76	+2.53	30
Fat (g)	10.2	-59.2	11.02	-55.92	8.5	-66.0	20.06	-19.76	21.44	-14.24	10.46	-58.16	31.58	+26.32	34.37	+37.48	21.37	-14.52	25
Calcium (mg)	295.77	-26.05	309.6	-22.6	230.87	-42.28	434.54	+8.63	458.13	+14.53	302.83	-24.29	466.8	+16.7	474.4	+18.6	354.75	-11.31	400
Iron (mg)	6.75	-62.5	7.62	-57.6	8.30	-53.8	9.70	-46.1	10.72	-40.4	10.28	-42.8	10.36	-42.4	11.15	-38.05	10.83	-39.8	18
Beta Carotena (mcg)	426.73	-73.3	1219.92	-23.7	384.29	-75.91	682.81	-57.32	1375.71	-14.01	667.66	-58.27	1408.05	-11.99	2430.02	+51.87	1670.1	-33.11	1600
Thiamine (mg)	0.47	-47.7	0.49	-45.5	0.48	-46.6	0.74	-17.7	0.68	-24.4	0.51	-43.3	0.69	-23.3	1.27	+41.1	0.61	-32.2	0.9
Riboflavin (mg)	0.36	-54.0	0.51	-49.0	0.32	-68.0	0.67	-33.0	0.54	-46.0	0.63	-37.0	1.04	+4.0	1.16	+16.0	0.71	-29.0	1.0
Niacin (mg)	6.59	-40.09	7.89	-26.27	8.08	-26.54	9.89	-10.09	10.7	-2.72	9.07	-17.54	10.57	-3.90	11.37	+3.36	10.36	-5.81	11
Ascorbic acid (mg)	57.19	42.97	40.06	+0.15	46.67	+16.67	53.87	+34.67	39.26	-1.85	41.10	+2.75	54.75	+36.87	53.06	+32.65	55.0	+40.0	40

*RDA = Recommended Dietary Allowances, ICMR (1989)

Irrespective of the area and income, on an average, the consumption of energy, were deficient for 4 to 6 year old children when compared with RDA. The deficit ranged from 0.54 per cent for the urban high income group to 51.65 per cent for the low income tribal group. Thus there was a vast range in deficit as far as the energy consumption was concerned. Protein consumption was found to be excess over RDA amongst middle income rural, and high income rural, urban and tribal children, the excess percentage being 2.96 per cent for middle income rural, 13.16 for rural, 17.56 for urban and 2.53 for tribal high income group children respectively. The low income group children irrespective of area, consumed less amount of protein as compared to RDA. The intake of fat revealed that only the high income group rural and urban children consumed excesss over RDA, the percentage excess over RDA was 26.3 per cent and 37.4 per cent for rural and urban children respectively. The highest percentage of deficit in fat consumption was registered by tribal low income children (66.0 per cent). Percentage adequacy of fat of this age group is depicted in Figure 5.

Deficient intake of calcium was found amongst the low income group rural, urban and tribal children. While the middle and high income groups of rural and urban children consumed 8.63 per cent, 14.53 per cent, and 16.7 per cent, and 18.6 per cent excess calcium over RDA,

respectively. The tribal children from middle and high income group however had deficient intake of calcium as compared to RDA. Iron intake was found to be deficient in all the children surveyed irrespective of area and income groups. The percentage of deficient intake of iron was less in urban high income children and high in rural low income children; the deficit ranging from 38.05 per cent to 62.5 per cent.

The urban high income children had excess amount of beta carotene in their diet, while the low and middle income group rural, urban and tribal children had deficient intake of beta carotene as such in their daily diet. Highest deficiency was found amongst low income tribal and rural children. Intake of water soluble vitamin namely thiamine, riboflavin and niacin, was deficient among the low and middle income group children irrespective of area, while the high income group urban children had an intake of 41.1 per cent excess over RDA for thiamine. Similarly the high income rural and urban children had 4 per cent and 16 per cent riboflavin excess over RDA. An excess over RDA for niacin was consumed by high income children, the percentage being 3.36.

As far as the ascorbic acid intake was concerned it was revealed that almost all the children of the selected households, irrespective of income categories, had excess amount of ascorbic acid in their diet. Except the urban middle income children, who registered a meagre 1.85 percent deficient intake of ascorbic acid as compared to RDA. This excess of ascorbic acid intake may be due to the consumption of citrus fruits like amla, lime, lemon, and certain local varieties of citrus fruits.

Thus, the diets of 4 to 6 year old children irrespective of area and income was deficient in energy, and iron. For some nutrients like protein, fat, calcium, beta carotene, thiamine, riboflavin and niacin, urban high income group children recorded excess intake, whereas these were also deficient in the diets of other groups.

3. Nutrient Intake of 7 to 9 Year Old Children.

Nutrient intake of 7 to 9 year old children belonging to different income levels and areas as studied is presented in Table - XXVI.

TABLE XXVI
MEAN NUTRIENT INTAKE OF 7-9 YEAR OLD CHILDREN

Nutrient	Low Income Group						Middle Income Group						High Income Group						* RDA
	Rural		Urban		Tribal		Rural		Urban		Tribal		Rural		Urban		Tribal		
	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	
Energy (Kcal)	1234.06	-36.71	1466.55	-24.79	942.00	-51.69	1527.25	-21.67	1659.77	-14.88	1228.94	-36.97	1653.9	-15.18	1860.98	-4.56	1574.75	-19.24	1950
Protein (g)	23.77	-42.02	17.73	-56.75	25.15	-38.65	32.87	-19.82	40.0	-2.43	35.0	-14.63	35.13	-14.31	49.52	+20.78	35.62	-13.12	40
Fat (g)	10.28	-58.88	11.35	-54.6	8.69	-65.24	19.27	-22.92	26.25	+5.02	13.44	-46.24	24.36	-2.56	47.67	+18.39	23.06	-7.76	25
Calcium (mg)	244.36	-38.91	250.24	-37.44	206.45	-23.38	360.25	-9.93	494.75	+23.68	327.45	-18.13	396.35	-0.91	551.43	+37.85	384.9	-3.77	400
Iron (mg)	8.53	-67.19	6.09	-76.57	7.89	-69.65	10.47	-59.73	12.21	-53.03	10.37	-60.11	13.01	-49.96	12.85	-50.57	11.27	-56.65	25
Beta Carotene (mcg)	461.48	-50.77	1507.08	-37.20	434.63	-81.89	731.67	-69.51	1364.03	-42.33	813.41	-66.10	1571.55	-34.51	2096.15	-12.66	1167.75	-51.34	2400
Thiamin (mg)	0.69	-31.0	0.58	-42.0	0.51	-49.0	0.73	-27.0	0.88	-12.0	0.52	-48.0	0.71	-29.0	1.16	+16.0	0.65	-35.0	1.1
Riboflavin (mg)	0.57	-52.5	0.56	-53.3	0.33	-45.0	0.62	-48.33	0.57	-52.5	0.53	-55.83	1.07	-10.83	1.03	-14.16	0.71	-40.6	1.1
Niacin (mg)	10.17	-21.76	7.61	-41.46	8.29	-36.23	10.65	-18.07	11.83	-9.0	9.27	-28.69	11.27	-13.30	12.42	-4.46	10.44	-19.69	15
Ascorbic acid (mg)	43.43	-8.58	39.77	-0.57	51.26	+28.15	51.35	+28.37	54.56	+36.41	55.45	+38.62	58.35	+45.87	58.87	+47.17	52.5	+31.25	40

*RDA = Recommended Dietary Allowances ICMR (1989)

The data presented in the table reveals that energy intake was found to be deficient amongst the children irrespective of income and area when compared with RDA. The deficit ranged from 4.56 per cent to 51.6 per cent. The protein intake was found to be deficient amongst low and middle income groups of children irrespective of area, while the high income group urban children's intake of protein was 20.78 per cent excess over the RDA. The middle income urban children had only 2.43 per cent deficit intake of protein. The tribal high income group of children registered 13.12 per cent deficit as far as protein intake was concerned. The intake of fat by the children from the selected areas of low income group was deficient. Figure 6, gives the percentage adequacy of fat in the diets of 7 to 9 year old children. While the middle income and high income group urban children, registered 5.02 per cent and 18.39 per cent excess intake of fat over RDA. The rural and tribal high income group children had 2.56 and 7.76 per cent deficient intake of fat respectively.

Calcium intake was found to be excess over RDA amongst urban middle high income group children, the percentage excess over RDA for calcium amongst these

PERCENTAGE ADEQUACY OF FAT INTAKE OF 7-9 YEAR OLD CHILDREN

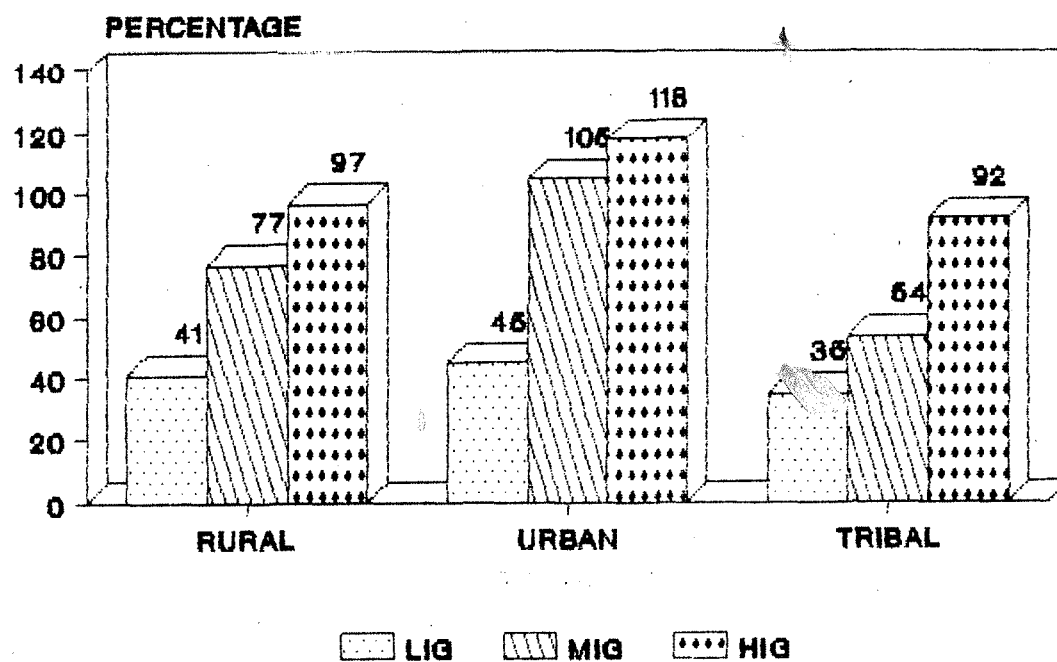


FIG. 6

children were 23.68 per cent and 37.85 per cent respectively. The rural and tribal high income group children registered very negligible per cent of deficit in calcium intake, the per cent deficit being 0.91 per cent and 3.77 per cent respectively. The intake of iron was found to be deficient among all the children of the selected areas and income categories. Similarly, beta carotene intake was deficient as compared to RDA among the children of rural, urban and tribal areas irrespective of income.

The percentage deficit intake of beta carotene was less in Urban high income group children (12.66 per cent), while the tribal low income group had the highest percentage deficit (81.8 per cent). The intake of water soluble vitamins were as such found to be deficient, namely riboflavin and niacin in the daily diet of the 7 to 9 year old children. Thiamine intake was found to be 16 per cent excess over RDA, amongst the high income urban children. Rest of the low and middle income groups of children from rural, tribal and urban areas had deficient intake of thiamine. As far as ascorbic acid intake by the 7 to 9 year old children is concerned., except for the low income group urban children, rest of the children from low, middle and high income irrespective of area, had an excess

quantity of ascorbic acid intake, as compared to RDA. The per cent excess intake over RDA in the case of ascorbic acid by the children ranged from 8.58 per cent to 47.17 per cent.

It is thus evident that for the 7 to 9 year old children also energy deficit was observed irrespective of area and income. Except for high income urban children, all the other groups of children had deficit intake of protein as well. For nutrients like fat and calcium excess intake was registered by urban middle and high income groups. All the children had a deficit of iron and beta carotene in their diets. Except thiamine in urban high income, the other water soluble vitamins were deficient in all the other groups of children irrespective of area and income.

4. Nutrient Intake of 10 to 12 Year Old Children

a. Boys.

The nutrient intake of 10 to 12 year old boys of different income levels and areas are presented in Table-XXVII.

TABLE XXVII

MEAN NUTRIENT INTAKE OF 10-12 YEAR OLD BOYS

Nutrient	Low Income Group						Middle Income Group						High Income Group						* RDA
	Rural		Urban		Tribal		Rural		Urban		Tribal		Rural		Urban		Tribal		
	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	
Energy (Kcal)	1995.3	- 8.89	2015.7	- 7.95	1990.4	- 9.11	2085.0	- 4.79	2185.7	- 0.19	2000.0	- 8.67	2192.5	+ 0.72	2195.9	+ 0.26	2190.3	+ 0.01	2190
Protein (g)	35.6	-34.07	37.9	-29.81	34.0	-37.03	42.3	-21.66	45.8	-15.18	40.5	-25.0	51.9	-3.88	54.2	+ 0.37	50.8	- 5.92	54
Fat (g)	18.20	-17.27	20.51	- 6.77	15.06	-31.54	20.72	- 5.81	22.20	+ 0.90	19.85	- 9.77	21.60	- 1.8	23.40	+ 6.36	21.01	- 4.5	22
Calcium (mg)	380.5	-36.58	488.09	-18.65	359.4	-40.1	467.8	-22.03	570.9	- 4.85	413.0	-31.16	558.6	- 6.9	600.5	+ 0.08	540.5	- 9.91	600
Iron (mg)	30.0	-11.76	31.5	- 7.35	29.60	-12.94	34.12	+ 0.35	34.0	0	32.8	- 3.52	34.3	+ 0.88	34.04	+ 0.11	34.2	+ 0.58	34
Beta Carotene (mcg)	1817.0	-24.29	1830.5	-23.72	1693.2	-29.45	2050.1	-14.57	2149.5	-10.43	1928.5	-19.64	2285.0	- 4.79	2400.3	+ 0.01	2200.0	- 8.33	2400
Thiamin (mg)	0.70	-36.36	0.87	-20.90	0.60	-45.45	0.84	-23.63	0.95	-13.63	0.78	-29.09	1.10	0	1.10	0	1.05	- 4.54	1.1
Riboflavin (mg)	0.80	-38.46	0.85	-34.61	0.65	-50.0	0.90	-30.76	1.20	- 7.69	0.79	-39.2	1.14	-12.30	1.28	=1.53	0.87	-33.07	1.3
Niacin (mg)	11.74	-21.73	12.00	-20.0	11.60	-22.66	12.25	-18.33	13.07	-12.86	12.04	-19.73	14.38	- 4.13	16.03	+ 6.86	13.00	-13.33	15
Ascorbic acid (mg)	50.06	+25.15	54.37	+35.92	49.50	+23.75	55.8	+39.5	56.03	+40.07	48.50	+21.25	60.1	+50.25	58.69	+46.72	56.2	+40.5	40

* RDA = Recommended Dietary Allowances ICMR (1989)

As far as the nutrient intake of 10 to 12 year old boys were concerned the energy was found to be deficient amongst the low and middle income boys irrespective of areas. The high income group boys from rural, urban and tribal areas had an excess energy intake as compared to RDA. The per cent excess ranged from 0.01 to 0.26 percent. The protein intake was deficient for all the children except for an excess of 0.37 per cent for the urban high income group boys. The fat intake pattern of the 10 to 12 year old boys revealed that, the urban high and middle income group boys had 6.36 and 0.90 per cent excess fat intakes over RDA. Rest of the boys of the three areas studied, irrespective of income, consumed deficit amounts of fat in their diet as compared to RDA. Figure 7 represents the percentage adequacy of fat intake by this age group of boys.

The calcium intake was found to be deficient in all the three areas surveyed, except for the high income group urban boys who had an excess calcium intake of 0.08 per cent over RDA. The iron intake was found to be 0.88

PERCENTAGE ADEQUACY OF FAT INTAKE OF 10-12 YEAR OLD MALE

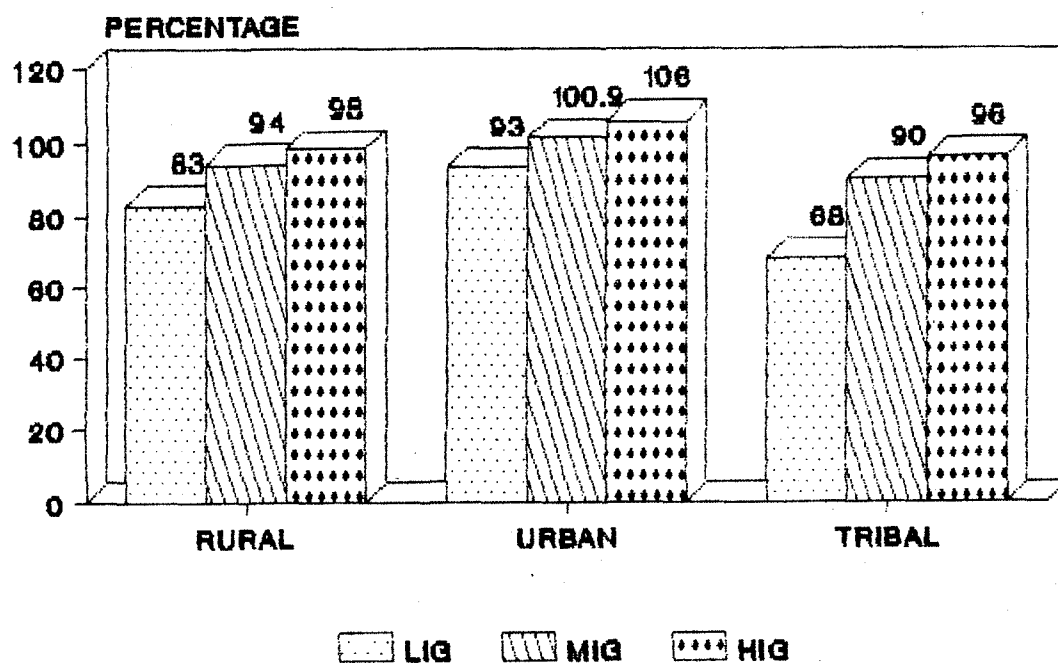


FIG. 7

per cent, 0.11 per cent and 0.58 per cent excess over RDA among the boys belonging to high income rural, urban and tribal households. The boys belonging to rural middle income consumed 0.35 per cent excess iron over RDA., while the boys belonging to urban middle income group, consumed exactly the amount recommended. The low income group boys irrespective of area, had deficit intake of iron as compared to RDA.

The beta carotene intake by the 10 to 12 year old boys in the selected areas of Assam, among low and middle income groups, revealed deficit intake as compared to RDA. The high income urban boys registered 0.01 per cent excess intake of beta carotene over RDA, while the rural and tribal boys belonging to high income groups reported deficit intakes of betacarotene. As far as water soluble vitamin intakes is concerned, it was revealed that the rural and urban boys belonging to high income group fulfilled the RDA requirement for thiamine , while the boys belonging to low and middle income groups from different areas surveyed, consumed deficient amount of thiamine. As far as riboflavin intake is concerned, it was found that all the boys irrespective of income and areas,

registered deficit amount as compared to RDA. The urban high income group boys had 6.86 per cent excess niacin as compared to RDA in their daily diet. All had excess intake of ascorbic acid.

If one looks at the overall nutrient consumption of 10 to 12 year old boys, energy deficit is observed among low and middle income group irrespective of area. Urban high income group children revealed excess intake of protein, fat and calcium. Urban middle income group children had excess intake of fat in their diet. Except low income, iron intake was satisfactory in all the area and income groups. Beta carotene intake was deficient except for the urban high income group children. As far as B vitamins were concerned thiamine intake was satisfactory among the rural and urban high income group children. Others recorded deficit intake. Niacin intake was adequate among the urban high income group children.

b. Girls.

The nutrient intake of 10 to 12 year old girls in the selected areas of Assam is presented in the Table XXVIII.

TABLE XXVIII

MEAN NUTRIENT INTAKE OF 10-12 YEAR OLD GIRLS

Nutrient	Low Income Group						Middle Income Group						High Income Group						* RDA
	Rural		Urban		Tribal		Rural		Urban		Tribal		Rural		Urban		Tribal		
	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	
Energy (Kcal)	1905.0	-3.29	1911.0	-2.99	1885.2	-4.30	1914.2	-2.83	1923.6	-2.35	1900.8	-3.51	1970.8	+0.04	1972.6	+0.13	1970.5	+0.02	1970
Protein (g)	35.8	-37.19	37.0	-35.08	35.3	-38.07	43.1	-24.38	45.3	-20.52	42.0	-26.31	52.0	-8.77	55.0	-3.50	50.4	-11.57	57
Fat (g)	18.14	-17.54	20.49	-6.86	15.04	-31.63	20.31	-7.68	22.0	0.0	19.8	-10.0	21.81	-0.86	23.6	+7.27	20.81	-5.40	22
Calcium (mg)	382.7	-36.21	485.51	-19.08	347.8	-42.03	464.2	-22.63	572.4	-4.6	419.0	-30.16	558.0	-7.0	601.1	+0.18	544.3	-9.28	600
Iron (mg)	18.57	-2.26	18.70	-1.57	18.50	-2.63	19.3	+1.57	19.5	+2.63	19.0	0.0	20.4	+7.36	20.6	+8.42	20.0	+5.26	19
Beta Carotene (mcg)	1808.3	-24.65	1825.0	-23.95	1490.5	-29.56	2052.7	-14.47	2145.3	-10.61	1930.7	-19.55	2291.7	-4.51	2400.8	+0.03	2205.0	-8.12	2400
Thiamin (mg)	0.63	-37.0	0.73	-27.0	0.51	-49.0	0.8	-20.0	0.8	-12.0	0.7	-30.0	1.0	0.0	1.02	+2.0	0.89	-11.0	1.0
Riboflavin (mg)	0.80	-33.3	0.87	-27.5	0.67	-44.16	0.88	-26.66	0.98	-18.33	0.75	-37.5	1.0	-16.66	1.06	-11.66	0.85	-29.16	1.2
Niacin (mg)	11.30	-13.07	11.90	-8.46	11.20	-13.84	12.06	-7.23	12.50	-3.84	11.61	-10.76	13.50	+3.84	13.87	+6.69	12.68	-2.46	13
Ascorbic acid (mg)	53.16	+32.9	58.81	47.02	53.75	34.37	60.7	51.75	54.70	36.75	56.32	40.8	62.0	55.0	60.43	51.07	59.2	48.0	40

* RDA = Recommended Dietary Allowance (ICMR) 1989

The energy intake was deficient among the low and middle income group girls belonging to rural, urban and tribal areas. The girls belonging to high income group rural, urban and tribal areas respectively registered 0.04 per cent, 0.13 per cent and 0.02 per cent excess energy intake as compared to RDA. Irrespective of areas and income, the 10 to 12 year old girls consumed less amount of protein as suggested by the ICMR. The fat intake was deficient among the low income group girls irrespective of area. Figure 8 represents the percentage adequacy of fat in the diets of 10 to 12 year old girls. Whereas the girls belonging to middle income group urban area, consumed exactly the same amount as suggested by the ICMR, the high income group urban girls consumed 7.27 per cent excess fat over the RDA.

The calcium consumption was deficient among the low and middle income group girls from rural, urban and tribal areas, while the urban high income group girls consumed 0.18 per cent excess calcium over RDA. Iron consumption was found to be excess over RDA among the middle income rural, and urban girls while the tribal girls

PERCENTAGE ADEQUACY OF FAT INTAKE
OF 10-12 YEAR OLD FEMALE

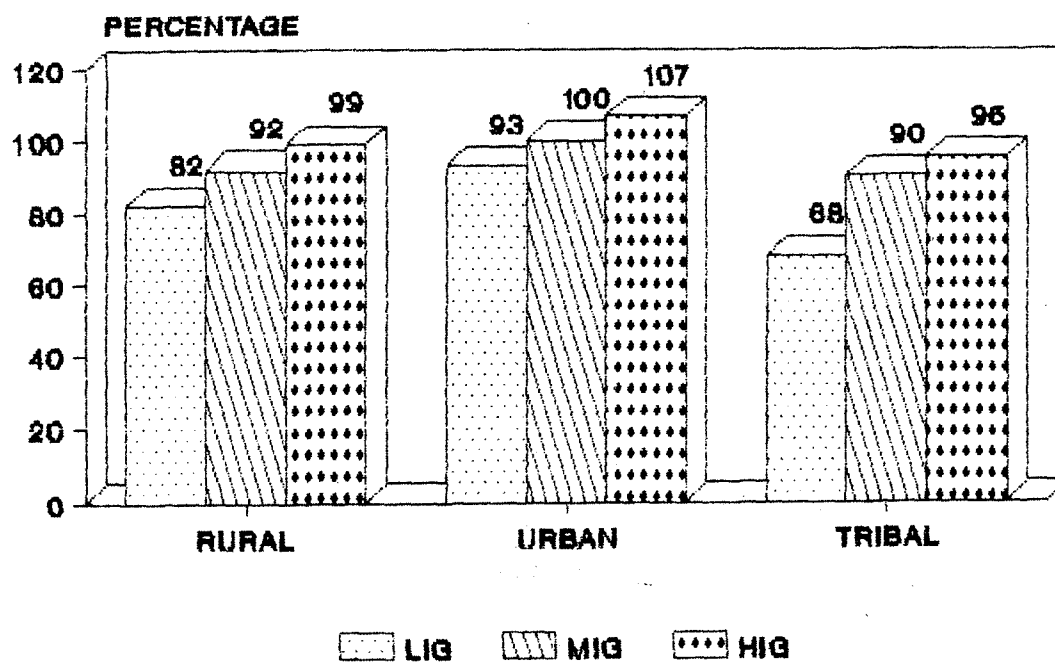


FIG. 8

from low income group consumed exactly the suggested RDA by ICMR. Irrespective of area, girls belonging to high income groups consumed excess quantity of iron as compared to RDA. The per cent excess of iron intake over RDA among the high income group girls were 7.36 per cent. 8.42 per cent and 5.26 per cent respectively in rural, urban and tribal areas.

Beta carotene intake was found to be deficient among the girls belonging to low and middle income families from the three areas surveyed. Girls belonging to high income group urban families had an excess of 0.03 per cent beta-carotene when compared to their daily requirement as suggested by ICMR. Thiamine intake as reported by low and middle income group girls from rural areas was deficient in quantity. Girls belonging to high income group families of rural areas, consumed exactly the required allowance of thiamine recommended by ICMR, while the urban girls belonging to high income group consumed two per cent excess thiamine over RDA. Riboflavin intake by all the girls belonging to different income categories and areas was deficient as compared to the recommended allowances

given by ICMR. As far as niacin intake was concerned, the data revealed that, low and middle income girls irrespective of area, consumed deficient amount of niacin in their daily diet., While the high income group girls belonging to rural and urban areas had 3.84 per cent and 6.99 per cent excess of niacin over RDA. Ascorbic acid intake was found to be excess over RDA amongst all the girls from different socio-economic categories and areas surveyed. This may be due to excess amount of citrus fruits consumed by these population groups.

The overall nutrient intake picture of 10 to 12 year old girls revealed that, energy intake was deficient among low and middle income households irrespective of area surveyed. Protein intake was deficient among all the girls of the three areas. Fat, calcium, beta carotene, and thiamine intake was excess over RDA among high income group urban girls. Excess iron intake was seen among the high income group rural, urban and tribal girls. Riboflavin intake was deficient whereas ascorbic acid intake was excess among all the girls from the selected three areas.

5. Nutrient Intake of 13 to 15 Year Old Adolescents..

a. Boys.

Nutrient intake of 13 to 15 year old boys from the selected areas belonging to different income categories is presented in Table XXIX.

TABLE XXIX

MEAN NUTRIENT INTAKE OF 13-15 YEAR OLD BOYS

Nutrient	Low Income Group				Middle Income Group				High Income Group				* RDA						
	Rural		Urban		Rural		Urban		Rural		Urban								
	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit							
Energy (Kcal)	2160.5	-11.81	2269.5	- 7.36	2077.4	-15.20	2422.7	- 1.1	2440.9	- 0.37	2400.8	- 2.02	2450.57 + 0.02	2450.4	+ 0.01	2450			
Protein (g)	36.9	-47.28	38.0	-45.71	35.6	-49.14	43.0	-38.5	46.5	-33.57	40.5	-42.14	52.0	-25.7	59.5	-15.5	51.5	-26.42	70
Fat (g)	18.50	-15.90	20.75	- 5.68	15.10	-31.36	21.03	- 4.40	22.45	+ 2.04	20.0	- 9.09	22.70 + 3.18	23.71 + 7.77	21.60	- 1.81	22		
Calcium (mg)	385.0	-35.83	487.0	-18.83	360.0	-40.0	475.9	-20.68	581.0	- 3.16	415.0	-30.83	565.0	- 5.83	600.61 + 0.10	550.2	- 8.3	600	
Iron (mg)	33.0	-19.51	34.7	-15.36	30.0	-26.82	38.75	- 5.48	40.7	- 0.73	34.7	-15.36	41.08 + 0.19	41.12 + 0.29	41.0	0	41		
Beta Carotene (mcg)	1830.2	-23.74	1850.2	-22.90	1790.2	-25.40	2078.7	-13.38	2180.0	- 9.16	1970.0	-17.91	2300.9	- 4.12	2400.5	+ 0.02	2245.0	- 6.45	2400
Thiamin (mg)	0.72	-40.0	0.89	-25.83	0.65	-45.83	0.87	-27.5	1.15	- 4.16	0.80	-33.33	1.20	0	1.25 + 4.16	1.17	- 2.5	1.2	
Riboflavin (mg)	0.83	-44.66	0.87	-42.0	0.70	-53.33	1.0	-33.33	1.27	-15.33	0.80	-46.66	1.15	-23.33	1.44	- 4.0	1.04	-30.66	1.5
Niacin (mg)	11.80	-26.25	12.10	-24.37	11.70	-26.87	13.05	-18.43	13.60	-15.0	12.25	-23.43	14.39	-10.06	16.07 + 0.43	13.70	-14.37	16	
Ascorbic acid (mg)	50.5	+26.25	57.03	-42.57	50.0	-25.00	58.25	+45.62	59.19	+47.97	52.51	+31.27	60.2	+50.5	58.51	+46.25	58.15	+45.37	40

* RDA = Recommended Dietary Allowances ICMR (1989)

Irrespective of area, the boys belonging to low and middle income group households had deficit quantity of energy in their daily diet as compared to RDA, whereas the boys belonging to high income rural, urban and tribal households, consumed excess energy over RDA, as suggested by the ICMR. The protein intake by the 13 to 15 year old boys in the three areas and from different income groups was found to be deficient as compared to RDA for the same age group. The fat intake of the boys belonging to low income groups irrespective of area, was found to be deficient or below the RDA. Figure 9 gives the adequacy of fat intake in the diets of 13 to 15 year old boys. As for the middle income group boys, the fat intake was deficient for tribal and rural boys, whereas the urban boys belonging to the middle income group revealed excess fat intake over RDA. Similar trend was found in the case of rural and urban high income group boys, who consumed excess fat over RDA.

Calcium intake was found to be deficient among the tribal, rural and urban boys belonging to low and middle income groups. The urban high income group boys had excess calcium intake of 0.10 Per cent over RDA, while the tribal and rural boys belonging to high income group had deficient intake of calcium to the tune of 8.3 to 5.83

per cent as compared to RDA. Iron intake amongst the boys belonging to low and middle income group, irrespective of area was found to be deficient, while the boys belonging to high income groups, from rural and urban areas consumed, 0.19 per cent and 0.29 per cent excess iron respectively. The tribal boys consumed exactly, the quantity recommended by ICMR.

The beta carotene intake among the boys of 13 to 15 year age group was found to be deficient, while the boys belonging to high income group from urban areas consumed an excess or 0.02 per cent of beta carotene as compared to RDA. Thiamine intake was deficient among the low and middle income group boys belonging to rural, urban and tribal areas and also, among the tribal high income group boys, while the high income group rural boys could fulfil the requirement of thiamine as suggested by ICMR, and the boys belonging to high income group urban families reported 4.16 per cent excess intake of thiamine over RDA. Riboflavin intake was found to be deficient among all the boys belonging to different income categories and areas. As far as niacin intake was concerned, it was

revealed that, except the high income group urban boys, who consumed 0.43 per cent excess niacin over RDA, rest of the boys belonging to low, middle and high income groups, irrespective of area, recorded deficient intake of niacin. Ascorbic acid intake was found to be excess over RDA among all the boys belonging to three different areas and income categories.

The overall nutrient intake picture of the 13 to 15 year old boys, revealed that excess energy intake was only recorded among the high income group boys from the three areas. Protein intake was deficient among all the boys irrespective of area and income. The other nutrients like fat, calcium, beta carotene, thiamine and niacin intake was in general deficient among the low and middle income categories irrespective of area. The urban high income group categories registered excess intake of fat, calcium, iron, beta carotene, thiamine and niacin.

b. Girls.

The nutrient intake of 13 to 15 year old girls belonging to different socio-economic categories from the selected areas are presented in the Table - XXX.

TABLE XXX

MEAN NUTRIENT INTAKE OF 13-15 YEAR OLD GIRLS

Nutrient	Low Income Group						Middle Income Group						High Income Group						* RDA
	Rural		Urban		Tribal		Rural		Urban		Tribal		Rural		Urban		Tribal		
	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	
Energy (Kcal)	1901.7	- 7.68	1903.5	- 7.59	1875.6	- 8.95	1945.7	- 5.54	1985.0	- 3.64	1985.0	- 6.55	2061.7	+ 0.09	2062.0	- 0.09	2060.5	+ 0.02	2060
Protein (g)	36.0	-44.61	37.5	-42.30	35.5	-45.38	43.0	-33.84	45.7	-29.69	41.9	-35.53	52.2	-19.69	57.6	-1.38	51.0	+21.53	65
Fat (g)	18.47	-16.04	20.54	- 6.63	15.12	-31.27	21.0	- 4.54	22.21	+ 0.95	20.0	- 0.09	22.59	+ 2.68	23.70	+ 7.72	21.57	- 1.95	22
Calcium (mg)	383.1	-36.15	485.01	-19.16	350.2	-41.63	470.2	-21.63	575.4	- 4.1	420.5	-29.91	560.7	- 6.55	600.70	+ 0.11	550.0	- 8.33	600
Iron (mg)	24.5	-12.5	25.0	-10.7	20.7	-26.07	28.00	0	28.60	+ 2.14	27.8	- 0.71	29.20	- 4.28	29.31	- 4.67	29.0	- 3.57	28
Beta Carotene (mcg)	1825.3	-23.94	1839.9	-23.33	1785.7	-25.59	2075.4	-13.52	2170.0	- 9.56	1969.3	-17.94	2301.0	- 4.12	2400.6	+ 0.02	2239.6	- 6.68	2400
Thiamin (mg)	0.70	-30.0	0.75	-25.0	0.60	-40.0	0.86	-14.0	1.00	± 0	0.80	-20.0	1.1	+10.0	1.13	+13.0	1.07	+ 7.0	1.0
Riboflavin (mg)	0.80	-33.3	0.85	-29.16	0.71	-40.8	0.92	-23.3	1.00	-16.6	0.80	-33.3	1.10	- 8.33	1.2	± 0	1.04	-13.3	1.2
Niacin (mg)	11.68	-16.57	12.00	-14.8	11.65	-16.78	12.82	- 8.42	13.32	- 4.85	12.15	-13.21	14.00	± 0	14.50	+ 3.57	13.66	- 2.42	14
Ascorbic acid (mg)	54.7	+36.75	60.50	+51.25	54.3	+35.75	60.65	+51.62	62.01	+55.0	56.37	+40.92	62.3	+55.75	63.00	+57.5	60.47	+51.17	40

* RDA = Recommended Dietary Allowances ICMR (1989)

The 13 to 15 year old girls belonging to low and middle income group were not able to meet their daily recommended allowances of energy, while the high income group girls from rural, urban and tribal areas recorded an excess intake of energy over RDA, the excess being 0.08 per cent 0.09 per cent and 0.02 per cent respectively. Protein intakes was also inadequate on an average for this age group in all the three areas surveyed irrespective of income levels. Fat intake was deficient among the low income group girls irrespective of areas. The middle income group girls belonging to rural and tribal households registered deficient intake of fat the percentage deficit being 4.5 per cent and 0 9.09 per cent respectively. On the other hand the girls belonging to urban middle income group households, recorded 0.95 per cent excess intake of fat, as compared to RDA. The high income group girls belonging to rural and urban areas had fat intakes of 2.68 per cent 7.72 per cent excess over RDA respectively, while the tribal high income group girls recorded 1.95 per cent deficit in fat intake as compared to RDA. The adequacy of fat intake by this age group of girls is also give in Figure 10.

PERCENTAGE ADEQUACY OF FAT INTAKE OF 13-15 YEAR OLD FEMALE

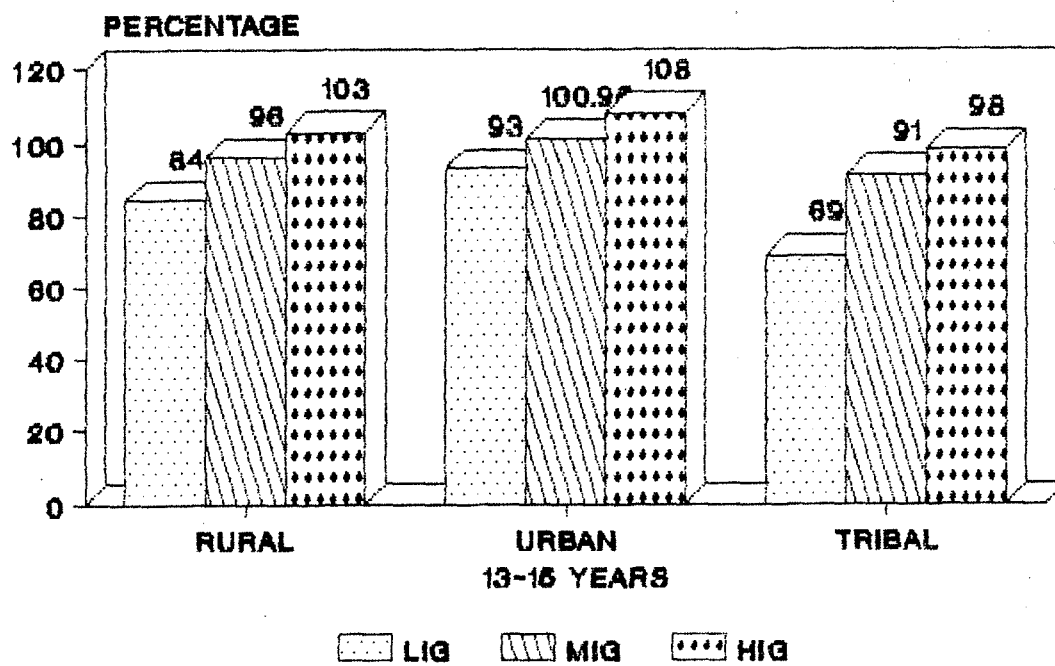


FIG. 10

Regarding calcium intake of the group, it was revealed that deficient intake was recorded among the low and middle income girls belonging to rural, urban and tribal areas, while, the girls from high income urban households, registered 10.11 per cent excess intake of calcium over RDA. Iron intake was deficient among the girls belonging to low income group, irrespective of area. The rural middle income girls were taking the exact quantity of iron as suggested by ICMR for this age group. The girls belonging to urban middle income households, recorded excess iron intake over RDA. High income rural, urban and tribal girls were taking excess of iron as compared to RDA. Tribal middle income recorded deficit iron intake.

Daily intake of beta carotene was also found to be deficient among the rural, urban and tribal girls belonging to low and middle income categories, while the urban high income group adolescent girls had a meagre excess of beta carotene intake (0.02 per cent) over RDA. As far, as the thimaine intake was concerned, data revealed that the girls belonging to low income categories, had

deficient intake of thiamine, while the middle income group urban girls had a thiamine intake on par with the recommended allowances given by ICMR. Girls belonging to high income categories from rural, urban and tribal areas recorded an excess of 10.0 per cent and 7.0 per cent of thiamine intake over RDA. The riboflavin intake was also deficient among the low and middle income girls from the three different areas surveyed. The girls belonging to urban high income group households had a daily riboflavin intake on par with the ICMR requirement. Similar trend was observed in the case of niacin intake by the girls,. The high income group girls from rural area could fulfil the niacin requirement as given by ICMR, while the girls belonging to urban high income households recorded an excess of 3.57 per cent niacin intake as compared to RDA. In the case of ascorbic acid intake, it was observed that the intake was excess over RDA among all the girls irrespective of income categories and areas.

Thus, as far as the nutrient intake of 13 to 15 year old girls are concerned, it was observed that, energy was not sufficient among the low and middle income

households from the three areas. Protein intake was grossly deficient. The rural and urban high income group girls recorded excess intake of fat, iron, thiamine and niacin. Otherwise, all the other nutrient intake was observed to be deficient.

6. Nutrient Intake of 16 to 18 Year Old Adolescents.

a. Boys.

The nutrient intake of the 16 to 18 year old adolescent boys is tabulated in Table - XXXI.

TABLE - XXXI
MEAN NUTRIENT INTAKE OF 16-18 YEAR OLD BOYS

Nutrient	Low Income Group						Middle Income Group						High Income Group						* RDA
	Rural		Urban		Tribal		Rural		Urban		Tribal		Rural		Urban		Tribal		
	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	
Energy (Kcal)	2170.0	-17.80	2278.3	-13.70	2090.5	-20.81	2415.7	-8.52	2445.6	-7.36	2600.5	-1.49	2640.8	+0.03	2687.9	+1.81	2641.2	+0.04	2640
Protein (g)	36.95	-52.62	40.10	-48.58	36.60	-53.07	46.50	-40.38	52.09	-33.21	48.06	-38.38	57.30	-26.53	64.30	-17.56	54.8	-29.74	78
Fat (g)	19.70	-10.45	20.30	-7.72	16.79	-23.68	21.15	-1.13	22.50	+2.27	21.00	-4.54	23.60	+7.27	25.07	+13.95	22.05	+0.22	22
Calcium (mg)	387.5	-22.5	459.0	-8.2	370.5	-25.9	460.0	-8.0	560.0	+12.0	432.8	-13.44	508.8	+1.75	588.5	+17.7	500.0	± 0	500
Iron (mg)	36.82	-26.36	39.90	-20.2	35.04	-29.92	40.51	-18.98	42.01	-15.98	38.70	-22.6	44.05	-11.9	47.8	-4.4	42.59	-14.82	50
Beta-carotene (mcg)	1860.0	-22.5	1870.0	-22.08	1807.2	-24.70	2100.5	-12.47	2190.5	-8.72	1978.4	-17.56	2309.6	-3.75	2401.7	+0.07	2255.0	-6.04	2400
Thiamin (mg)	0.87	-33.07	0.95	-26.92	0.80	-38.46	1.16	-10.76	1.19	-8.26	1.14	-12.3	1.27	-2.30	1.32	+1.53	1.25	-3.84	1.3
Riboflavin (mg)	0.86	-46.25	1.0	-37.5	0.85	-46.87	1.15	-28.12	1.35	-15.62	1.0	-37.5	1.30	-18.75	1.52	-5.0	1.23	-23.12	1.6
Niacin (mg)	12.0	-29.41	12.25	-27.94	11.8	-30.58	13.25	-22.05	13.75	-19.11	12.40	-27.05	14.60	-14.11	16.75	-1.47	13.80	-18.82	17
Ascorbic acid (mg)	54.0	+35.0	57.00	+42.5	52.5	+31.25	58.2	+45.5	62.0	+55.0	55.0	+37.5	60.8	+52.0	65.3	+63.25	60.5	+51.25	40

* RDA - Recommended Dietary Allowance ICMR (1989)

The data reveals that, the boys belonging to high income groups rural, urban and tribal areas recorded excess intake of energy. The per cent excess energy ranged from 0.03 per cent to 1.81 per cent. The low and middle income group boys irrespective of area were found to be consuming deficient intakes of energy as compared to RDA. Protein intake as recorded among the 16 to 18 year old boys from different income categories and area, was deficient when compared to RDA. The deficit percentage in protein intake ranged from 17.56 to 53.07 per cent. As far as fat intake was concerned, the boys belonging to low income group in the rural, urban and tribal areas had deficit intake of fat, while the boys belonging to urban middle income households recorded 2.27 percent excess fat as compared to RDA. The boys belonging to middle income group from rural and tribal areas registered deficit intake of fat. Excess intake of fat was found among the high income group boys belonging to the three areas surveyed and the percentage excess in fat intake over RDA ranged from 0.22 percent to 13.95 percent. Figure 11 also gives the fat adequacy of their diets.

PERCENTAGE ADEQUACY OF FAT INTAKE OF 16-18 YEAR OLD MALE

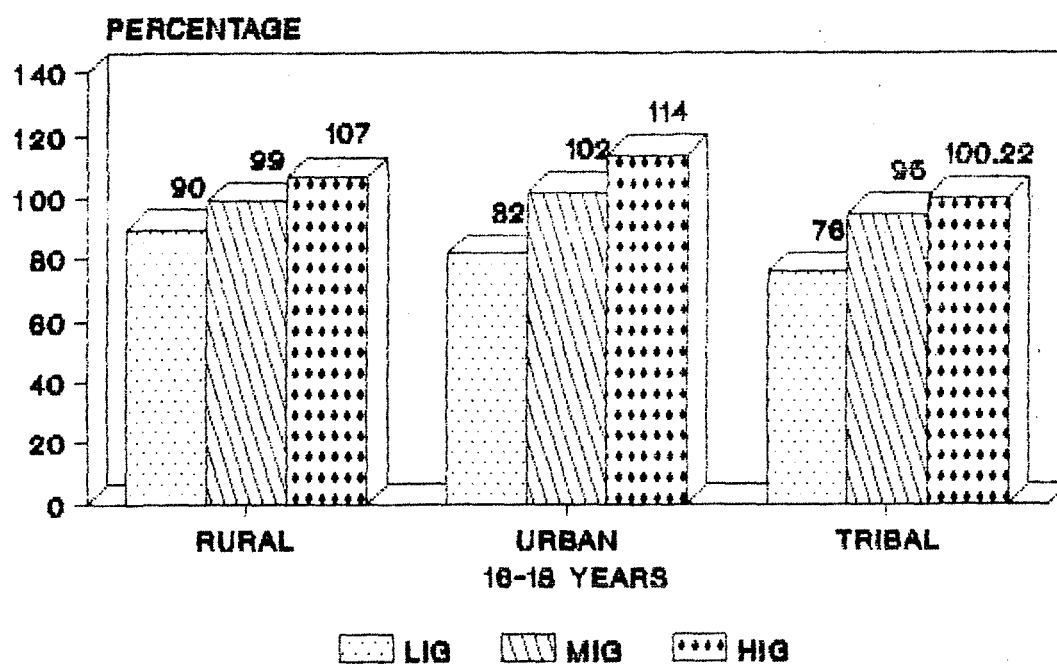


FIG. 11

Similar trend was found in the case of calcium intake among the boys surveyed from different areas and income categories. The boys belonging to middle income urban and high income rural and urban areas, had an excess intake of calcium as compared to RDA, while the tribal boys belonging to high income households could just fulfil the RDA for calcium suggested by ICMR. Iron intake was found to be deficient among all the boys belonging to different income levels and the three area surveyed. A 4.4 per cent deficit intake of iron was observed among the urban high income group boys while the tribal low income group boys registered 29.92 per cent deficit intake of iron as compared to RDA.

The beta carotene intake was found to be deficient among low, middle and high income group boys except high income group urban boys, who had a 0.07 per cent excess intake over RDA. Similar trend was revealed in case of thiamine intake also. The riboflavin and niacin intake by this group of boys were found to be deficient irrespective of income and areas. On the other hand, ascorbic acid intake by all the boys of 16 to 18 year age

group, belonging to the three different income levels and areas, were found to be in excess over the daily suggested level of requirement by ICMR.

The over nutrient intake among the 16 to 18 year old boys revealed that energy intake was deficient among low and middle income group from the three areas surveyed. Protein, iron, riboflavin, and niacin intakes were also deficient among them. Fat intake was excess among high income group from the three areas studied. Calcium intake was excess over RDA among the rural and urban high income groups, whereas the urban high income group recorded an excess beta carotene and thiamine intake.

b. Girls.

Nutrient intake of 16 to 18 years old girls belonging to the three different areas and income groups is presented in Table XXXII

TABLE XXXII
MEAN NUTRIENT INTAKE OF 16-18 YEAR OLD GIRLS

Nutrient	Low Income Group						Middle Income Group						High Income Group						* RDA
	Rural		Urban		Tribal		Rural		Urban		Tribal		Rural		Urban		Tribal		
	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	
Energy (Kcal)	1930.0	- 6.31	1935.5	- 6.04	1904.0	- 7.57	1967.3	- 4.5	2000.7	- 2.87	1970.8	- 4.33	2070.1	+ 0.49	2075.8	+ 0.76	2060.5	+ 0.02	2060
Protein (g)	37.20	-40.95	37.60	-40.31	35.68	-43.36	43.07	-31.63	45.81	-27.28	41.97	-33.38	52.10	-17.30	59.70	- 5.23	51.25	-18.65	60
Fat (g)	18.70	-15.0	20.65	- 6.13	15.07	-26.95	21.45	- 2.5	22.54	+ 2.45	20.30	- 7.72	22.78	+ 3.54	24.85	+12.95	22.09	+ 0.40	30
Calcium (mg)	386.70	-22.66	487.31	- 2.53	355.0	-29.0	473.7	- 5.26	560.0	+12.0	421.89	-15.62	562.4	+12.48	603.0	+20.6	554.3	+10.86	500
Iron (mg)	24.35	-18.83	25.20	-16.0	20.75	-30.83	28.93	- 3.56	29.70	- 1.0	25.78	-14.06	3.25	+ 0.83	32.70	+ 9.0	30.04	+ 0.13	30
Beta carotene (mcg)	1830.7	-23.72	1844.0	-23.16	1800.5	-24.98	2088.0	-13.0	2182.7	- 9.05	1982.7	-17.38	2285.9	- 4.75	2400.8	+ 0.03	2290.5	- 4.56	2400
Thiamin (mg)	0.72	-28.0	0.78	-22.0	0.67	-33.0	0.87	-13.0	1.00	± 0	0.87	-13.0	1.11	+11.0	1.15	+15.0	1.09	+ 9.0	1.0
Riboflavin (mg)	0.85	-29.16	0.90	-25.0	0.80	-33.33	0.90	-25.0	1.05	-12.5	0.83	-30.83	1.15	- 4.16	1.24	+ 3.33	1.10	-8.33	1.0
Niacin (mg)	11.80	-15.71	12.25	-12.5	11.72	-16.28	13.00	- 7.14	13.65	- 2.5	12.39	-11.5	14.20	+ 1.42	14.62	+ 4.42	14.00	± 0	15
Ascorbic acid (mg)	56.7	+41.75	59.8	+49.5	55.0	+37.5	60.5	+51.25	63.9	+59.75	57.0	+42.5	65.7	+64.25	65.9	+64.75	62.4	+56.0	60

* RDA = Recommended Dietary Allowances ICMR (1969)

It is evident from the table that, girls from high income, group households belonging to rural, urban and tribal areas had an excess intake of 0.49 per cent, 0.76 per cent and 0.02 per cent energy as compared to RDA., whereas deficient intake of energy was observed among the girls belonging to low and middle income groups, irrespective of area.

As far as intake of protein was concerned, data revealed that, deficient intake of protein was recorded among all the girls from all the three areas and income levels studied. Fat intake was deficient among the low income group girls belonging to rural, urban and tribal areas, whereas the middle income group urban girls recorded a 2.45 per cent excess over RDA. The high income group girls belonging to rural urban and tribal areas registered excess fat intake over RDA. The per cent excess over RDA ranged from 0.40 to 12.95 per cent. Their fat intake adequacy is also represented in Figure 12.

Similar trend was reflected in the case of calcium intake by 16 to 18 year old girls. Excess intake of calcium over RDA was observed among urban middle income

PERCENTAGE ADEQUACY OF FAT INTAKE OF 16-18 YEAR OLD FEMALE

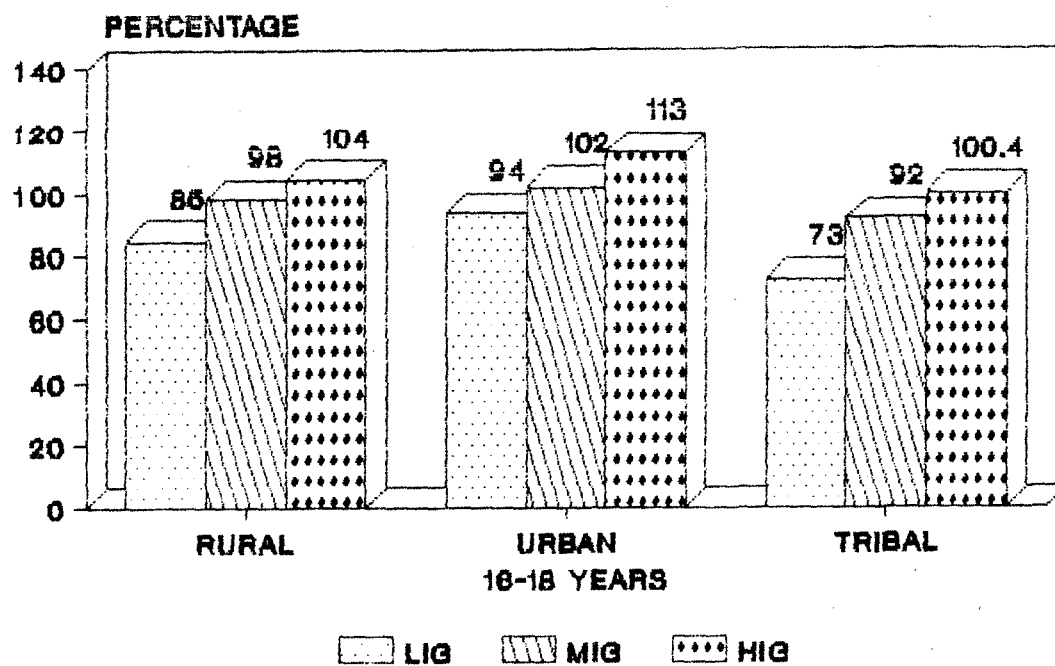


FIG. 12

and high income group girls belonging to all the three areas. The excess intake of calcium over RDA ranged from 10.86 per cent to 20.6 per cent. Iron intake of girls belonging to low and middle income groups irrespective of area, was found to be deficient when compared to RDA. Excess intake of iron over RDA was recorded among the adolescent girls belonging to high income categories, irrespective of area.

Beta carotene intake was found to be deficient among the low and middle income adolescent girls belonging to rural, urban and tribal areas while the high income group urban adolescent girls recorded a meagre excess intake (0.03 per cent) of beta carotene over RDA.

Thiamine intake was deficient among the low income group girls belonging to three different areas, while the middle income group girls from urban areas could fulfil the suggested requirement of thiamine, as compared to RDA. Adolescent girls belonging to high income group rural, urban and tribal areas had an excess intake of 11 per cent, 15 per cent and 9 per cent respectively as compared to RDA. As far as riboflavin intake was concerned deficient intake was recorded by the girls belonging to low and middle income groups, irrespective of areas, while

the high income group urban adolescent girls had an excess of 1.1 per cent riboflavin as compared to RDA. Niacin intake registered a similar trend. The low and middle income group girls belonging to rural, urban and tribal areas had deficient niacin intake when compared to RDA, while high income group girls from rural and urban areas recorded 1.42 per cent excess intake of niacin over RDA. But the tribal high income group girls could fulfil their daily niacin requirements as suggested by ICMR. Ascorbic acid intake was found to be excess over RDA among all the adolescent girls from different areas and income categories studied.

In general it was observed that, the 16 to 18 year old girl's energy intake was deficient except among the high income group households from the three areas surveyed. Protein intake was grossly deficient. Other nutrients like fat, calcium iron, thiamine, and ascorbic acid was sufficient and excess over RDA among the high income group girls from rural, urban and tribal areas.

7. Nutrient Intake of Adults

a. Adult Males.

Nutrient intake of adult males belonging to different categories of income and the three different areas are presented in Table - XXXIII.

TABLE - XXXIII
MEAN NUTRIENT INTAKE OF ADULT MEN

Nutrient	Low Income Group				Middle Income Group				High Income Group				* R D A						
	Urban		Rural		Urban		Rural		Urban		Rural								
	Mean or deficit	%Excess or deficit	Mean or deficit	%Excess or deficit	Mean or deficit	%Excess or deficit	Mean or deficit	%Excess or deficit	Mean or deficit	%Excess or deficit	Mean or deficit	%Excess or deficit							
Energy (kcal)	2256.6	-21.50	2290.3	-20.33	2180.2	-24.16	2475.8	-13.88	2578.1	-10.33	2625.7	-8.67	2890.5	+0.53	2965.0	+3.13	2877.5	+0.08	2875
Protein (g)	35.07	-41.55	38.76	-35.4	33.87	-43.55	40.57	-32.38	47.59	-20.68	40.55	-32.41	52.39	-12.66	61.06	+1.76	53.25	-11.25	60
Fat (g)	12.25	-38.75	13.79	-31.05	12.05	-39.75	26.07	+30.35	30.92	+54.6	16.80	-16.0	35.0	+75.0	52.30	+161.5	24.88	+24.4	20
Calcium (mg)	306.05	-23.48	321.07	-19.73	300.8	-24.3	345	-13.75	358.5	-10.37	330.4	-17.4	407.31	+1.32	410.57	+2.64	406.80	+1.7	400
Iron (mg)	20.10	-28.2	21.35	-23.5	20.00	-28.57	25.39	-9.32	26.08	-6.85	25.40	-10.57	28.77	+2.75	29.59	+5.67	28.46	+1.64	28
Beta-Carotene (mcg)	1775.9	-26.00	1825.0	-23.95	1730.7	-27.88	2074.3	-13.57	2166.5	-9.72	2050.7	-14.55	2257.5	-5.93	2400.3	+0.012	2250.2	-6.24	2400
Thiamin (mg)	0.85	-39.28	8.84	-40.0	0.80	-42.85	1.05	-25.0	1.10	-21.42	1.00	-28.57	1.25	-10.71	1.36	-2.85	1.22	-12.85	1.4
Riboflavin (mg)	0.87	-45.62	1.02	-36.25	0.86	-46.25	1.22	-23.75	1.41	-11.87	1.10	-31.25	1.38	-13.75	1.60	± 0	1.28	-20.0	1.6
Niacin (mg)	12.49	-30.61	12.60	-30.0	12.15	-32.5	12.33	-25.94	14.01	-22.16	13.05	-27.5	16.54	-8.11	17.55	-2.5	16.54	-8.11	18
Ascorbic acid (mg)	45.55	+13.87	50.02	+25.05	46.39	+15.97	52.02	+30.05	53.00	+32.5	50.07	+25.17	56.78	+41.95	60.14	+50.35	55.18	+37.95	40

*RDA = Recommended Dietary Allowances ICMR (1989)

As far as the energy intake of the adults were concerned, except rural, urban and tribal high income, groups, the low and middle income adults of the three areas surveyed, recorded deficient energy intake. Irrespective of areas, the diets of adults male belonging to low and middle income were also deficient in protein. The fat intake by the adult males belonging to high income groups from the three areas surveyed recorded excess over RDA. The percentage excess fat intake ranged from 24.11 per cent to 161.5 per cent. The adults belonging to middle income categories from rural and urban areas also recorded excess fat intake over RDA, whereas the low income group of adult males from the three areas surveyed consumed deficit fat as compared to RDA. Adequacy in fat intake of adult males is denoted in Figure 13.

Intake of calcium and iron among the adult male population from the rural, urban and tribal areas, in the different income categories revealed similar trends. Calcium and iron intakes were found to be deficient among the low and middle income categories, irrespective of area, while the high income group adult male, belonging to

PERCENTAGE ADEQUACY OF FAT INTAKE OF ADULT MALE

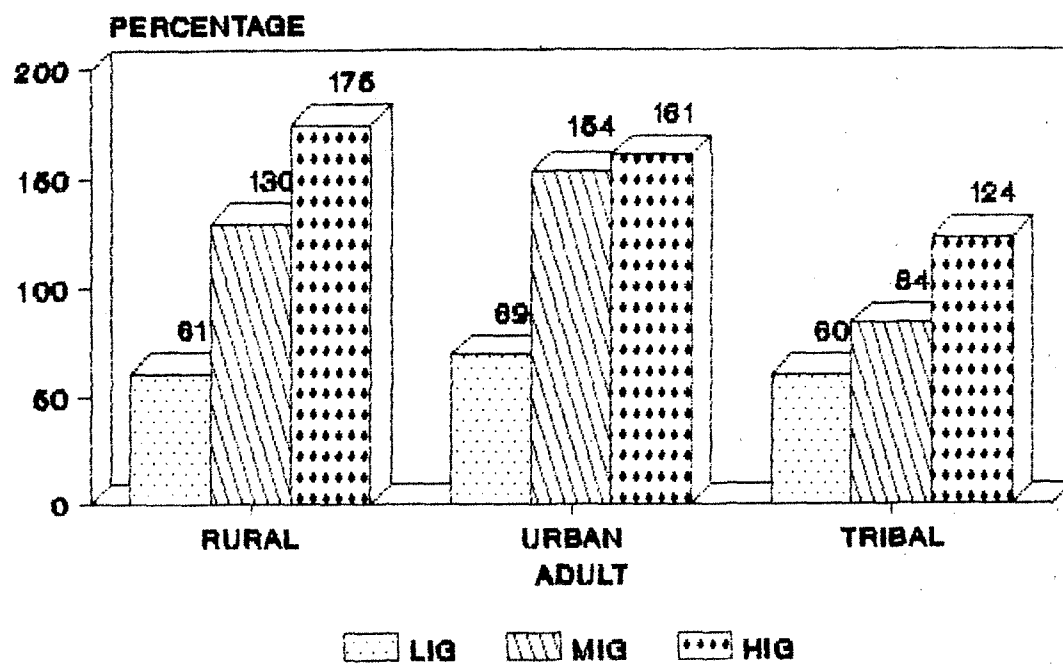


FIG. 13

rural, urban and tribal areas respectively recorded excess calcium and iron intake over RDA. Intake of beta carotene was also deficient except among the high income urban adult male members, who consumed 0.01 per cent beta carotene in excess of RDA.

Intake of B Complex vitamin, thiamine was deficient among the adult male population irrespective of area and income levels. Riboflavin requirement was only met by the urban high income group adult male members alone. Similarly, niacin intake was grossly deficient among all the adult male members from different income categories and areas surveyed. The intake of ascorbic acid was satisfactory, as almost all the adult male population registered an excess ascorbic acid intake when compared to RDA.

The overall picture of nutrient intake for adult male population revealed that, the rural, urban and tribal high income adults only had an excess energy intake. Protein and iron intake was adequate only among the urban

high income group adults. Excess fat intake over RDA was noticed among the middle income rural and urban adults and also among the high income group adults from the three areas surveyed. Deficient intake of beta carotene, thiamine and niacin were also observed. These results on adult male indicate that the nutrient intake of was better among high income group of urban and tribal populations compared to middle and low income categories. Similar observations were also reported by Reddy et al., (1990) from studies conducted at Hyderabad. Deficiency of retinol and riboflavin in the diets of low income urban population was also reported by Kaur and Sood (1988).

b. Female Adults.

Nutrient intake of adult females belonging to different income categories and areas are presented in Table - XXXIV.

TABLE - XXXIV
MEAN NUTRIENT INTAKE OF ADULT WOMAN

Nutrient	Low Income Group						Middle Income Group						High Income Group						* RDA
	Rural			Urban			Tribal			Rural			Urban			Tribal			
	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit	Mean	%Excess or Deficit			
Energy(Kcal)	1954.4	-12.16	1960.2	-11.90	1957.5	-12.02	2010.80	- 9.62	2025.60	- 8.96	2015.61	- 9.41	2250.8	+ 1.15	2340.1	+ 5.17	2270.0	+ 2.02	2225
Protein(g)	36.55	-26.9	38.09	-23.88	35.74	-28.52	43.44	-13.12	47.30	- 5.4	42.53	-14.94	52.47	+ 4.94	55.72	+11.44	52.35	+ 4.7	50
Fat (g)	13.75	-31.25	16.68	-16.6	13.54	-32.3	22.5	+12.5	27.55	+37.75	20.21	+ 0.05	34.88	+74.4	50.15	+150.75	33.29	+66.45	20
Calcium(mg)	300.1	-24.97	315.7	-21.07	300.5	-24.87	340.7	-14.82	360.3	- 9.92	332.0	-17.0	400.35	+ 0.08	405.24	+ 1.31	400.09	+ 0.02	400
Iron (mg)	20.23	-32.56	22.74	-24.2	20.00	-33.33	27.64	- 7.86	28.37	- 5.43	25.00	-16.66	30.17	+0.56	31.56	+ 5.2	30.00	± 0	30
Beta-carotene (mcg)	1810.0	-24.58	1860.0	-22.5	1800.2	-24.99	2005.9	-16.42	2100.8	-12.46	1955.9	-18.50	2167.0	- 9.70	2372.9	- 2.12	2108.5	-12.14	2400
Thiamin(mg)	0.67	-39.09	0.75	-31.81	0.66	-40.0	0.84	-23.63	0.92	-16.92	0.80	-27.27	1.11	+ 0.90	1.12	+ 1.81	1.10	± 0	1.1
Riboflavin(mg)	0.88	-32.30	0.94	-27.69	0.83	-36.15	1.08	-16.92	1.14	-12.30	1.00	-23.07	1.21	- 6.92	1.30	± 0	1.16	-10.76	1.3
Niacin(mg)	11.45	-18.21	12.07	-13.78	11.38	-18.71	12.82	- 8.42	13.29	- 5.07	12.08	-13.71	14.00	± 0	14.36	+ 2.57	13.85	- 1.07	15
Ascorbic acid	58.35		60.44	-51.10	54.83	+37.07	65.44	+63.6	66.36	+70.9	60.54	+51.35	68.49	+71.22	70.12	+75.3	65.32	+63.3	40

* RDA - Recommended Dietary Allowances (1989) ICMR

As far as the energy and protein intakes were concerned adult females of low and middle income categories of the three areas were not able to meet their requirements. The adult females belonging to high income rural, urban and tribal areas were consuming more energy and protein compared to RDA. The excess percentage intake of energy ranged from 1.15 to 5.17 per cent and the excess percentage intake of protein ranged from 4.7 per cent to 11.44 per cent respectively. Fat intake was just satisfactory among the middle income group adult women belonging to rural, urban and tribal areas. The high income categories of women, irrespective of area, recorded higher per cent of fat intake as compared to ICMR allowances. Low income group irrespective of areas reported deficient intake of fat. Figure 14 denotes the adequacy of fat intake in the diets of adult women.

Calcium intake among the high income categories of adult female populations was satisfactory. The low and middle income groups of women, irrespective of area reported, deficient calcium intake as compared to the RDA. Similarly, the iron intake was found to be deficient among low and middle income group of adult female belonging to

PERCENTAGE ADEQUACY OF FAT INTAKE OF ADULT FEMALE

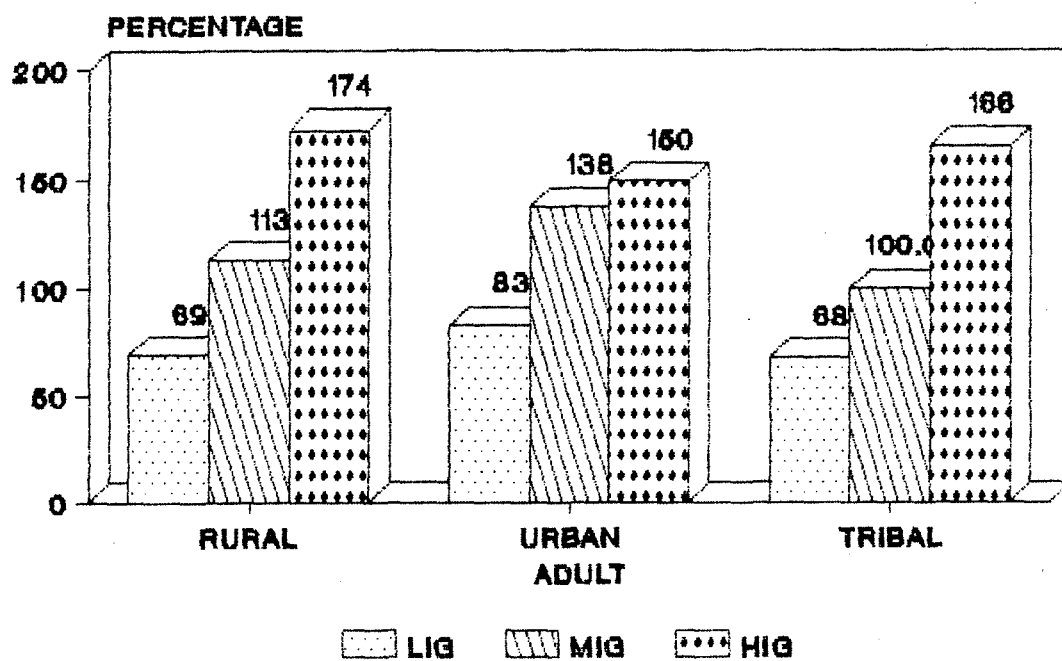


FIG. 14

rural and tribal areas. High income group women, irrespective of area, had an adequate intake of iron as compared to RDA.

Beta carotene intake was found to be deficient among all the adult women, irrespective of area and income levels studied. Among the B complex vitamins, thiamin requirement was not met among the low and middle income groups of women, irrespective of area while the high income categories of women from rural, urban and tribal households could meet their thiamine requirements. Deficient intake of riboflavin and niacin was recorded among low and middle income group adult women belonging to rural urban and tribal areas, while the high income group women could meet the riboflavin requirement as suggested by ICMR. Similarly, the high income group rural and urban adult female had adequate intake of niacin as compared to RDA. As far as ascorbic acid requirement was concerned, irrespective of income categories and area, excess intake of ascorbic acid was recorded among all the adult women surveyed.

The nutrient intake pattern of adult female reveals that, the low and middle income categories, of adult female could not fulfil their energy requirement. Similarly protein intake was not adequate as far as low and middle income adult females were concerned. Irrespective of area, the adult females belonging to middle and high income households recorded excess intake of fat. Calcium and iron was adequate only among high income group adult females from the three different areas surveyed. Thiamine, riboflavin and niacin intake was deficient among low and middle income females from the rural, urban and tribal areas surveyed.

The nutrient intake picture of the selected population groups belonging to different age groups from the three areas surveyed thus revealed that; the energy intake was deficient among the 1 to 3, 4 to 6 and 7 to 9 year children irrespective of area and income, energy intake of 10 to 12 year and 13 to 15 year old boys and girls belonging to high income groups from rural, urban and tribal areas recorded adequacy, whereas the rest of the boys and girls of these age groups from low and middle income group categories could not satisfy their energy requirement. Similarly, adolescent boys and girls (16 to

18 years) belonging to high income groups from the three areas, recorded excess energy intake over RDA. The adult and female population from high income categories belonging to rural, urban and tribal areas registered excess intake of energy than their low and middle income group counterparts, who recorded deficient energy intake. Protein intake was grossly deficient among the low and middle income group children from 1 to 9 years. In this age group, however, the high income group children from rural, urban and tribal areas recorded excess protein intake over RDA. Similarly, children belonging to 7 to 9 years and 10 to 12 year old boys from urban high income categories only recorded excess protein intake over RDA. The older children 10 to 12 years old (girls), 13 to 15 year old boys and girls and 16 to 18 year old adolescent boys and girls recorded deficient protein intake. In case of adult male and female population, protein intake was not adequate except among urban high income group adult male and rural, urban and tribal high income group females.

Fat intake in general as evident from the surveyed population from low income categories irrespective of area, was deficient. Also, the urban and rural high

and middle income categories of population belonging to different age groups revealed adequate fat intake. The adolescent boys and girls, adult male and female populations belonging to high income categories and from the three different selected areas consumed excess intake of fat over RDA.

Calcium intake was adequate only in the case of rural and urban high income group 1 to 6 year old children. Similarly the urban high income group children from 7 - 12 years also recorded excess calcium intake over RDA and 13 to 15 year old boys and girls had excess calcium intake over RDA. The high income group adolescent boys and girls belonging to the three different areas studied also recorded excess calcium over RDA. Similarly the rural and urban middle income group adult male and female members and high income categories of adults belonging to the three different areas also recorded excess calcium intake.

Iron intake was grossly deficient among the 1 to 9 year old children and 16 to 18 year old boys, whereas the rural, urban and tribal high and middle income boys

and girls (10 to 16 years age) could meet their iron requirement as suggested by ICMR. Similarly the high income group rural, urban and tribal, 16 to 18 year old girls and adults could meet their iron requirements.

The betacarotene intake was grossly deficient among all the age and groups of selected populations belonging to the three different areas studied, except that the urban high income categories recorded a comparatively adequate intake of betacarotene, specifically among the children 1 to 6 years, and older children 10 to 15 year and adolescents 16 to 18 year old respectively.

As far as water soluble vitamin, thiamine, riboflavin and niacin intakes are concerned, it was observed that, intake of these three vitamins were deficient, except urban high income categories, whose thiamine intake was adequate. Riboflavin intake was also adequate only in case of urban high income categories of 1 - 6 years old children, 13 to 15 years old girls and 16

to 18 year old girls and adult male and female members, Niacin intake picture was also better among urban high income categories of 1 to 6 year old children, 10 to 15 year old boys and girls and adolescent girls and adult female from rural and urban high income categories. Ascorbic acid intake was invariably adequate among all the age sex groups of populations from the three different areas studied, irrespective of income levels.

G. Heights and Weights of the Selected Age Groups

1. Mean Heights and Weights of Pre-school Children (4 to 6 years)

The mean height and weight of the 4 to 6 year old preschool children of rural, urban and tribal areas are presented in Table XXXV. Annexure 3 gives the individual heights and weights of all the subjects.

TABLE - XXXV
MEAN HEIGHTS AND WEIGHTS OF PRE-SCHOOL
CHILDREN (4 to 6 Years)

Area	Sex	Number	Height (cm)			Weight (kg)		
			Mean	Indian* Standard	% Excess or deficit	Mean	Indian Stand- ard	% Excess or deficit
Rural	Male	30	108.60	109.63	-1.43	18.61	18.70	-0.48
	Female	30	106.26	108.20	-1.79	17.41	17.73	-1.80
Urban	male	40	109.74	109.63	+0.10	20.17	18.70	+7.86
	Female	40	108.37	108.20	+0.15	19.02	17.3	+7.27
Tribal	Male	30	106.51	109.63	-2.84	17.77	18.70	-4.97
	Female	30	105.08	108.20	-2.88	17.05	17.73	-3.83

* NCHS (ICMR) 1989

It is evident that the height measurement of preschool boys belonging to rural areas recorded 1.43 per cent deficit when compared to the Indian standard height measurement suggested by NCHS (ICMR 1989). Girls (4 to 6 years old) belonging to rural areas recorded 1.79 per cent deficit in height measurement as compared to standard measurements. Similarly the tribal preschool boys also recorded 2.84 per cent deficit in height measurement when compared to the standard. Preschool girls belonging to tribal areas registered 2.88 per cent deficit in height measurements as compared to standards. As far as urban preschool boys and girls are concerned, the height measurements revealed that irrespective of sex, the urban preschool children were taller when compared with the standard measurements. They were also taller than their rural and tribal counterparts.

The rural preschool boys recorded 0.48 per cent deficit in weight measurements as compared to standards. Similar trend was observed among girls from rural areas, who recorded 1.80 per cent deficit in weight measurements as compared to standard measurements. As far as the weight measurements of tribal preschool children are concerned, the male and female preschool children recorded 4.97 per cent and 3.83 per cent deficit in weight as compared to standard measurements respectively. Urban pre school

children were heavier when compared with the standard as well as their rural and tribal counterparts. This might be due to the fact that urban pre school children maintained better dietary adequacy in contrast to their rural and tribal counterparts which must be reflecting in their anthropometric measurements.

To determine whether there was any correlation between anthropometric measurements and nutrient intake, two pairs of variables were tested and the data are presented in Table XXXVI.

TABLE - XXXVI
 CORRELATION CO-EFFICIENT OF TWO PAIRS OF VARIABLES
 BASED ON ANTHROPOMETRIC MEASUREMENTS AND
 NUTRIENT INTAKES OF THE PRE-SCHOOL
 CHILDREN (4 to 6 years old)

Variables	Rural		Urban		Tribal	
	Boys	Girls	Boys	Girls	Boys	Girls
Quetlet's Index Vs Fat	.6890**	.6700**	.4468**	.6237**	.8389**	.4605**
Energy						
Quetlet's Index VS Protein	.8844**	.8313**	.8209**	.6817**	.6055**	.8377**

** Significant at p 0.01 level.

TABLE - XXXVII
MEAN HIGHT AND WEIGHT OF THE SELECTED POPULATION
GROUPS FROM DIFFERENT AREAS OF ASSAM

Areas	Height (cm)					Weight (kg)		
	Age/Sex group (in Years)	Mean	*Indian stand- ard	%excess or deficit	Mean	*Indian stand- ard	%excess or deficit	
Rural	7-9	M	126.30	126.96	-0.51	27.52	27.00	+1.92
		F	123.58	126.40	-2.23	25.80	26.75	-3.55
	10.12	M	148.30	141.50	+2.68	37.00	35.54	+4.10
		F	143.05	142.76	+0.20	35.30	37.91	-6.88
	13-15	M	154.40	159.66	-3.29	46.55	47.88	-2.77
		F	152.15	158.33	-3.90	44.50	46.66	-4.62
	16-18	M	166.88	174.33	-4.27	52.30	57.28	-8.60
		F	156.50	163.00	-3.98	47.20	49.92	-5.44
	20-50	M	172.58	171.63	+0.55	64.30	60.00	+7.16
		F	162.50	164.00	-0.91	54.05	50.00	+8.10
Urban	7-9	M	126.45	126.96	-0.40	27.71	27.00	+2.62
		F	125.20	126.40	-0.94	25.80	26.75	-3.55
	10-12	M	142.75	141.50	+0.88	36.77	35.54	+3.46
		F	140.60	142.76	-1.47	35.40	37.91	-6.62
	13-15	M	156.65	159.66	-1.88	47.06	47.88	-1.71
		F	152.35	158.33	-3.77	44.58	46.66	-4.45
	16-18	M	167.94	174.33	-3.66	53.54	57.28	-6.52
		F	158.15	163.00	-2.97	47.86	49.92	-4.12
	20-50	M	172.77	171.63	+0.66	63.56	60.00	+5.93
		F	163.30	164.00	-0.42	53.37	50.00	+6.74
Tribal	7-9	M	125.70	126.96	-0.99	26.70	27.00	-1.11
		F	123.66	126.40	-2.15	24.62	26.75	-7.96
	10-12	M	142.05	141.50	+0.38	35.50	35.54	-0.11
		F	139.60	142.76	-2.21	35.02	37.91	-7.62
	13-15	M	152.66	159.66	-4.59	43.60	47.88	-8.93
		F	148.72	158.33	-6.06	42.05	46.66	-9.87
	16-18	M	161.54	174.33	-7.33	51.82	57.28	-9.93
		F	154.37	163.00	-5.29	45.70	49.92	-8.45
	20-50	M	170.80	171.63	-0.48	61.75	60.00	+2.91
		F	163.85	164.00	-0.30	50.45	50.00	+0.90

M = Male F = Female * NCHS (ICMR) 1989

The rural 7 to 9 year boys and girls were shorter compared with the standard. The deficit was 0.51 percent for boys and 2.23 for girls. The rural boys were heavier than the girls and standard values suggested by NCHS (IMCR 1989). The deficit of weight for girls was 3.55 per cent. As far as urban 7 to 9 year children were concerned boys and girls were shorter than the standard values suggested for the age group. Boys were heavier than girls and the body weights were more than the standard measurements. Tribal 7 to 9 year boys and girls were shorter and less heavier than the standard measurements suggested by NCHS for this age group.

Ten to twelve year old rural boys were taller and heavier compared to the standard values. Girls were taller compared to the standard values but their body weights showed a deficit of 6.88 percent compared with standard. Urban 10 to 12 year old boys were taller and heavier compared to standard values. But urban girls showed a deficit of 1.47 percent for height and 6.62 percent for weight compared with the corresponding standard values. Tribal boys were taller than the standard values but weight showed a deficit of 0.11 per cent. Tribal girls recorded deficit height and weight measurements as compared with the standard values.

Rural adolescent boys and girls of 13 to 18 years age were less taller and heavier as compared with the respective standards. Urban adolescent boys and girls (13 to 18 year) were also less heavier and shorter compared to the standard values. Tribal adolescent boys and girls (13 to 18 years) were also shorter and less heavier compared to the standard values.

Rural men were taller and heavier and women were shorter compared to the reference height but the body weights were more than the standard values. Similar trend was observed among the urban men and women. Tribal men and women were shorter compared to the standard values but the body weights were more compared to the standard.

In general, nutrient intake deficits especially that of energy might have contributed over a long period in these deficits in heights and weights for most of the age groups in all the these areas.

H. Total Fats and Oil Intake Pattern in Assamese Diets.

During the conduct of weighment survey aliquots of foods consumed by the different age groups were collected to analyse the total fat intake by the different age groups of Assamese population selected from the three different areas. Total intake constitutes both invisible and visible (or added) fat. Weighment survey gave the intake of visible fat. From these data the visible, invisible and total fat intakes of the different age groups were ascertained and categorized both incomewise and areawise. The percentage of energy derived from the visible invisible and total fat were also computed to arrive at the fat consumption pattern in Assamese diets.

1. Total Fat Intake According to Income

The total fat intake pattern of various age groups according to income is presented in Table XXXVIII. Figure 15&16 gives the total fat intake pattern (visible + invisile) of the different age groups according to income.

When one looks at the visible fat intake of all income groups it is evident that except for the adults (20-59years) in the high income brackets the intake is far below the recommendation. However, when the invisible fat

TABLE - XXXVIII
TOTAL FAT INTAKE OF VARIOUS AGE GROUPS ACCORDING TO INCOME (g/day)

Age group	Sex	LIG			MIG			HIG			RDA (ICMR, 1989)
		Visible	Invisible	Total	Visible	Invisible	Total	Visible	Invisible	Total	
1-3	M	5.0	5.0	10.0	9.0	6.0	15.0	8.0	10.0	18.0	25
	F	5.5	4.0	9.5	8.0	5.0	13.0	8.0	10.0	18.0	
4-6	M	5.0	4.0	9.0	10.0	13.0	23.0	14.0	12.0	26.0	25
	F	5.0	5.0	10.0	8.0	7.0	15.0	16.0	12.0	28.0	
7-12	M	5.0	5.5	10.5	15.0	12.0	27.0	21.0	12.0	33.0	25
	F	5.0	3.0	8.0	10.0	7.0	17.0	22.0	11.5	33.5	
13-19	M	5.0	5.0	10.0	9.0	8.0	17.0	14.0	9.0	24.0	22
	F	6.0	6.0	12.0	11.0	8.0	19.0	15.0	8.0	23.0	
20-39	M	7.0	5.0	12.0	16.0	9.0	25.0	25.0	15.0	40.0	20
	F	8.0	5.0	13.0	17.0	9.0	26.0	25.0	14.0	39.0	
40-59	M	10.0	7.0	17.0	19.0	13.0	32.0	24.0	16.0	40.0	20
	F	9.0	6.5	15.5	18.0	12.0	30.0	22.0	14.0	36.0	
16 and above	M	9.0	7.0	16.0	14.0	9.0	23.0	15.0	13.0	28.0	20
	F	8.0	6.0	14.0	12.0	8.0	20.0	13.0	11.0	24.0	

F = Female
M = Male
LIG - Low income group
MIG - Middle income group
HIG - High income group

TOTAL FAT INTAKE OF MALE OF VARIOUS AGE GROUPS ACCORDING TO INCOME (g/day)

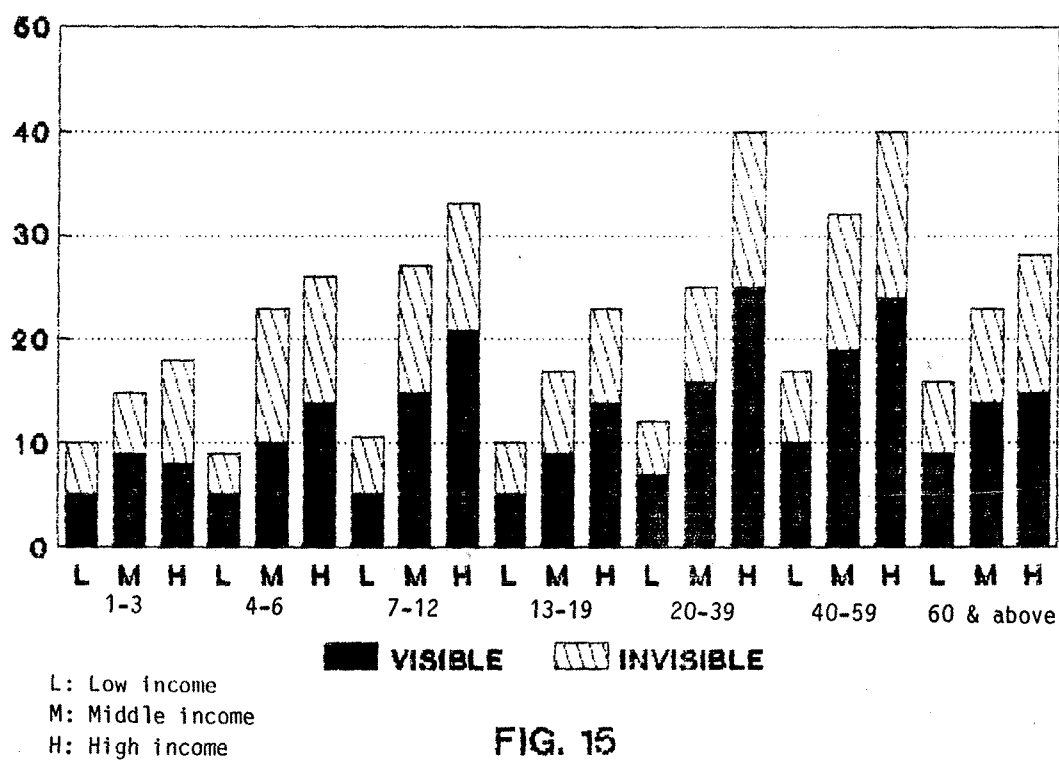


FIG. 15

intake which ranges from 4 to 16g in the diets of different age groups and income levels, the total intake picture varies making a larger section of the population studied to have adequacy in fat intake. It is however, still a matter of interest to note that barring the case of high income group in all age groups and that of a few groups like the 7 to 60 and above middle income groups, the total fat intake was lower than the recommended RDA for all groups. It is notable that in the low income groups for all ages and that of pre school children in all income groups, the total fat intake was far below the recommendations.

2. Total Fat Intake According to Area

The total fat intake pattern of various age groups from different areas studied is presented in Table XXXIX. The total fat intake pattern is also depicted in Figure 17 & 18.

TABLE - XXXIX

TOTAL FAT INTAKE PATTERN OF VARIOUS AGE GROUPS ACCORDING TO AREA (g/day)

Age Group	Sex	Rural			Urban			Tribal			RDA (ICMR, 1969)
		Visible	Invisible	Total	Visible	Invisible	Total	Visible	Invisible	Total	
1-3	M	5.5	4.5	10	8.0	4.0	12	4.0	4.0	8	25
	F	5.5	4.5	10	6.0	5.0	11	4.0	4.0	8	
4-6	M	9.0	11.0	20	16.0	10.0	26	5.0	5.0	10	25
	F	8.0	8.0	16	15.0	10.0	25	6.0	7.0	13	
7-12	M	8.0	8.0	16	20.0	12.0	32	5.0	7.0	12	25
	F	8.0	5.0	13	22.0	11.0	33	6.0	6.0	12	
13-19	M	9.0	8.0	17	12.0	8.0	20	7.0	7.0	14	22
	F	10.0	7.0	17	13.0	7.0	20	8.0	8.0	16	
20-39	M	15.0	9.0	24	22.0	11.0	33	10.0	9.0	19	20
	F	15.0	8.0	23	20.0	9.0	29	10.5	9.5	20	
40-59	M	16.0	14.0	30	25.0	12.0	37	12.0	11.0	23	20
	F	15.0	13.0	28	23.0	11.0	34	11.0	9.0	20	
60 and above	M	11.0	9.0	20	16.0	9.0	25	11.0	12.0	23	20
	F	10.0	8.0	18	13.0	8.0	21	8.0	11.0	19	

M - Male ; F - Female

TOTAL FAT INTAKE OF MALE OF VARIOUS AGE GROUPS ACCORDING TO AREA (g/day)

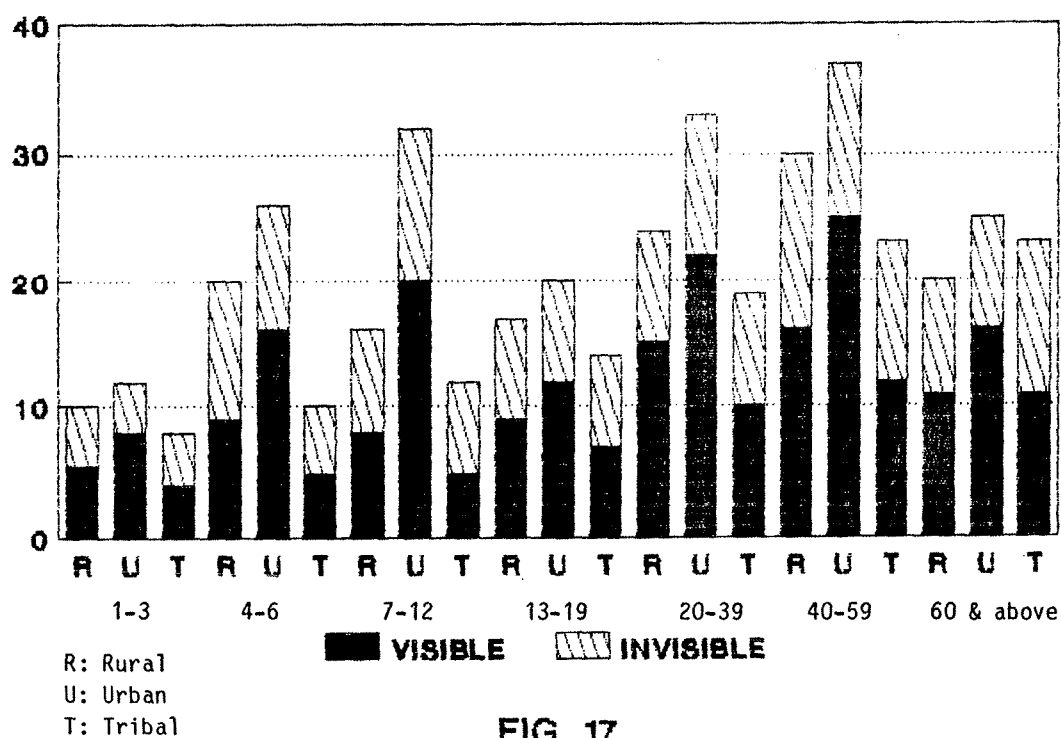


FIG. 17

TOTAL FAT INTAKE OF FEMALE OF VARIOUS AGE GROUPS ACCORDING TO AREA (g/day)

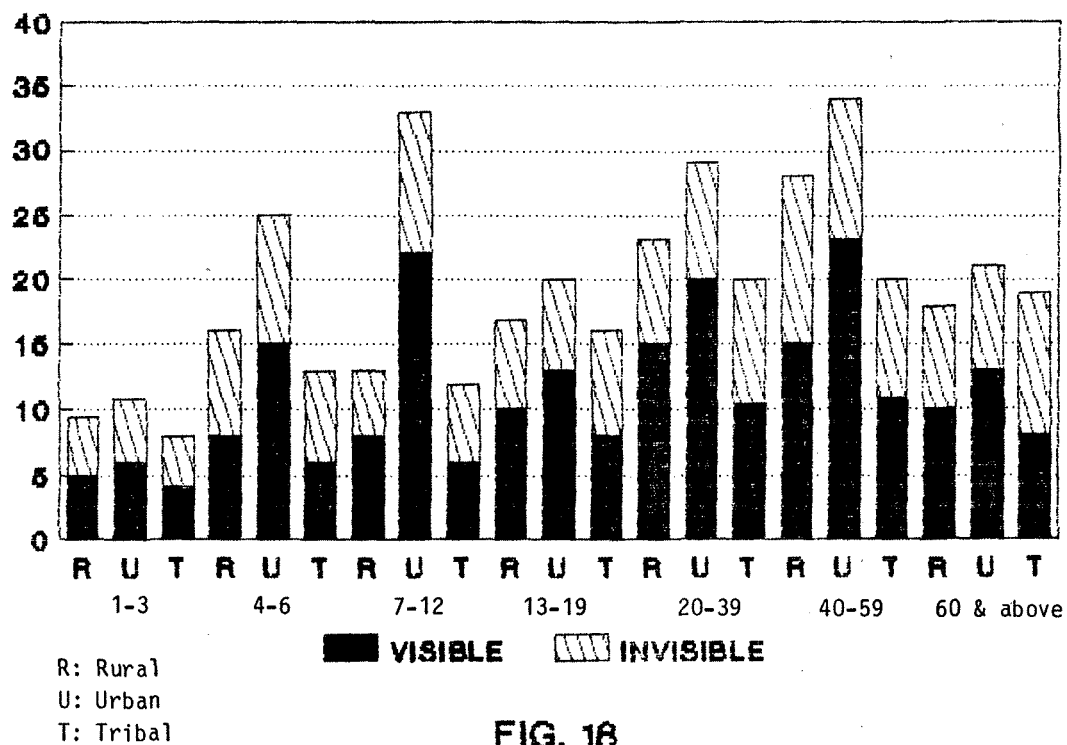


FIG. 18

The visible fat intake of all age groups irrespective of area except for the urban adults (20 to 59 years) was inadequate in terms of their RDA. When the invisible fat intake is considered, the total intake improved for all age groups from all the three areas. The invisible fat intake contributed from 4g in the case of 1 to 3 years old children to 12 to 14g in the case of adults. In spite of this, when the total fat intake is considered, only the adults (20 to 60 and above), from all areas and 4 to 6 and 7 to 12 year urban children could meet the dietary fat intake in comparison to RDA. It is notable that both in the rural and tribal areas a gross deficit intake was evident and this deficit was of alarming dimension in the case of pre school children (1 to 3 years) from all areas.

Thus the total fat intake - both visible and invisible when analysed - both income wise and areawise showed gross deficits except may be in the diets of adults from high income groups. In general, the adequacy of fat was just met (i.e. equal to RDA) in many groups from low and middle income adults and in rural and tribal areas, making it clear that by no means the total fat intake pattern was satisfactory in the dietaries studied.

3. Visible, Invisible and Total Fat Energy Per cent in the Diets of Various Age Groups

Details regarding the percentage energy contribution of visible, invisible and total fat in the dietaries of the population group from three different areas is presented in Table XL.

Percentage of energy derived from visible source of fat was lower than the recommended value for all age groups except for adults (40 to 59 years) from the urban area. The percentage of energy from invisible sources of fat was almost 50 per cent of the recommended value thus indicating the fact that inadequacies of total diet as reflected in energy intakes also resulted in lower intakes of invisible fat. When the total energy per cent (visible + invisible) from fat is considered, the value ranges from 6.4 to 12.7 per cent in rural diets, 7.3 to 17.7 per cent in urban diets and 5 to 10.7 per cent in tribal diets for the various age groups. It has been recommended by the ICMR (1989) that the total energy per cent from fat should not exceed 30 per cent. In the present data the total energy per cent (visible + invisible) adds up to a range of 5 to 17.7 per cent only in any of the area studied. This implies that there is a gross inadequacy in energy supplied by fat in the Assamese groups studied. The highest energy percentage from fat is again obtained by the urban groups and the lowest was recorded by tribal groups. These observations are in tune with the earlier observations that only some urban groups were able to have adequacy in fat intake and also that of energy intake.

Observations of Achaya (1986) shows that the total energy per cent from fat in Indian diets to range from 13

to 27 per cent. In the present study this range is even below than that observed by Achaya (1986) indicating in general a very low intake of fat in Assamese diets.

✓ From the foregoing discussions it is evident that the Assamese population in general were agriculture oriented and the dietary pattern did not vary much between the rural, urban and tribal groups. Mustard oil was universally consumed by all groups but refined oils and hydrogenated fats were the speciality of urban areas only. In general fat and oil inclusion in diets was opined by them as necessary for palatability and barring a few from urban middle and high income groups, did not consider an excess consumption of fats and oils to be harmful to health. All groups expressed that their diets were inadequate in fat which they ascribed to their low purchasing power. It was also evident that age old practice of restricting fat for certain disease condition was followed by all the three population group studied. Nutrient intake pattern as brought out by weighment survey revealed gross inadequacies of macro and micro nutrients except ascorbic acid in almost all groups.

Heights and weights of all age groups were also lower than the standard reflecting the poor nutrient intake pattern. Actual analysis of the total fat contents of the

diets of different age groups also brought out the gross deficiency in fat intakes (both visible and invisible) in the diets of all age groups barring the adults. Percentage energy derived from fat was also not satisfactory for all age groups. Thus though in general the consumption pattern of fats in the Assamese diet were far from satisfactory. The pattern was somewhat better among the urban high and middle income groups. But in the urban low income groups and in all the income groups of rural and tribal areas, the pattern of fat consumption was not enviable. It thus emerges that there is a great need to educate all the population group in Assam to have better food and nutrient intake to assure better proportion of visible and invisible fat so as to enhance the percentage energy derived from fat. Better food intake can also help overcome deficiencies in macro and micro nutrients. It is recommended that there is a great need for well planned nutrition education programme in all the areas of Assam which will inturn help have a better nutritional status in further generations.

SUMMARY AND CONSLUSION

proforma calling for details on types and frequency of fat, foods rich in fat, quantity of fat and foods rich in fat used during special occasion, opinion regarding the usage of fats and oils, restriction in the usage of fats and oils during special conditions, disease etc., along with details on socio economic cum dietary habits was formulated.

To find out the actual food intake pattern a sub sample of 96 households were selected and three consecutive day weighment survey also conducted. The fat content of the diets of selected population group was also analysed by using standard procedure to find out the actual total fat intake pattern of the each age group from the selected areas. Height and weight measurements of all age groups in the selected 96 sample households was recorded using standard procedures.

The findings of the present investigation may be summarized as below:

1. Farming was the main occupation of 95.8 per cent of the rural and 91.6 per cent of tribal households whereas 93.7 per cent of the urban households were engaged in non-farming activities like white collar job and business.

2. Forty to 50 per cent of the households from the three different areas belonged to middle income group. Thirty three point four per cent of the households were high income and 25 per cent of urban and 16.6 per cent of the rural and tribal households belonged to low income group.
3. Majority of the rural and tribal household heads had studied upto primary level, whereas 33.8 per cent of the urban household members had studied upto degree level. Illiteracy level was more among the tribal and less among the urban households.
4. Nuclear family system was predominant among all the households surveyed. Fifty two point nine per cent of the urban households had 4 to 6 members in the families and 7 to 9 members were present in 40 per cent of the rural and tribal households. Cent per cent of the rural and tribal and 95.8 per cent of the urban households were non vegetarians.
5. Rice was the main cereal item consumed daily by the selected households from all the areas. Wheat and wheat products were exclusively used by urban

households. Majority of the households from the three areas surveyed consumed pulses, roots and tubers, local variety of greens, mustard oil, sugar and jaggery daily. Milk consumption was regular only among urban households. Fleshy foods were consumed weekly twice or thrice by the urban and rural households, and once in a week by tribal families.

6. The common menu followed by households were rice and rice products with sugar and jaggery as breakfast item. Wheat preparations were also included for breakfast in urban households. Lunch comprised of rice, pulse preparation and vegetable along with non vegetarian item once in a week. The dinner menu were similar to lunch except occasional inclusion of wheat preparation in the urban households.
7. Specially consumed foods by the pregnant women from the three different areas surveyed were banana flower, green leafy vegetables, fish, milk and ghee. The reasons attached to this type of special foods during pregnancy was good for foetus and mother's health, easy delivery and good for baby's blood and complexion. Food specially avoided during pregnancy

were papaya, "Khar" (alkaline preparation) brinjal, cucumber, mutton, pork, egg, pineapple etc. Reasons behind the avoidance was abortive, hairy growth, skin patches on baby's body etc. Special foods consumed by lactating mothers were black pepper, garlic, lean fish, indigenous greens, parboiled rice, sugar, jaggery and "Jhal" (a typical curry). The reason given were mainly galactagogue, pain killer and early wound healing (Uterus). The foods avoided during lactation were pulses, mutton, fatty fish, fruits, greens and hot spices and chillies and reasons given for avoidance were gas producing, difficult to digest, harmful for baby, septic and cold producing.

8. Breast feeding was exclusively practised by majority of rural and tribal mothers and 60 per cent of the urban mothers. Seventy five, 50 and 65 per cent of rural, urban and tribal mothers respectively weaned their infants by three months of age. The common weaning foods were "Bhimkol" (a local variety of banana), soft rice, "Pithaguri" (roasted rice-flour), sago, milk, and sugar. Pulse-rice-vegetable mix 'Khicedi' was also given by urban mothers, as a weaning food. Commercial baby foods were mainly used by urban mothers. Usual

family diet was introduced to the infants not earlier than 6 months but not later than one year by majority of the tribal and rural mothers. Urban mothers introduced their infants to family diet usually after teething. On an average 70 per cent of the rural and tribal mothers and 30 per cent of the urban mothers breast fed their babies till two years of age.

9. Consumption of fatty foods like nuts and oilseeds, fleshy foods, milk and milk products, fats and oils were found daily among the urban high income groups. Mustard oil was consumed daily by cent per cent to 75 per cent of the households from rural and tribal areas.
10. Special deep fat or shallow fat fried preparation were included in the menu during festivals and ceremonies and the practice was more common among urban high income groups. This group also used apart from mustard oil, refined and hydrogenated fats and oils.

11. Smearing, seasoning, adding, shallow-fat-frying and deep-fat-frying, were the different modes of using fats and oils in daily food preparation. Seasoning of dhal and curries were invariably practised by all the households. Addition of raw mustard oil to rice and mashed potato was a commonly observed practice.
12. Cent per cent of the households belonging to the three different areas surveyed opined that inclusion of fats and oils in the diet especially mustard oil enhances palatability. Inclusion of fat rich foods like deep fat fried foods, shallow fat fried foods, nuts and oil seeds, milk and milk products, fleshy food etc. were also opined to be palatability enhancers.
13. Cent per cent of the households from rural, urban and tribal areas, except 6 per cent of urban high income group expressed that mustard oil was not harmful to health. Thirteen per cent of the rural high income and 30 per cent and 25 per cent of the urban middle and high income households respectively expressed that dalda consumption was harmful to

health. Ten per cent of the urban middle and high income group opined that high consumption of ghee may lead to high blood pressure. Majority of the households from rural, urban and tribal areas opined that butter was not harmful for health, except 25 per cent of middle income and 13 per cent of the high income urban households.

14. Majority of the households in all the three areas expressed that foods rich in fat like the shallow and deep fat fried items, nuts and oil seeds, milk and milk products and fleshy food were not harmful to health. Only a few from urban high income group expressed that daily consumption of fleshy foods like pork and egg lead to heart ailments and increased cholesterol levels. Fats and oils were restricted by all groups during specific disease conditions.
15. The nutrient intake of 1 to 3 year old children was deficient in energy, protein, fat, beta carotene, calcium and iron, irrespective of area and income. A minor percentage of excess intake with regard to protein and fat was observed among the rural high income groups. Excess protein, fat, calcium, thiamine and niacin was observed among urban high income groups. Ascorbic acid intake was more than RDA for all the children irrespective of area and income.

16. The diets of 4 to 6 years old children was deficient in energy, and iron. For some nutrients like protein, fat, calcium, beta carotene, thiamine, riboflavin and niacin, urban high income group children recorded excess intake.
17. Energy deficit was also observed among 7 to 9 year old children irrespective of area and income. Except for high income urban children, all the other groups of children had deficit in their protein intake. For nutrients like fat and calcium, excess intake was registered by urban middle and high income group. All the children had deficit of iron and beta carotene in their diets. Except thiamine in urban high income, the other water soluble vitamins were deficient in all the other groups of children irrespective of area and income.
18. Energy deficit was again observed among low and middle income group 10 to 12 year old boys irrespective of area. Urban high income group children revealed excess intake of protein, fat and calcium, Urban middle income group children had excess intake was satisfactory in all the areas and

income groups. Beta carotene intake was deficient except in urban high income group children. As far as B vitamins were concerned thiamine intake was satisfactory among the rural and urban high income group children. Others recorded deficit intake. Niacin intake was adequate among the urban high income group children. Energy deficit was also recorded among 10 to 12 year old girls belonging to low and middle income groups, irrespective of area. Protein intake was also deficient among the girls of the three different areas surveyed. High income group urban girls recorded excess intake of fat, calcium, beta carotene and thiamine. Excess iron intake was recorded by the high income group rural, urban and tribal girls. Riboflavin intake was deficient whereas ascorbic acid intake was excess among all the girls from the selected areas.

19. The high income group 13 to 15 years old belonging to rural, urban and tribal areas, recorded excess energy intake. Protein intake was deficient among all the boys irrespective of area and income. The other nutrients like fat, calcium, beta carotene, thiamine, and niacin intake was deficient among the low and

middle income categories irrespective of the surveyed. The urban high income group registered excess intake of fat, calcium, iron, beta carotene, thiamine and niacin respectively. Energy deficit was observed among the low and middle income group 13 to 15 years old girls, belonging to the three areas studied. Protein intake was grossly deficient. The rural and urban high income group girls recorded excess intake of fat, iron, thiamine, and niacin.

20. Energy intake of low and middle income 16 to 18 years old boys belonging to the three different areas studied, was found to be deficient. Protein, iron, riboflavin, and niacin intake was also deficient among them. The high income group rural, urban and tribal boys recorded excess fat intake. Calcium intake was excess over RDA among the rural and urban high income groups. Urban high income groups also recorded excess beta carotene and thiamine intake. The high income group 16 to 18 years old girls from the three different areas studied had excess intake of energy. The protein intake was grossly deficient and the other nutrients like fat, calcium, iron, thiamine, and ascorbic acid was adequate and excess over RDA among the high income group girls from rural, urban and tribal areas.

21. The rural, urban and tribal high income group adult males had excess energy intake over RDA. Protein and iron intake was adequate only among the urban high income group adults. Excess intake of fat was observed among the middle income rural and urban adults and also among the high income group adults from the three areas surveyed. Deficient intake of beta carotene, thiamine and niacin were also observed. Energy and protein deficit was recorded among the low and middle income adult female population, belonging to rural urban and tribal areas. The high income group adult female, from the three different area studied recorded excess intake of energy over RDA. The adult female belonging to middle and high income households irrespective of area, recorded excess intake of fat. Calcium and iron was adequate only among high income adult female from the three different area surveyed. Thiamine, riboflavin and niacin intake was deficient among low and middle income female from rural urban and tribal areas surveyed.

22. The 4 to 6 years old pre-school boys and girls belonging to rural and tribal areas registered deficit height and weight measurements as compared to the suggested standards. The urban 4 to 6 year old children recorded 0.1 per cent and 0.15 per cent of excess measurements in height, and 7.86 and 7.27 per cent excess in weight measurements. The Quetlet's Index and fat energy per cent of 4 to 6 year old children belonging to rural, urban and tribal areas showed significant correlation. Similarly statistically significant correlation existed between Quetlet's Index and protein intake among the pre-schoolers belonging to the three different areas studied.
23. Ten to 12 year old boys and girls from rural areas were taller than their urban and tribal counterparts. The 20 to 50 year male population groups belonging to urban area were taller than their rural counterparts. The urban 7 to 9 year old boys were heavier than their rural counterparts, whereas the 10 to 12 years old rural boys were heavier than the urban boys. Similarly the 20 to 50 years age group of rural population recorded 7.16 per cent and 8.1 per cent excess weight than the suggested requirement and they were heavier than their urban and tribal counterparts.

24. The fat consumption pattern among the three areas and income levels revealed that in the urban households fat intake pattern was better than the rural and tribal counterparts. The high income groups of population had adequate total fat in their diets. The low and middle income groups could not fulfil their requirements. As such the energy contribution of the total fat and visible and invisible fat, were not satisfactory and was below the suggested desirable levels.

25. A gross deficiency of fat content (both visible and invisible) was observed in the diets of different age groups barring the adults. Percentage energy derived from fat was also not satisfactory for all the age groups. In general the consumption pattern of fats in the Assamese diet were far from satisfactory, the pattern was some what better among the urban high and middle income groups compared to urban low and all the income groups of rural and tribal areas.

From the foregoing summary it is evident that the pattern of fat consumption as studied in this investigation gives a picture which is far from satisfactory. Though the households in all the areas opined purchasing power was the main hurdle for not including adequate fat in their diets, it was evident that many households especially in the rural and tribal areas were not aware of the need to include fat and fatty foods in their diets and the proportion and quantity of fat needed. It also brings to light that only the urban high income groups were able to make use of the available facilities to improve their diets. They were the groups which had a fairly satisfactory fat and other nutrient intake as well. It may however be pointed out that this investigation is limited in scope as human experiments for invitro studies for fat absorption, detailed analysis of the fatty acid profile of diets and the like were beyond the scope of the present investigation. However, it has helped to evaluate the consumption pattern of fats and oils in Assamese diets and has brought out the fact, adequacy of fats and oils consumption has not been achieved. To further understand the pattern it is recommended that further studies along the following lines may be undertaken:

1. Fatty acid profile of the diets may be analysed.
2. Human experiment on fat absorption may be undertaken.

3. Intensive nutrition education programmes may be undertaken to educate the different categories of the population in Assam so as to enable them have a better food and nutrient intake to assure better proportion of fat intake and thereby bridge the deficits in nutrients.
4. Statewide nutrition education policy may be planned and built into the developmental programmes of each block. Such efforts may bring in better dietary habits and this coupled with economic activities can help improve the nutritional status over long periods of time.

It is hoped that such research activities along with statewide action programmes may help better the nutritional profiles of the Assamese population and help build a nutrition conscious future generation in the state.

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ANNEXURES

ANNEXURE - 1

**EVALUATION SCHEDULE FOR PATTERN OF EDIBLE FATS AND OIL
CONSUMPTION IN ASSAMESE DIETARIES**

1. Name of head of the family : CENTRE:
Date:
Name of Investigator:
- (a) Door No :
(b) Address :
(c) Occupation :
(i) Landless labourers
(ii) Agricultural labourers
(iii) Agricultural owners, cultivator
(iv) Land Lords
(v) Business
(vi) Professionals
(vii) Service (Govt./Private)
(viii) Others (Specify)
2. Income of head of the family: Rs.....
3. Composition of the family :
(a) Type: Joint/Nuclear :
(b) Religion and caste : H/C/M/S
(c) Vegetarian/Non-vegetarian:

* H = Hindu
C = Christian
M = Muslim
S = Sikh

Details of the family members

S.No	Name of the member	Relation to the head of the family	Marital status	Age	Sex	Consumption Unit	Weight (Kg)	Height (Cm)	Frank sign of mal nutrition	Education	Income p.m
			M UM W						1 2 3 4 5		Main Other Sources

4. Details of family food consumption and frequency (Specify food item):

Food	Quantity consumed expenditure		
	Daily	Weekly	Monthly
CEREALS			
1. Rice			
2. Atta (Wheat flour whole)			
3. Maida (Wheat flour refined)			
4. Semolina			
5. Rice flakes			
6. Rice puffed			
7. Any other			
PULSES AND LEGUMES			
1. Red gram			
2. Lentil			
3. Green gram			
4. Bengal gram			
5. Black gram			
6. Gram			
7. Green pea (dry)			
8. Rajmah			
9. Soyabean			
10. Any other			
ROOTS AND TUBERS			
1. Potato			
2. Sweet potato			
3. Yam			
4. Colocasia			
5. Tapioca			
6. Banana rhizome			
7. Beet root			
8. Carrot			
9. Mango ginger			
10. Onion			
11. Turnip			
12. Radish			
13. Any other			

Food	Quantity consumed (gm/ml)		
	Daily	Weekly	Monthly
GREEN LEAFY VEGETABLES			
1. Amaranth			
2. Ambat chuka			
3. Bathua leaves			
4. Bottle gourd leaves			
5. Colocasia leaves			
6. Coriander leaves			
7. Curry leaves			
8. Drumstick leaves			
9. Fenugreek leaves			
10. Mint			
11. Lettuce			
12. Mustard leaves			
13. Neem leave			
14. Pumpkin leaves			
15. Radish leaves			
16. Brassica leaves			
17. Spinach			
18. Sweet potato greens			
19. Manimuni sag			
20. Matikaduri			
21. Daron sag			
22. Purai sag			
23. Babori sag			
24. Tengesi sag			
25. Lofa sag			
26. Kalmou			
27. Dhekia (fern)			
28. Vaailata sag			
29. Any other			

Food	Quantity consumed (gm/ml)		
	Daily	Weekly	Monthly
OTHER VEGETABLES			
1. Ash gourd			
2. Beans (runner)			
3. Bitter gourd			
4. Bottle gourd			
5. Brinjal			
6. Cauliflower			
7. Chactha (<u>Dillenia Indica</u>)			
8. Cowpea pods			
9. Cucumber			
10. Drumstick			
11. French beans			
12. Giant chillies			
13. Jack tender			
14. Knol-khol			
15. Ladies fingers			
16. Papaya green			
17. Peas			
18. Plantain flower			
19. Plantain green			
20. Plantain stem (Posola)			
21. Pumpkin			
22. Pumpkin flowers			
23. Ridge gourd			
24. Snake gourd			
25. Toroi			
26. Squash			
27. Tomato			
28. Roselle			
29. Any others			

Food	Quantity consumed (gm/ml)			Expenditure
	Daily	Weekly	Monthly	(Rs)
FRUITS				
1. Amla				
2. Apple				
3. Bael fruits				
4. Banana				
5. Carambola				
6. Figs				
7. Cherries				
8. Grapes				
9. Guava				
10. Jack fruit				
11. Jambu				
12. Lemon				
13. Lichi				
14. Musambi				
15. Orange				
16. Any other				
17. Mango				
18. Melon				
19. Mulberry				
20. Paniyal				
21. Papaya ripe				
22. Peaches				
23. Pears				
24. Pine-apple				
25. Pomegranate				
26. Raisins				
27. Sapota				
28. Wood apple				
29. Zizyphus				
30. Leteku				
31. Any other (Specify)				

	Quantity consumed (gm/ml)			Expenditure (Rs)
	Daily	Weekly	Monthly	

NUTS AND OIL SEEDS:

1. Ground nut
2. Cashew nut
3. Coconut (dry or fresh)
4. Almond
5. Gingelly seed
6. Mustard seed
7. Pistachio nut
8. Walnut
9. Any other (Specify)

OIL AND FATS

1. Butter
2. Ghee (cow)
3. Ghee (Buffalo)
4. Vanaspati
5. Mustard oil
6. Ground nut oil
7. Gingelly oil
8. Sunflower oil
9. Safflower oil
10. Any other (Specify)

MEAT, FISH & POULTRY

Fish

1. Bhangar
2. Hilsa
3. Magur
4. Rohu
5. Chital
6. Chingri
7. Crab
8. Kohi

Food	Quantity consumed (gm/ml)			Expenditure (Rs)
	Daily	Weekly	Monthly	
9. Puthi				
10. Pabha				
11. Prawn				
12. Goroi				
13. Kharia				
14. Bahu				
15. Sarputi				
16. Sol				
17. Any other (Specify)				
MEAT & POULTRY				
1. Goat meat				
2. Chicken				
3. Duck				
4. Pigeon				
5. Pork				
6. Beef				
7. Turtles meat				
8. Hen's egg				
9. Duck's egg				
10. Fowl				
11. Snail				
12. Puhu meat				
13. Any others (Specify)				
MILK AND MILK PRODUCTS				
1. Cow's milk				
2. Buffalo's milk				
3. Goat's milk				
4. Reconstituted milk				
5. Milk human				
6. Curd				
7. Butter milk				
8. Skimmed milk				
9. Channa				

Food	Quantity consumed (gm/ml)			Expenditure
	Daily	Weekly	Monthly	(Rs)
10. Cheese				
11. Kheer				
12. Khoa				
13. Any others (Specify)				
SUGAR AND JAGGERY				
1. Sugar				
2. Jaggery				
3. Honey				
4. Others (Specify)				
CONDIMENTS AND SPICES				
1. Asafoetida				
2. Cardammom				
3. Chillies, dry				
4. Chillies, green				
5. Cloves				
6. Coriander				
7. Cumin seeds				
8. Fenurgreek seeds				
9. Garlic				
10. Ginger				
11. Mace				
12. Nutmeg				
13. Pepper				
14. Tamarind				
15. Turmeric				
16. Chinamon				
17. Any others (Specify)				

7. Outside home eating habits

Member eating	Meal - Eaten	Frequency per week	Kinds of food	Remarks on quality

8. Food intake pattern during special occasions

Occasion	Item prepared	Type of fat used	Approximate amount of fat used (gm)

a. FESTIVALS

b. CEREMONIES
(Annaprasna, marriage,
puberty etc.)

c. RITUALS
(Shradh etc.)

d. OTHERS

9. Preparation and consumption of fat fried foods

Prepared foods	Frequency of consumption			Amount of oil used (ml.)	Type of oil used
	Daily	Weekly	Monthly		
Puri					
Parthas					
Chappati					
Nimki					
Halwa					
Jelabi					
Chira vosa					
Mixture					
Boondia					
Sandwich					
Samosa					
Kachori					
Sweets					
Pakoda					
Vada					
Pitha					
Pulav					
Fried rice					
Khicidi					
Legume based preparation					
Vegetable dishes					
Curd/milk based dishes					
Egg preparations					
Meat preparations					

Prepared foods	Frequency of consumption			Amount of oil used (ml)	Type of oil used
	Daily	Weekly	Monthly		

Fish Preparations
 Chicken Preparations
 Pappads
 Chips
 Kheer Preparations (Specify)
 Alu pitika
 Kharoli
 Poppy seed preparation
 Pickles
 Others

10. How do you use oil / fats in the daily food preparations in the family?

a. Name of the preparation	How it is used

b. In combination with preparations

11. What is your opinion regarding the use of the following oils and oil foods with regard to palatability of food and their effect on health?

Items	Palatability				Effect on health			
	Must	Desi	Can	No-opinion	Most	Harmful	Not	No opinion
		-ra	be		harm		harmful	
		ble	dele					
			-ted					

OILS

Coconut
 Gingelly
 Palm
 Refined (double)
 Groundnut
 Mustard
 Safflower
 Cotton seed
 Sun-flower
 Soyabean
 Corn
 Vanaspathi
 Ghee
 Butter
 Others (Specify)

FRIED FOODS

(Specify items)

DEEP FAT

SHALLOW FAT

Palatability					Effects on health			
Must	Desi	Can	No	Opinion	Most	Harm	Not	No opinion
	-ra	be			harm	ful	harm-	
	ble	dele			ful		ful	
		-ted						

FLESHY FOODS

Mutton

Chicken

Duck

Pork

Fish

Dry

Fresh

Prawn

Crab

Egg

Birds

Turtle's Meat

Others (Specify)

12. Indicate the edible oils used by you (from item 11) and give reasons for the same

	Reasons					
Oil Used	Eco - nomi -cal	Status Symbolity	Necess- ity	Availa- bility	Family practice	Others (Specify)

13. Modification in food intake during specific disease conditions
 did any of your family member suffer from the following diseases?
 What were the modifications made in terms of dietary constituents
 such as cereals, pulses, fat and others?

				Recommended by		
Conditions	Age, sex of member	Modification	Self	Doctor	Nutri- tionist	Others
Cardiovascular disease						
High cholesterol						
Diarrhoea						
Constipation						
Dysentery						
Hypertension (Blood Pressure)						
Liver ailments (Jaundice/ Cirrhosis/Hepatitis/Others)						
Peptic and gastric ulcers						
Diabetes						
Respiratory tract infections						
Kidney disease						
Phrynoderma						
Typhoid						
Chicken pox						
Mumps						
Whooping cough						
Diphtheria						
Others (Specify)						

14. Do you think you are taking enough oils and fat in your diet?

Yes

No

Reasons 1.

1.

2.

2.

14.(a) Foods consumption pattern during pregnancy

Conditions	Foods specially consumed	How long	Foods avoided	How long	Reasons

14.(b) Foods consumption pattern during lactation

Conditions	Foods Specially consumed	How long	Foods avoided	How long	Reasons

15. Infant feeding practices

Type of feeding	Time of introduction			Amount (ml)	Frequency	Reasons
	Imme- dia- tely	1-2 hr	2-4 hr	4-6 hr		

1. Feeding of colostrum
2. Breast feeding
3. Any other milk
 - (i) Cow's milk
 - (ii) Buffalo milk
 - (iii) Goat milk
4. Formula feeding
 - (i) Reconstituted milk
(powder)
5. Mode of feeding
 - (i) Bottle
 - (ii) Spoon
 - (iii) Cup
 - (iv) Tumbler
 - (v) Any other (Specify)

16. Food given during weaning

Target group	Weaning food	Amount given	Frequency	Time of introduction of each food

ANNEXURE - 1
FAMILY AND INDIVIDUAL FOOD CONSUMPTION SURVEY
WEIGHMENT METHOD

Name of the head of the
family

Centre:

(a) Door No

(b) Address

Date

Name of the Investigator

Meal	Menu	Weight(g)		Amount of cooked food consumed		Waste Total amount cooked (g)	Raw equivalents consumed by the individual (g)
		Raw ingre-dients	Cooked food	Individual	Quantity (g)		
On Rising							
Breakfast							
Mid Morning							

Bed-time

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Tea

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Menu	Weight (g)	Amount of cooked food consumed	Raw Cooked Individual Quantity	Ingredients
		Waste	Raw	
		Raw equivalent	cooked	
		consumed by	amount	
		individuals		

ANNEXURE - II

TOTAL FAT EXTRACTION PROCEDURE

Chemicals:

1. Appropriate solvent, e.g diethyl ether, Petroleum ether, hexane
2. Cotton Wool (defatted)
3. Boiling chips (glass balls 0 4-5 mm)

Soxtec HT Procedure

1. Grind the samples thoroughly.
2. Load each thimble with about 3g (W_1) of the well mixed sample and cover with a thin layer of cotton wool.
3. Dry the thimbles.
4. Insert the thimbles into the soxtec HT.
5. Dry and preweight (W_2) the extraction cups (with boiling chips). Add 25-50 ml of the solvent into each cup.
6. Insert the cups into the soxtec HT.
7. Extract for 15 minutes in "Boiling" position and for 30-45 minutes in "Rinsing" position.

8. Evaporate the solvent.
9. Release the cups and dry at 100° C for 30 minutes.
10. Cool the cups in a desiccator and weight (W_3).
Calculate percentage fat/oil according to the formula

$$\% \text{ fat oil} = \frac{(W_3 - W_2)}{W_1} \times 100$$

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE

SELECTED POPULATION GROUPS

RURAL

10 - 12 (M)		10 - 12 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
(1)	(2)	(3)	(4)
145.33	37.05	148.05	35.3
143.30	37.07	140.22	32.4
142.30	37.01	143.55	34.0
145.60	37.30	140.30	34.5
145.30	37.60	142.35	35.0
146.30	37.57	145.00	35.6
147.56	36.55	142.80	35.3
147.33	35.05	144.17	35.0
145.50	35.54	145.27	35.3
143.30	36.50	143.10	35.0
145.37	37.20	143.02	35.2
146.30	37.00	143.57	35.3
145.30	37.10	143.17	32.8
145.33	36.58	143.05	32.0
145.60	35.00	143.11	32.0
140.57	35.07	143.05	32.9
144.32	35.58	143.50	33.0
144.67	35.80	143.50	33.5
145.35	35.07	144.20	33.7
145.50	35.85	142.5	35.07
145.30	36.11	142.5	35.3
145.50	36.29	142.6	35.15
145.20	36.50	142.5	35.2

Contd...

Contd.,

(1)	(2)	(3)	(4)
144.78	36.50	143.0	35.0
145.00	36.51	143.05	34.5
145.33	36.50	142.05	34.3
145.30	37.00	142.30	34.0
145.35	37.50	143.02	25.0
145.60	37.00	143.05	35.3
140.88	36.85	144.07	32.4
144.80	86.88	144.00	32.4
145.25	36.59	143.05	35.3
145.00	37.00	142.2	35.4
145.25	37.02	140.5	35.4
145.30	37.00	143.6	35.0
145.05	37.01	143.5	35.0
145.07	36.54	143.17	35.4
145.15	36.09	143.00	35.0
145.30	36.17	143.02	34.9
145.22	36.55	142.5	34.3
145.33	36.52	145.0	34.5
144.88	36.52	142.0	36.0
146.35	36.59	142.7	34.5
146.07	36.71	143.0	32.8
146.07	36.71	143.0	32.8
142.21	36.70	143.05	33.7
144.85	35.5	143.3	34.8
143.50	35.7	143.17	35.2

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE SELECTED POPULATION GROUPS RURAL

13 - 15 (M)		13 - 15 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
(1)	(2)	(3)	(4)
154.40	46.51	152.15	42.3
152.27	46.00	152.3	42.0
155.03	46.00	152.3	42.0
155.5	46.5	152.5	42.0
152.3	45.01	152.5	42.5
156.0	45.22	153.0	42.0
154.3	45.01	153.0	44.0
154.8	43.27	153.0	44.0
154.3	45.8	150.7	44.5
154.5	46.52	152.3	44.5
155.6	46.35	153.7	45.5
153.8	46.8	153.4	46.0
153.8	46.67	153.0	46.0
153.6	46.6	153.0	46.7
153.6	46.60	150.5	45.3
154.0	46.87	151.7	44.5
154.0	42.39	151.8	40.3
154.3	44.52	150.7	42.5
154.7	46.58	152.3	45.0
154.3	46.56	152.17	45.0
154.4	46.7	152.2	44.8
150.2	46.8	153.0	44.5
155.2	46.8	153.0	44.7
153.8	45.5	152.0	44.5

Contd.,

Contd.,

(1)	(2)	(3)	(4)
154.3	43.7	152.1	46.0
154.0	43.6	152.15	43.0
154.5	44.2	152.2	42.5
153.8	44.8	153.0	40.0
153.6	44.8	152.0	40.5
152.6	44.9	150.3	42.3
152.7	44.8	153.0	46.0
153.7	45.0	152.2	43.0
154.4	45.1	152.5	44.5
150.2	45.3	152.5	44.5
150.7	43.7	150.0	42.0
152.8	42.5	150.5	40.0
152.8	42.8	150.7	40.5
155.5	46.0	152.3	42.3
152.5	45.8	152.3	42.5
153.0	46.8	152.4	45.0
154.5	46.4	152.5	40.5
153.0	46.5	152.5	43.0
153.0	47.5	153.0	47.0
163.5	46.4	152.5	47.5
153.8	46.9	154.0	47.0
153.5	46.6	148.3	40.7
153.7	46.6	148.3	40.7
153.7	46.6	148.3	40.5
152.4	46.7	140.6	41.2
153.4	46.5	141.7	44.0
154.4	45.17	150.0	44.3
154.5	46.7	152.0	40.0
154.5	46.7	153.5	40.2

Contd.,

Contd.,

(1)	(2)	(3)	(4)
154.3	46.5	153.6	44.0
154.7	46.8	150.6	43.0
154.5	47.0	152.5	42.5
153.5	47.0	150.5	40.0
154.0	47.3	150.2	42.0

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE

SELECTED POPULATION GROUPS

RURAL

16 - 18 (M)		16 - 18 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
(1)	(2)	(3)	(4)
160.5	52.0	156.5	46.0
166.8	52.0	150.3	47.5
167.0	52.0	150.0	47.5
160.5	50.0	150.5	47.0
160.3	52.4	154.0	47.0
166.0	53.0	154.0	46.0
166.5	52.5	155.5	47.0
166.0	50.5	155.0	45.5
164.2	50.7	156.5	47.5
164.0	50.0	156.0	47.5
168.0	55.0	156.0	47.0
164.0	53.0	156.0	47.0
163.5	53.0	156.0	47.0
166.5	52.3	150.0	46.0
166.0	52.3	155.0	47.5
168.0	52.5	150.0	47.0
166.8	54.0	156.0	47.5
165.0	54.0	156.0	47.5
168.0	55.0	156.5	47.0
160.5	51.5	156.0	46.3
166.8	55.0	156.0	47.5
165.0	52.5	155.0	47.0
166.0	52.0	153.0	47.0
166.0	52.5	153.0	46.5

Contd.,

Contd.,

(1)	(2)	(3)	(4)
165.3	52.0	155.4	47.0
165.0	54.0	154.0	46.5
166.7	54.5	150.3	47.0
166.8	55.3	150.5	47.2
166.0	56.0	150.0	47.0
166.0	55.0	155.0	46.5
166.0	52.3	156.0	46.5
165.0	52.3	150.0	45.5
162.0	52.0	155.0	46.0
162.5	52.0	165.0	46.0
162.5	53.0	156.0	46.0
164.0	53.5	156.8	47.0
165.0	52.0	156.0	47.8
160.0	52.0	156.5	47.5
160.0	53.0	150.0	47.2
160.0	52.0	155.0	47.0
163.5	52.5	152.0	47.5
164.0	52.0	152.0	47.0
164.0	50.0	155.0	47.0
166.0	53.5	154.0	46.0
166.0	54.0	154.3	47.5
166.5	52.5	150.0	47.5
164.0	52.0	156.0	47.6
160.0	52.0	156.0	47.0
164.5	55.0	156.7	47.5
164.0	54.0	156.5	47.5
164.0	52.0	156.5	47.0
166.0	53.5	156.5	46.6
166.0	53.0	156.5	46.5
166.5	53.0	156.0	47.5
165.0	52.3	156.5	47.5

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE

SELECTED POPULATION GROUPS

RURAL

20 - 50 (M)		20 - 50 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
(1)	(2)	(3)	(4)
174.5	64.3	162.5	54.0
170.5	64.0	160.0	54.0
168.5	63.0	160.5	54.0
170.0	63.0	162.5	53.5
170.5	63.5	162.5	53.5
170.5	63.5	160.0	53.5
172.0	65.3	160.0	64.5
173.0	64.0	158.0	54.0
172.5	64.0	158.0	53.2
172.5	65.0	159.0	52.0
172.5	64.0	159.0	50.0
172.0	64.0	155.0	50.5
172.5	64.0	162.0	50.5
174.0	64.0	162.5	52.5
172.0	63.0	160.5	54.0
172.0	62.0	160.5	50.5
172.5	62.5	160.5	53.0
172.0	62.5	162.5	50.0
172.5	65.0	165.0	54.0
170.5	62.5	163.0	52.5
173.0	63.5	163.5	54.0
170.0	64.0	162.0	52.0
172.5	66.0	162.0	50.0

Contd.,

Contd.,

(1)	(2)	(3)	(4)
172.0	60.0	163.5	51.0
172.0	66.5	162.0	51.0
170.0	62.5	164.0	48.5
172.5	63.0	160.2	50.2
173.0	64.5	160.5	52.0
173.0	65.3	162.5	54.0
173.0	64.5	160.6	54.0
170.0	64.0	160.5	54.5
173.5	66.0	162.0	54.5
172.0	65.0	162.5	54.0
172.5	62.0	162.5	54.0
170.5	62.0	162.3	54.0
170.3	62.5	165.0	54.0
172.5	62.0	162.5	54.0
173.0	63.0	162.0	53.0
172.5	64.5	162.0	52.0
172.0	62.0	163.0	52.0
173.5	65.0	163.5	50.0
173.0	64.0	162.0	50.5
172.0	64.0	162.5	54.0
172.5	65.0	162.0	50.2
172.5	64.5	162.5	49.0
172.0	64.0	160.5	52.0
172.5	65.0	160.5	52.0
172.5	64.5	163.0	51.0
170.5	64.5	160.5	50.0
170.5	63.0	163.5	52.7
172.0	64.5	162.0	52.5

APPENDIX III
INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE
SELECTED POPULATION GROUPS
URBAN

4 - 6 (M)		4 - 6 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1	2	3	4
108.5	19.6	108.0	18.6
108.0	18.7	108	18.7
110.2	19.8	110	20.0
110.5	19.5	110	20.0
103.0	17.0	107	18.9
108.5	19.7	108	18.7
110.0	20.1	109	19.0
110.0	21.2	108	18.0
111.5	21.7	111	19.7
109.2	19.3	112	20.8
109.5	19.6	113	21.2
112.5	21.5	112	22.0
113.0	22.5	110	21.6
113.0	22.8	110	19.8
109.5	19.8	108	19.0
110.0	20.0	113	18.2
106.0	18.8	106	22.0
106.5	19.0	106	18.0
108.0	19.7	107	18.0
109.3	20.0	108	18.8
110.0	20.5	105	18.9
113.0	22.0	105	17.4
113.0	22.1	109	17.3
109.5	19.5	109	19.0
112.5	21.4	110	19.5

Contd...

Contd.,

1	2	3	4
112.0	21.7	110	19.5
112.0	21.0	109	19.0
106.0	18.0	111	20.7
107.5	19.3	111	20.8
110.0	21.0	109	19.1
112.0	21.5	106	17.0
110.0	19.7	108	18.7
109.5	19.5	109	19.0
108.5	19.0	105	17.9
108.0	19.0	105	17.0
111.5	21.6	106	18.0
108.5	19.4	106	18.5
108.0	19.2	104	17.0
		104	16.5

ANNEXURE 111

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE
SELECTED POPULATION GROUPS

URBAN

7 - 9 (M)		7 - 9 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1	2	3	4
126.4	27.7	125.2	25.8
126.0	25.0	125.0	25.0
120.0	27.6	125.0	25.5
125.5	27.0	125.8	25.5
125.6	27.5	125.5	25.0
125.5	27.5	125.0	25.0
126.0	27.5	125.5	25.8
126.5	27.4	125.0	26.0
126.4	27.0	125.5	25.5
126.0	25.5	128.0	25.4
126.0	27.0	122.5	25.5
126.5	27.0	125.0	24.0
126.0	27.5	124.0	24.5
125.3	25.0	123.0	24.5
125.0	25.6	122.0	24.0
124.0	25.8	122.5	23.0
120.0	25.0	123.0	23.5
122.3	26.0	124.5	23.5
120.5	27.0	124.8	24.5
125.5	27.0	125.0	25.7
126.5	27.0	125.6	25.0
126.0	27.5	125.2	25.5
122.5	26.0	125.0	25.8
125.0	26.0	125.5	25.8
125.6	22.0	125.5	25.6
125.5	25.0	124.0	25.5
125.0	22.0	126.5	25.3
125.0	25.0	122.5	26.0
125.4	25.7	125.0	26.5

Contd.,

1	2	3	4
142.5	35.0	140.0	35.0
142.0	35.7	141.2	35.4
143.0	36.0	140.2	35.0
145.0	36.5	141.5	34.9
140.0	36.5	140.5	34.5
141.2	36.5	139.0	35.2
142.5	36.5	140.2	33.7
142.0	36.5	140.5	34.5
141.7	36.5	140.2	35.7
142.2	36.5	143.5	36.0
140.0	36.0	143.6	35.0
142.5	35.7	140.0	35.0
141.6	35.2	143.5	33.4
142.7	36.0	140.2	34.5
142.7	35.5	141.0	34.8
142.0	36.0	141.0	34.0
142.5	36.0	140.0	34.5
142.8	35.6	140.6	35.0

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE SELECTED POPULATION GROUPS URBAN

10 - 12 (M)		10 - 12 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1	2	3	4
142.7	36.7	140.6	35.0
142.5	36.0	140.0	37.0
142.0	36.5	140.0	35.0
142.5	36.0	140.0	34.0
142.0	37.7	139.0	34.2
140.0	36.0	139.0	34.5
141.5	35.5	135.7	35.0
140.2	36.7	139.0	34.7
142.7	37.0	138.6	35.0
140.5	36.5	130.5	36.0
139.5	36.7	137.5	35.7
139.0	35.0	140.1	35.2
140.0	35.9	141.2	35.5
140.0	35.5	140.0	35.0
148.0	36.0	140.5	33.9
142.3	35.7	142.0	34.7
142.6	36.0	141.0	35.0
140.0	36.0	140.0	35.6
142.7	36.5	140.5	35.0
142.5	36.5	140.6	35.0
140.0	36.0	140.2	34.5
141.0	33.9	144.0	34.7
140.5	37.0	143.0	34.0
140.5	36.0	140.1	34.8
138.5	36.5	140.2	35.6
138.0	36.5	141.2	35.7
139.5	37.0	140.5	36.0
140.2	36.0	140.2	36.0
142.5	35.7	140.0	36.7
140.5	36.0	140.5	36.0
142.0	35.9	139.0	36.5
139.0	35.0	138.6	36.8
140.2	36.0	135.7	35.0
140.5	36.0	140.0	35.1
140.7	36.0	140.2	35.0
143.0	36.2	140.0	36.0
142.8	36.5	140.2	35.0
142.5	36.0	139.2	35.5
142.0	35.0	139.0	35.0

Contd...

1	2	3	4
126.0	25.8	125.0	25.7
126.0	25.8	125.5	25.0
126.5	26.0	122.5	25.0
126.5	27.0	124.3	25.5
125.0	27.0	125.0	25.8
125.0	27.5	125.5	25.0
122.0	26.0	125.0	24.5
124.5	25.0	122.4	25.9
127.0	24.3	125.0	24.8
127.0	22.5	124.5	24.5
125.3	26.7	124.5	24.5
120.0	27.5	123.6	25.0
125.3	27.5	124.5	25.5
125.6	27.7	125.0	25.0
125.0	27.7	124.0	25.5
120.5	27.7	125.0	25.0
122.5	27.5	125.5	25.5
126.0	27.0	124.5	24.7
125.8	27.5	123.0	24.0
126.5	27.0	122.0	24.0
126.8	27.5	125.0	25.8
126.0	27.0	122.5	25.5
126.4	28.0	125.0	25.8
126.4	28.0	122.5	25.0
126.5	28.5	123.6	25.2
126.7	27.5	126.0	25.5
126.0	25.5	123.5	25.0
126.0	26.0	126.5	25.8
126.5	26.0	123.0	25.0

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE SELECTED POPULATION GROUPS URBAN

13 - 15 (M)		13 - 15 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1	2	3	4
156.0	47.06	152.0	44.5
150.5	47.0	150.3	44.5
154.5	47.5	153.0	44.9
154.0	48.5	152.5	44.0
156.0	47.3	153.0	44.7
156.3	47.5	153.5	46.9
155.7	47.9	153.6	46.0
155.5	47.2	153.5	46.5
156.0	48.9	153.0	45.8
154.5	48.0	152.0	45.0
155.6	46.5	152.0	45.0
156.0	48.0	152.0	44.2
153.0	47.6	152.0	44.3
155.8	47.6	153.5	45.5
155.0	47.0	153.0	46.0
156.0	45.9	154.0	46.0
156.3	48.0	154.0	44.8
156.5	48.0	152.5	44.0
157.0	56.2	152.0	44.5
156.0	50.0	152.0	44.3
156.0	50.0	152.5	40.8
157.0	51.0	152.2	43.5
156.0	47.3	150.0	45.0
153.9	47.5	151.7	43.2
155.7	48.0	152.5	43.0
155.8	48.0	153.5	44.5

Contd....

Contd.,

1	2	3	4
155.5	47.5	155.2	44.6
156.0	45.0	152.3	44.5
156.7	45.0	152.4	44.0
156.0	47.5	152.5	47.0
156.5	47.0	150.5	44.5
157.8	48.0	152.0	43.5
156.6	47.0	152.3	44.0
156.0	47.6	152.5	47.0
156.5	47.06	153.0	44.5
164.5	46.0	152.6	45.0
165.0	46.5	153.5	46.0
154.2	47.0	153.0	44.0
154.5	47.3	152.5	44.5
156.0	47.1	152.0	44.5
156.3	48.0	152.6	43.5
156.7	47.2	153.5	46.0
155.0	47.5	152.0	45.0
155.3	42.0	155.0	44.5
154.0	48.5	152.0	44.5
158.0	49.0	152.0	44.5
157.0	48.0	150.5	44.3
157.0	48.5	150.3	44.5
156.0	48.0	152.0	44.0
156.5	47.5	152.0	45.3
156.2	47.0	150.6	43.7
156.0	47.06	152.3	45.0
156.2	47.2		

ANNEXURE III
INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE
SELECTED POPULATION GROUPS
URBAN

16 - 18 (M)		16 - 18 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1	2	3	4
167.9	53.5	158.15	47.8
165.0	53.0	156.0	47.0
167.8	53.0	158.0	47.0
165.5	53.5	158.5	46.5
167.5	53.5	154.0	47.0
159.0	54.0	154.5	46.0
159.5	54.2	156.6	47.0
165.0	54.0	150.7	46.5
165.0	54.5	153.0	47.0
166.3	53.6	156.0	47.5
166.5	53.0	157.0	47.0
166.2	53.8	157.0	47.5
167.0	55.0	158.0	47.0
167.5	55.0	158.9	46.5
167.9	54.5	158.5	46.5
167.9	55.0	156.0	47.5
165.8	54.3	150.3	47.8
165.5	53.0	156.0	47.0
166.5	54.2	157.3	47.5
166.0	53.5	155.0	47.8
160.0	53.5	153.0	47.0
166.0	53.8	154.5	49.0
167.0	53.0	155.0	49.0
167.5	54.5	152.0	50.5
167.8	54.0	154.3	50.6
165.5	56.0	155.0	50.2
165.0	54.0	156.0	51.2

Contd...

Contd.,

1	2	3	4
165.0	50.2	151.2	52.0
165.5	50.8	157.0	50.0
166.0	53.5	157.3	49.0
162.5	50.5	157.8	47.5
163.5	55.7	158.0	47.8
165.5	58.6	158.0	49.0
167.0	58.9	158.5	48.8
167.5	56.7	158.0	48.0
167.0	56.0	158.0	47.0
160.5	56.8	156.0	48.0
162.5	56.0	158.5	48.0
162.4	56.0	157.0	48.0
163.5	50.0	158.5	48.0
165.0	51.5	158.0	47.5
164.5	53.7	158.9	48.5
160.0	53.0	158.5	48.0
162.5	34.5	158.0	47.5
162.5	55.8	158.0	48.5
165.7	55.0	157.3	48.0
105.0	55.0	150.0	47.9
106.0	54.2	155.6	48.0
163.7	55.6	155.3	46.0
160.0	54.0	156.4	48.5
167.8	55.6	157.0	48.0
167.5	54.0	158.0	48.5

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE SELECTED POPULATION GROUPS

URBAN			
20 - 50 (M) Height(cm) Weight (kg)		20 - 50 (F) Height(cm) Weight(km)	
(1)	(2)	(3)	(4)
172.7	62.5	163.3	53.3
170.2	60.5	160.5	51.2
165.0	60.3	160.5	54.0
165.0	57.0	166.0	55.0
169.0	55.0	163.5	52.0
168.5	51.3	166.0	52.0
168.5	58.0	165.7	55.0
170.5	58.0	164.0	53.0
172.0	59.0	163.5	53.5
172.0	60.5	163.5	53.0
172.5	63.7	164.0	52.0
169.0	63.0	165.5	52.7
169.0	65.0	164.0	52.0
168.5	63.0	163.5	53.6
170.5	62.5	167.5	54.5
170.3	63.0	165.0	54.0
172.4	63.0	163.0	53.3
172.5	60.5	160.0	52.5
170.0	60.5	164.5	50.5
170.0	61.5	165.3	52.0
168.5	62.0	165.7	56.0
165.0	58.5	165.5	53.4
168.5	58.9	155.0	52.5
166.7	62.5	158.0	53.5
170.0	62.5	159.0	54.0
172.5	62.9	158.0	53.3

Contd...

Contd.,

(1)	(2)	(3)	(4)
173.0	62.0	160.2	54.2
173.4	63.0	158.9	51.5
172.5	64.0	160.7	54.0
170.8	65.5	163.0	53.6
172.8	65.0	163.5	53.8
172.5	67.5	163.7	53.0
170.6	67.0	163.0	52.5
168.5	65.5	164.0	52.5
169.0	65.0	165.0	52.6
169.5	67.0	165.0	53.6
170.0	65.0	163.0	53.0
170.5	63.7	160.0	53.7
172.3	63.5	163.2	52.0
173.0	63.0	162.5	52.0
172.5	63.0	162.0	53.0
172.0	63.7	163.5	50.0
172.5	65.7	163.0	52.5
170.5	62.5	162.8	52.5
168.5	63.7	160.5	53.0
166.8	65.7	163.0	53.4
169.0	62.5	162.5	52.0
172.0	63.7	163.0	52.5
173.0	63.7	162.5	50.3
173.5	63.0	163.0	53.2

APPENDIX III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE

SELECTED POPULATION GROUPS

RURAL

4 - 6 (M)		4 - 6 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
(1)	(2)	(3)	(4)
102.0	17.5	102.0	16.0
105.0	18.0	103.0	16.0
108.0	19.2	103.2	16.5
105.3	18.2	107.5	17.8
109.2	19.3	100.0	15.3
111.5	20.0	103.0	16.0
111.0	20.0	107.5	17.4
110.5	19.7	108.0	18.0
105.0	17.0	110.0	19.0
103.0	16.8	105.1	16.2
108.5	19.3	106.0	16.8
107.0	18.0	110.2	18.3
108.5	19.0	108.3	18.5
110.0	19.0	109.0	19.3
109.0	19.7	105.0	16.0
109.5	18.0	106.4	16.8
102.0	19.7	107.0	19.0
105.0	20.8	108.0	17.0
109.5	20.8	104.0	18.2
112.0	20.0	104.0	16.3
111.5	20.0	110.0	19.6
112.0	20.3	106.0	17.0
110.5	20.0	108.2	18.4
110.2	19.3	109.0	19.0

Contd.,

Contd.,

(1)	(2)	(3)	(4)
108.5	20.0	109.0	19.5
110.0	18.0	103.5	16.7
107.0	18.1	102.0	16.2
107.0	18.2	107.2	17.8
107.2	17.0	107.1	17.5
105.5	17.0	107.0	17.0
108.0	19.0	106.5	17.5
		106.0	18.0
		107.5	18.0
		104.0	17.5
		107.0	18.0
		106.0	18.0
		106.0	18.0
		104.0	16.3
		106.0	16.8
		109.0	19.3

APPENDIX III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE

SELECTED POPULATION GROUPS

RURAL

7 - 9 (M)		7 - 9 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
(1)	(2)	(3)	(4)
126.0	27.52	123.50	25.80
120.3	27.39	123.0	26.00
125.0	27.50	122.06	26.01
126.3	27.45	123.07	26.07
122.5	27.80	123.60	26.08
120.5	27.55	123.57	25.90
126.0	27.30	123.55	25.85
126.3	26.50	123.58	25.80
125.7	26.85	123.60	25.80
124.0	26.8	124.5	26.65
122.3	27.00	235.33	26.07
120.3	27.40	125.36	26.32
125.3	27.50	125.00	26.50
120.0	27.50	125.0	26.00
122.0	27.50	126.00	25.80
126.5	27.00	125.50	25.80
126.0	27.50	123.50	25.00
125.5	27.50	122.50	25.80
126.5	26.50	123.50	25.50
126.0	26.50	123.55	25.50
126.5	26.50	124.50	25.60
125.50	27.50	124.80	26.00
126.0	27.50	125.00	26.00

Contd.,

Contd.,

(1)	(2)	(3)	(4)
126.3	27.5	123.50	26.0
126.5	27.5	123.6	26.4
126.9	27.5	124.5	25.5
127.5	27.5	125.0	25.5
127.0	27.5	124.0	25.7
125.7	26.0	123.5	26.3
125.0	26.0	123.0	25.5
125.0	27.5	124.5	26.0
126.6	27.5	124.5	26.0
128.0	27.5	124.0	25.5

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE SELECTED POPULATIONS GROUPS TRIBAL

4 - 6 (M)		4- 6 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1	2	3	4
106.0	17.5	102.5	15.8
102.0	16.0	100.2	15.8
103.5	16.6	103.7	16.11
102.0	16.0	100.0	16.0
108.0	18.2	100.0	15.0
108.5	18.5	98.5	15.6
106.0	17.0	99.0	15.0
109.0	19.5	101.2	15.3
107.5	18.0	105.0	16.7
110.0	20.0	105.0	16.4
99.5	15.7	100.0	16.9
99.4	15.5	106.2	15.7
102.5	16.0	100.5	16.9
106.0	17.2	105.0	15.7
106.0	17.0	107.0	16.9
107.5	18.0	107.0	17.0
110.0	19.3	108.5	17.6
110.0	20.0	106.0	16.5
107.5	17.5	105.0	16.0
109.2	19. 5	105.0	16.8
108.3	18.5	106.2	17.3
108.0	18.0	106.0	16.5
108.0	18.1	109.0	18.9
111.0	20.2	107.0	17.8
110.2	19.7	110.0	21.5
107.0	17.5	108.5	19.8
104.9	16.9	109.0	19.6
104.0	16.7	109.0	20.0
105.3	16.5	108.5	19.5
108.5	18.04	108.0	19.5

Contd.,

1	2	3	4
		108.0	19.0
		105.0	16.5
		105.0	16.0
		105.0	16.4
		105.0	16.0
		110.0	19.8
		110.0	21.5
		109.5	18.5
		109.0	18.5
		109.0	20.0

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE SELECTED POPULATIONS GROUPS TRIBAL

7 - 9 (M)		7 - 9 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1	2	3	4
127.7	26.7	123.0	24.6
125.0	26.0	120.5	25.0
125.0	26.0	123.0	24.0
125.6	26.5	125.0	26.0
126.1	26.5	120.5	24.0
126.0	26.7	123.5	24.0
126.5	25.5	123.0	25.0
126.5	26.0	125.0	24.5
126.5	26.7	126.0	26.0
125.7	26.5	126.0	24.5
125.4	27.5	125.0	23.5
126.0	27.0	122.5	23.0
125.0	26.5	123.0	24.2
126.0	26.0	121.5	24.5
126.0	26.7	120.5	25.0
126.0	26.8	125.0	24.5
124.5	26.5	125.0	24.6
125.0	26.0	125.3	24.0
125.7	26.5	125.5	24.2
125.7	25.0	123.0	24.0
125.5	26.0	123.2	24.3
125.6	26.0	123.5	24.5
125.0	26.0	123.0	25.0
125.5	26.5	122.5	24.3
126.0	26.0	122.5	24.7

Contd...

Contd.,

1	2	3	4
125.0	26.5	123.6	23.0
126.7	27.0	123.7	23.5
126.0	28.5	123.0	23.8
127.3	27.0	120.5	25.0
126.0	26.0	121.0	24.5
125.0	27.0	123.5	24.5
125.5	25.0	123.0	24.3
125.7	25.0	123.0	23.9
125.0	26.5	123.4	25.5
126.5	26.0	123.5	26.0
126.0	26.5	123.0	20.5
125.0	26.4	125.0	20.5
125.0	26.0	125.0	23.5
125.7	25.5	123.0	23.0
128.0	25.0	123.3	24.0
126.0	25.7	125.0	24.5
128.0	26.0	124.0	24.0
122.5	25.0	121.2	24.0
128.9	25.5	121.2	24.5
125.3	27.0	123.5	24.9
125.7	26.7	123.0	24.5
126.0	26.5	125.0	23.0
125.0	26.0	120.2	20.0
125.0	26.5	123.5	23.0
126.0	27.0	123.0	23.0
126.0	27.0	123.0	23.5
125.5	26.5	123.0	23.6
124.0	26.0	123.0	22.7
124.5	26.5	123.5	24.5
125.0	26.0	125.0	24.0
125.3	26.3		

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE SELECTED POPULATIONS GROUPS TRIBAL

10 - 12 (M)		10 - 12 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1	2	3	4
142.0	35.5	139.6	35.02
140.5	35.0	135.8	35.0
152.5	36.0	136.6	35.0
143.0	35.0	135.5	33.0
140.5	33.5	136.0	34.0
142.0	33.0	139.0	34.5
142.0	35.0	138.5	34.5
143.0	35.0	138.2	35.0
142.5	35.5	138.5	35.0
142.5	34.0	137.0	33.6
144.3	35.0	138.0	33.7
142.0	36.2	139.5	33.0
142.5	35.0	139.0	33.5
143.0	35.0	135.8	33.6
142.7	36.7	139.0	33.5
142.2	35.0	139.5	33.0
140.5	35.2	138.0	33.5
142.5	34.5	138.5	34.0
143.0	35.0	130.5	34.0
142.0	35.2	136.0	33.5
142.0	36.0	138.5	33.5
145.0	35.2	138.0	34.0
143.0	25.0	137.5	34.0
142.0	34.4	139.0	33.5
141.5	36.5	140.2	35.0
142.0	36.0	140.0	35.0
138.5	35.0	140.0	36.0

Contd...

Contd.,

1	2	3	4
138.0	35.2	140.2	35.0
135.0	33.9	141.2	33.0
139.0	36.7	142.5	34.0
140.5	34.5	140.0	35.0
141.5	35.2	141.2	33.0
141.5	35.2	139.5	35.0
140.2	35.0	139.6	35.0
141.2	35.0	139.7	34.0
142.3	35.3	138.5	35.0
141.5	35.0	136.0	35.0
142.0	35.2	133.7	35.0
141.5	36.0	136.0	34.5
141.7	36.0	135.5	34.5
142.0	35.2	136.0	33.3
141.5	35.2	137.0	34.5
140.7	35.7	139.0	33.7
142.2	35.3	138.5	34.0
143.0	35.0	138.5	35.5
142.5	35.0	139.0	35.5
142.0	35.7	135.0	55.0
141.0	36.0	139.0	35.0
141.5	34.7	135.0	35.0
141.6	34.0	139.0	35.0
142.3	34.5	139.0	36.0
140.5	35.5	137.5	35.0
140.5	35.0	137.5	35.3
142.5	35.6		

ANNEXURE III
INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENTS OF THE
SELECTED POPULATIONS GROUPS
TRIBAL

13 - 15 (M)		13 - 15 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1	2	3	4
152.3	43.6	148.7	42.0
152.0	42.0	148.5	42.0
152.5	43.5	148.2	42.5
153.0	43.0	148.0	42.0
152.0	43.5	148.0	42.0
153.0	43.6	146.5	42.5
153.5	43.6	147.0	43.0
153.0	42.5	147.0	42.0
152.3	42.5	148.0	43.5
152.3	43.0	148.5	43.0
152.3	43.0	144.0	42.0
152.3	43.6	145.3	41.5
154.0	43.5	148.0	41.5
153.0	43.0	148.5	42.5
153.2	44.0	146.0	42.0
153.5	44.0	146.5	42.0
152.0	43.2	147.2	42.0
152.3	43.5	147.5	41.5
150.5	43.0	148.0	42.0
150.6	43.0	147.5	42.0
152.0	43.5	147.0	42.0
152.5	43.0	147.0	42.0
153.0	42.5	143.2	43.0
152.3	42.5	148.0	42.0
152.0	43.0	148.5	42.5

Contd....

Contd.,

1	2	3	4
152.6	43.6	148.7	43.0
152.0	43.5	142.0	42.0
152.3	43.0	148.0	42.1
152.5	43.6	148.2	42.0
154.0	43.0	148.5	42.5
153.0	43.0	148.0	42.2
153.0	42.5	148.2	42.0
152.0	42.0	148.5	42.0
152.5	43.0	148.0	42.0
153.3	43.5	148.0	42.3
152.0	43.0	148.7	42.5
152.5	43.0	147.0	41.6
150.3	43.6	147.0	41.7
153.6	42.5	148.5	41.5
152.0	40.0	148.7	42.0
152.5	43.0	148.0	43.0
150.0	42.5	147.5	43.0
152.0	42.0	147.5	42.5
152.3	42.5	148.6	42.0
153.5	42.5	148.0	42.0
152.3	4.0	147.7	42.5
152.0	40.5	148.5	42.5
152.5	41.5	148.7	42.5
152.3	42.0	148.0	42.0
153.0	42.6	148.5	42.0
153.0	43.0	146.0	42.0
152.3	43.5	147.5	42.0
153.6	43.6	147.0	42.2
153.0	43.6	148.2	42.5
152.0	43.5	148.7	42.0
152.5	43.6	148.3	42.0
152.3	43.0	145.0	41.0

Contd.,

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENT OF THE

SELECTED POPULATIONS GROUPS

TRIBAL

16 - 18 (M)		16 - 18 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1	2	3	4
161.5	51.8	154.0	45.7
161.0	51.5	154.0	45.0
161.2	51.5	154.5	45.0
161.5	51.2	154.0	44.5
162.0	51.0	154.2	44.5
162.0	51.5	154.5	44.0
161.5	50.0	154.0	45.5
161.5	51.5	153.5	45.5
161.0	52.0	153.5	45.0
161.2	52.0	153.5	45.0
160.0	51.5	154.0	45.0
160.5	51.8	152.5	45.0
160.0	50.5	152.0	45.5
161.2	50.5	153.5	46.0
161.0	50.0	154.0	45.0
161.2	49.5	154.0	45.2
161.5	51.3	153.5	45.0
161.2	51.0	154.0	45.5
161.0	50.5	153.0	45.0
161.5	50.7	154.2	45.7
160.0	50.8	154.0	45.5
160.5	52.0	154.0	45.0
161.5	52.0	153.5	45.7

Contd.,

1	2	3	4
160.0	50.8	154.0	45.5
160.5	52.0	154.0	45.0
161.5	52.0	153.5	45.7
161.5	51.0	150.0	45.7
161.0	51.0	150.0	45.7
160.0	51.5	151.0	45.0
160.0	51.5	151.0	45.0
160.5	51.5	152.5	45.5
161.5	51.7	152.3	45.0
161.5	51.8	152.0	45.0
161.5	51.8	152.0	45.0
161.0	51.0	154.0	46.6
161.2	51.5	154.5	46.0
160.5	51.0	154.0	45.8
161.2	51.0	153.7	45.0
161.0	51.2	153.0	44.0
161.0	51.5	154.0	44.5
160.5	51.5	154.5	45.0
160.0	51.8	154.5	45.0
160.0	51.0	154.0	45.0
161.5	51.2	154.0	45.5
162.0	51.5	154.0	45.0
162.0	51.5	154.0	45.0
162.0	51.8	154.0	45.8
161.5	52.0	154.2	45.0
161.0	52.0	154.2	45.0
163.0	51.0	152.0	44.0
162.5	51.3	153.5	44.7
162.5	51.8	154.0	47.0
161.0	51.0	154.0	45.7
162.0	51.5	153.8	45.0
162.5	51.0	152.8	45.0

Contd..

Contd.,

(1)	(2)	(3)	(4)
161.5	50.0	153.5	45.0
162.5	50.2	154.0	45.5
161.7	50.7	153.5	45.2
162.0	52.5	154.5	45.0
161.5	52.5	154.5	45.0
161.0	52.8	154.0	45.5
161.0	51.7	154.0	45.0
161.0	52.0	154.0	45.5
161.3	51.8	154.0--	45.5
161.5	51.0	154.2	45.0
161.0	51.5	154.5	45.7

ANNEXURE III

INDIVIDUAL HEIGHT AND WEIGHT MEASUREMENT OF THE SELECTED POPULATIONS GROUPS

TRIBAL

20 - 50 (M)		20 - 50 (F)	
Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1	2	3	4
170.8	61.7	163.5	50.5
170.5	61.5	163.0	50.0
170.0	61.0	163.5	51.0
169.5	62.0	163.0	51.0
170.0	61.5	162.5	50.5
172.0	61.0	163.5	50.5
171.5	61.5	163.0	51.0
171.0	61.0	164.0	51.0
171.5	62.0	163.5	50.5
170.0	59.2	163.5	51.2
170.0	60.5	163.0	51.5
170.5	60.5	164.0	51.7
171.5	61.5	163.0	50.0
172.0	52.0	163.5	51.0
170.0	61.7	163.0	51.5
169.5	60.5	163.0	50.0
172.0	61.5	162.0	50.0
170.0	61.5	162.5	50.2
171.0	60.0	163.0	50.0
170.0	61.5	163.5	51.0
170.5	61.7	163.0	50.5
170.5	61.0	163.5	50.5
171.0	61.5	163.5	50.5
170.5	60.5	164.0	51.0

Contd.

Contd. ,

(1)	(2)	(3)	(4)
170.8	60.5	164.0	51.5
170.0	61.5	164.0	51.0
171.0	61.0	164.0	50.5
170.5	61.5	163.0	50.5
170.0	60.0	163.5	50.0
170.5	61.5	163.5	50.2
170.8	61.7	163.0	51.2
170.5	60.5	162.2	50.0
170.0	61.0	163.0	50.5
171.5	61.5	163.5	50.5
171.5	61.8	164.0	51.5
171.5	61.8	163.8	50.5
171.5	61.0	164.0	51.5
171.8	61.5	164.0	51.5
170.5	61.0	163.0	50.5
170.5	61.0	163.5	51.0
170.0	60.5	160.5	50.0
171.5	61.2	163.5	51.0
170.0	59.0	163.0	50.5
171.5	60.5	163.0	50.5