DIETARY PROFILE OF GOITRE PATIENTS

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THESIS

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DECLARATION

I hereby declare that this thesis entitled "**Dietary profile of goitre patients**" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award of any degree. diploma. associateship. fellowship or other similar title of any other University or Society.

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Certified that this thesis entitled "**Dietary profile of goitre patients**" is a record of research work done independently by **Ms. Sheeja Kamal** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to her.

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DEDICATED

TO

MY FATHER

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INTRODUCTION

1. INTRODUCTION

Iodine is an essential micronutrient required for normal human growth and development. It is a necessary nutrient for the production of thyroid hormones which regulate a variety of physiological functions and is critical for the optimum development of brain and different parts of the body.

The actual daily need of iodine by human body is about 150 mcg. But the mean iodine intake of an average Indian is 28-32 mcg (Kochupillai, 2000). Inadequate intake of iodine adversely affects thyroid hormone production, resulting in the disease known as the Iodine Deficiency Disorders.

Iodine Deficiency Disorders are global phenomena. Iodine deficiency is a major public health problem in India. Iodine deficiency therefore poses a serious threat to health and quality of our human resources. It affects all age groups leading to a wide spectrum of disorders. Among the disorders goitre is the most common and visible ill-effect of iodine deficiency, prevalent in different parts of the world, including India.

Goitre is a public health hazard. In India itself 40 million people are believed to be afflicted. Endemic goitre prevalent throughout the country from the hills of Himachal to the Terai of Uttarpradesh to coastal Kerala (Prasannan, 2000).

Goitre is an abnormal swelling in the neck caused by an enlarged thyroid gland. The most common cause of goitre is lack of iodine (Orbis, 1987) in the diet. Iodine occurs mostly as iodides on the top soil of earth. Glaciers, floods, heavy rain, deforestration and soil erosion contribute to leaching out of iodine from soil. Thus the food crops and vegetables grown in these regions become deficient in iodine. Due to the iodine deficiency in food crops and vegetables, most of the human beings do not get the adequate amount of iodine. In view of the continuous degradation of the environment, there is an urgent need to supplement dietary iodine.

Several other factors may also contribute or may even be responsible for local endemics like pollution of drinking water, flooding, poverty, protein energy malnutrition and presence of effective goitrogens in unusual dietary situation, goitrogens present in food stuff adversely influence the utilisation of iodine present in the diet. The high amount of thiocyanates and isothiocyanates present in goitrogenic foods like tapioca, cabbage etc. responsible for its goitrogenic activity.

Elimination of goitre is of public health importance and therefore information regarding dietary pattern and etiology is of utmost value in deciding management strategies.

Studies pertaining to the dietary pattern of goitre patients in Kerala is scarce. Hence an attempt was made to assess the dietary profile of goitre patients. The objective of the present study is to find out the

(1) Socio economic profile of goitre patents

(2) Dietary profile of goitre patients and

(3) Health profile of goitre patients

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

Literature available on different aspects related to the present study entitled "Dietary profile of goitre patients" is furnished under the following headings.

2.1 Consequences of Iodine Deficiency Disorders

2.2 Prevalence of goitre in the world

2.3 Prevalence of goitre in India

2.4 Causes of goitre

2.5 Dietary sources of iodine

2.6 Prevention of goitre

2.1 Consequences of Iodine Deficiency Disorders

Iodine deficiency is caused by hyperplasia of the thyroid gland due to non-availability of iodine for the synthesis of its hormones (Raheena, 1997).

WHO (1990) reported that iodine deficiency is yet another major nutrition problem in India. Hetzel and Pandav (1994) pointed out that iodine deficiency affect different parts of the body, particularly muscle, heart, liver, kidney and the developing brain.

According to Brahmam (1998) depending on the stage of development the iodine deficiency leads to a variety of

disorders such as abortions, still births, congenital abnormalities, increased perinatal mortality, increased infant mortality, neurological cretinism, myxodematous cretinism and psychomotor defects. The author also pointed out that during neonate stage iodine deficiency cause neonatal goitre and neonatal hypothyroidism. In childhood, iodine deficiency leads to lowered IQ, impaired learning and pre school performance, mental retardation, growth failure or stunting, speech and hearing defects, juvenile hypothyroidism and retarded physical development (I plus, 1995; Hetzel and Dunn, 1989).

A study conducted by Ninan (1997) reported a spectrum of disorders arising out of continuous iodine deficiency in food. It include deaf-mutism, squint, difficulty in standing or walking normally etc.

According to ICMR (1989) the major crippling consequences of iodine deficiency is endemic cretinism ie. severe stunting coupled with mental retardation. Endemic cretinism is associated with severe iodine deficiency during intra uterine life.

Stanbury (1994) revealed that cretinism is a consequence of severe iodine deficiency in early pregnancy. The author also reported that cretins are feeble-minded dwarfs with characteristic faces and gait.

Hetzel and Orley (1985) observed that cretinism increases significantly when the mother's normal daily intake of iodine falls below 20 mcg (normal daily intake for adults being 80-150 mcg).

Shukla (1982) stated that the infants are apparently normal at birth and signs appear only in the middle of 1st year producing a fall.

Hetzel (1989) reported that a wide range of defects such as mental deficiency, deaf-mutism and spastic paralysis of legs in varying degrees are associated with this condition.

Pandav *et al.* (1988) revealed that myxoedematous cretins exhibit signs of hypothyroidism such as coarse and dry skin, swollen tongue, deep hoarse voice, apathy and mental deficiency, skeletal retardation, weak abdominal muscles, sluggish bowel functions and delayed tenden reflexes in this condition.

The author also reported that neurological cretinism is seen predominantly in areas with environmental iodine deficiency, while myxoedematous cretinism is seen predominantly in areas where consumption of foods having goitrogens is common.

Schrvder *et al* (1996) observed that an advanced or extreme hypothyroidism, called myxoedema is rare and usually

results from long term undiagnosed disease. The author also reported that myxoedema can cause life threatening coma on under active thyroid.

Halpern *et al* (1991) observed that many experimental findings in different species of animals indicate that severe lack of dietary iodine deficiency retards foetus brain development and may impair other new psychological processes.

Fenzi *et al* (1990) suggested that neuropsychological alterations occurs in people living in regions with mild iodine deficiency.

In a study conducted by NIN (1995) reported that foetal tissues are dependent on thyroid hormones for their differentiation, growth and development. The author also reported that thyroid deficiency is associated with severe retardation in maturation of all organ systems, severe iodine deficiency can lead to significant brain damage during perinatal development.

2.2 Prevalence of goitre in the world

WHO (1985) reported that endemic goitre is the best known and easily recognizable forms of iodine deficiency recognized for centuries in many parts of the world. According to Pandav and Kochupillai (1982) endemic goitre still remains one of the world's most serious health problem. International

Council for Control of Iodine Deficiency Disorders (1995) reported that about 800 million people living in iodine deficient environment throughout the world are exposed to the risk of Iodine Deficiency Disorders and out of them, 190 million are known to suffer from goitre.

World Health Organization (1985) reported that about 500 million Asians inhibit such endemic goitre areas. In many areas of the South East Asia Region, goitre affects 50 per cent or more of the population. The eight countries in the South East Asia Region having Iodine Deficiency Disorders (DD) as a recognized problem are Bangladesh, Bhutan, Burma, India, Indonesia, Nepal, Srilanka and Thailand. Altogether in the eight IDD affected countries of the region, 102 million people have goitre.

It is well documented that iodine deficiency diseases are wide spread in China, occurring mainly in the inland and mountainous regions. It has been estimated that about 40 per cent of the IDDs world wide occur in China and except for the Shangai Municipality, IDDs are present in most parts of China (Ma *et al.*, 1993).

In many areas of Bhutan, Burma and Nepal, 80-100 per cent of people have goitre. According to Kung *et al.* (1996) iodine deficiency is a serious public health problem world wide and is associated with mental retardation and cretinism.

Cao *et al.* (1994) stated that endemic cretinism caused by severe iodine deficiency is the world's most common preventable causes of mental retardation.

2.3 Prevalence of goitre in India

Brahmam (1998) reported that in India, the endemic belt of goitre and cretinism mainly lies along the slopes, foot hills and plains adjacent to Himalayas, extending over 2400 kms. It extends from the State of Jammu and Kashmir in the West through the States of Himachal Pradesh, Punjab, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Mizoram, Nagaland, Manipur, Tripura and Arunachal Pradesh in the east. In addition, several pockets of endemic goitre are being identified in the other parts of the country such as Aravali Hills of Rajasthan, Sub Vindhya Hills of Madhya Pradesh, Narmada Valley in Gujarat, Hilly areas of Orissa, Andhra Pradesh, tea estates of Karnataka and Kerala and the districts of Aurangabad and Pune in Maharashtra. The author also reported that about 150 million people are exposed to the risk of IDD in the country. Out of this, about 55 million have goitre and 2.2 million suffer from cretinism.

According to Pandav *et al* (1989) Iodine Deficiency Disorders are a major public health problem all over India. Out of the 122 districts from 23 States surveyed by the Government of India, iodine deficiency and endemic goitre is

present in 111 districts. In the remaining 2 States Orissa and Tamilnadu iodine deficiency has been reported by the local medical practioners.

Ninan (1997) reported that the frequent heavy rain pour and flooding has made India and its neighbouring South East Asian countries deficient in iodine. The water and both animal and vegetable foods in India have reduced iodine content compared to other areas in the world. It is estimated that the average iodine intake in India is 100-160 mcg/day, much lower compared to developed countries, 210-340 mcg in U.S.A.

Sample surveys conducted by the Directorate of Government Health Services (1997) in 216 districts of 25 states in India have identified 186 districts as Iodine Deficiency Disorders endemic with a goitre rate of over 10 per cent. As per the results of these surveys no state in India is free from iodine deficiency.

Health ministry 2000 indicated that out of 275 districts surveyed in 25 States and 5 union territories, 235 districts are endemic, were the prevalence rate is more than 10 per cent and 2000 million people are living at the risk Iodine Deficiency Disorders in the country.

According to Anitha (1990) epidemiological survey of the data obtained from various states revealed that the incidence of goitre varies from a minimum of 7 per cent to a

maximum of 80 per cent. Currently not less than 140 million people are estimated to be living in the goitre endemic regions of the country. (Dood and Godhia, 1992). Kavishe (1983) reported that gross goitre rates ranges from 0.5 to 88 per cent and visible goitre rates ranges from 0 per cent to 20.5 per cent in different areas of the country.

Desai (1990) pointed out that the overall prevalence of goitre ranges from 7 per cent in one of the district near the seashore to 45 per cent in the district located in the hilly area. Singh and Singh (1980) confirmed the presence of goitre in Eastern Uttar Pradesh due to iodine deficiency and additive factors like socio economic conditions. Karmarkar (1990) stated that the prevalence rate of goitre in Uttar Pradesh is 70-80 per cent. A survey was conducted by Shah (1990) on 3000 children in the age group of 10-14 years studying in the municipal schools of Bombay revealed that the goitre prevalence rate was about 36 per cent. Lakshmi (1990) pointed out that the prevalence rate in 8 districts of Andhra Pradesh varied from a minimum of 17 per cent to a maximum of 50 per cent.

The overall prevalence of goitre in tribal areas of Visakhapatnam district was found to be 34.7 per cent (Lakshmi, 1985).

ICMR (1989) reported that Iodine Deficiency Disorders, endemic goitre and endemic cretinism are particularly prevalent in the agency area of Visakhapatnam. Sridhar (1990) revealed that in Visakhapatnam 80 per cent has a primary thyroid disorder.

According to Tyabji (1985) in Andhra Pradesh, Iodine Deficiency Disorders have been identified to be prevalent among the tribal population of five of the nine districts with tribal tracts, the prevalence rates ranging from 18 per cent to 48 per cent.

Krishnamachari (1974) reported that endemic goitre is a public health problem in Maharashtra. Choksi *et al.* (1990) stated that the overall prevalence of goitre in middle income group school children in Bombay city was found to be 10.13 per cent.

Sankar *et al.* (1994) stated that a high prevalence of endemic goitre exist in Sikkim. Sankar *et al.* (1995) pointed out that in sadam, the prevalence of goitre was 73.5 per cent. The author also reported that the differences in the mean concentrations between the goitrous and nongoitrous groups were statistically significant.

Park (1995) reported that the overall prevalence of goitre in Sub Himalayan regions was found to be 36 per cent.

Ahmed (1990) revealed that iodine deficiency diseases are widely prevalent and pose a problem of great magnitude in Assam.

As epidemiological study of goitre conducted in two rural communities of Varanasi revealed that the overall prevalence of goitre was as high as 28.44 per cent (Ray *et al.*, 1989).

According to Chaturvedi *et al.* (1996) the prevalence of total goitre in rural South Delhi was found to be 16 per cent. The problem of visible goitre was minimal and overwhelming. Majority of goitre cases belonged to lower grades.

Pandav *et al.* (1997) reported that Iodine Deficiency Disorders are an important cause of mental handicap and poor educability of children. Though Delhi does not lie in the classical Himalayan goitre belt, it has been shown that IDD was endemic in Delhi. Studies of school children in Delhi reported a total goitre rate of 55 per cent which indicates severe endemicity.

The prevalence of endemic goitre was assessed by Agarwal *et al.* (1983) in 4680 school children of Piliblint, Simla, Mandi, Bilaspur and Sundernagar, Jammu and Kashmir, Kamrup, Kohima and Imphal. The prevalence rate was 67.2 per cent in Champaran, over 50 per cent in Simla,

31 per cent in Himachal Pradesh about 40 per cent in Piliblint. 25.2 per cent in Imphal, 23.5 per cent in Kamrup and 5.3 per cent in Kohima.

The prevalence of endemic goitre among 1190 school children of Bharuch district and a near by Baroda village was studied by Agarwal *et al.* (1983) revealed that more than 60 per cent of the children in Janaarj and Jharia villages of Bharuch had goitre.

Joshi *et al.* (1993) stated that in rural area of Meerut the prevalence rate of endemic goitre was 50.1 per cent. The author also reported that the prevalence was increased with age.

In a study conducted by Thakur *et al.* (1997) it was found that Dibrugarh district is a chronic endemic goitrous region of India.

Bhardwaj *et al.* (1997) reported that the goitre prevalence in the school age children was 20.5 per cent indicating that iodine deficiency was a public health problem in the Bikaner district of Rajasthan. An earlier survey conducted on the Kota district, Rajasthan also reported a goitre prevalence of 13 per cent.

Kapil *et al.* (1997) revealed that the total goitre prevalence in Bihar was 11.6 per cent.

According to Poulose *et al* (1984) the first report of endemicity of goitre in Kerala came from Idukki district where a 33 per cent incidence of goitre was found among the labour population in tea estates.

Kochupillai *et al.* (1976) stated that endemic goitre was not prevalent in people residing along the coastal strips of two districts in Kerala as well as in midlands where cassava is widely consumed.

A survey conducted among 1400 patients attending the thyroid clinic of Medical College Hospital, Thiruvananthapuram revealed that about 30 per cent of the patients suffer from simple goitre (Poulose, 1997). The author also opined that the prevalence is more in hilly areas like Vandiperiyar (19 per cent) and Kumily (17 per cent).

The prevalence of goitre in Kerala was found to be 20 per cent. More than 73 per cent of the patients were from rural areas and the affected populations were mainly in the prime stages of life with 16 per cent children up to 15 years, 60 per cent in the age group of 16 to 30 years and 18 per cent in the age group of 31 to 45 years (Prema, 1997).

2.4 Causes of goitre

Stanbury (1980) reported that etiology of endemic goitre has been attributed primarily to absolute and chronic

iodine deficiency. Lal *et al.* (1996) stated that iodine deficiency has been found to enhance the conditions like abortion, still birth, higher infant mortality, neonatal chemical hypothyroidism, endemic goitre and endemic cretinism. Hetzel and Orley (1985) revealed that goitre in over 50 per cent of an adult population is a reliable indicator of a sufficiently severe iodine deficiency to cause frequent births of disabled children. Filteau *et al.* (1994) reported that different contributing causes of goitre among pregnant women in rural Bangladesh, severe iodine deficiency was also included.

Maberly (1994) stated that iodine deficiency is the leading cause of preventable intellectual impairment and is associated with the spectrum of neurological and development pathology and more than one billion people are at risk.

According to Lamberg (1993) an important and world wide nutritional problem is the iodine deficiency which prevails in large areas of the globe and is the main cause of endemic goitre. Goitre means enlargement of thyroid gland and is caused by intrinsic and environmental factors.

Iodine deficiency in food is one of the factors or a condition out of many reasons responsible for goitre formation (Kothari, 1990). The author also indicated that the diet of all people located in all parts of the country is deficient in iodine.

A study conducted by Jooste *et al.* (1992) among undernourished school children in Eastern caprivi revealed that dietary iodine deficiency was the most likely cause for the endemic goitre in these children, who were predisposed to nutritional disorders by long-term undernourishment.

Mahadi *et al.* (1986) pointed out that the main cause of endemic goitre in the sudan is dietary iodine deficiency. According to Osman and Fatah (1981) low iodine intake, high sodium, potassium and iron in water, low vitamin A in the diet and poor nutritional status are the factors contributing to the high incidence of goitre.

Ubom (1991) revealed that goitre as having multicasual factors like deficiency of iodine, familial or genetic tendencies, diet and pollutants which serve as goitrogens.

ICMR (1989) reported that certain chemical substances such as thiocyanates, thio-oxazolidone, flavanoids, disulphides, phenols, phthalates, biphenyls and lithium which are found in environment are called as 'goitrogens'. Depending on the level of interference, the goitrogens have been categorised into three classes : Thiocyanate, isothiocyanate and cyanogenic glycosides which inhibit iodine up take by the thyroid gland and are grouped as class I goitrogens. Thiourea, thionamides and flavonoids which affect the stages of

organification and coupling in the process of thyroxine synthesis are grouped under class II goitrogens. Excess iodine and lithium which interfere at the stage of protealysis - a step necessary for utilisation of thyroxine, are grouped as class III goitrogens. NIN (1997) revealed that there are some common food stuffs which contain a large amount of goitrogenic compounds. Many of the crucifers that serve as sources of foods and condiments being to the genus brassica. Common example of such foods are cabbage and related vegetables, turnip and mustard green. Cabbage contains thioglucosides and these compounds are metabolised in the body and give thiocyanates and isothiocyanates. These metabolites have antithyroid effect which is not over come by giving larger amounts of iodine (Ahmed, 1990; Karmarkar, 1990). The high amount of thiocyanates and isothiocyanates responsible for goitrogenic activity. A number of commonly consumed foods analysed at the NIN showed varied concentrations of thiocyanate, a hydrolysis product of thioglucosides or glucosinolates. Ladies finger is also believed to contain goitrogenic substances. Okra and millets too are shown to contain thiocyanates (Rao and Lakshmi, 1990; Dube, 1992).

Choudhary (1983) stated that the goitrous effect of pearl millets is due to a thionamide like substance in it, which interferes with formation of thyroid hormones and is not counteracted by iodine prophylaxis. According to Pennington

(1991) goitrogens are also found in kelp, maize, bamboo shoots, sweet potatoes and lime beans.

There are other goitrogenic substances, cassava and tapioca which contain cyanogenic glucosides. These compounds on hydrolysis yield free cyanide which also interferes in iodine metabolism (Ahmed, 1990). Poulose (1997) stated that cassava contain hydrocyanic acid in a form which can block the thyroidal uptake of iodine resulting in thyroid hormone depletion and goitre. According to Parvathy (1987) prolonged consumption of cassava with high hydrocyanic acid content and in properly processed cassava chips may cause goitre.

Ekpechi *et al.* (1996) revealed that the goitrogenic action of cassava was first suspected to be due to a goitrogen present in the tuber.

In a study conducted by Ermans *et al.* (1983) cassava ingestion was one of the key factor in the etiology of endemic goitre and cretinism.

Ermans *et al.* (1980) opined that cassava has a definite anithyroid action in human and animals resulting in the development of endemic goitre and cretinism. In KAU goitrogenic action of cassava was studied by Parvathy (1987). The salient findings of the study indicated that in the diet in which cassava predominated gain in weight of rats, weight of liver and concentration of liver protein were significantly

lower when compared to the central serum and urinary thiocyanate were highest in the cassava diet supplemented with protein. Serum and liver cholesterol levels were highest in the group deficient on both protein and iodine. Serum protein bound iodine was lowest for the group fed cassava alone without protein and iodine supplementation.

Ermans *et al.* (1983) revealed that endemic goitre is very common among the tapioca eating African population.

An ICAR scheme on "Tapioca consumption and goitre incidence" was conducted in Kerala Agricultural University by Prema (1988). The study revealed that seventy four per cent of the goitre patients were subsisting mainly roots and tubers. The author also reported that certain endemic goitre pockets are identified in southern parts of Kerala where tapioca cultivation and consumption is high. According to Poulose (1997) majority of the people in the districts of Kottayam and Idukki are consumers of tapioca where the goitre prevalence is high in Kerala.

Ahuja (1990) reported that bacterial contamination of drinking water with E coli and its total count contributed to a significant extent to the causation of the disease. Certain types of goitrogens derived from the sediments of rock as well as items of food were also considered as etiological causes of goitre.

Large amounts of certain inorganic chemicals such as halides. disulphides and particularly nitrites and nitrates present in water interfere with the trapping mechanism (Ahmed, 1990).

According to Thilly *et al.* (1983) the soyabean milk has also been observed to produce goitre in infants. The goitrogenic substance in soya flour has not been identified, but iodine supplementation eliminates the problem.

Schrvder *et al.* (1996) revealed that the presence of protein caloric deficiency impairs the development of goitre due to a goitrogenic diet.

Rao (1995) revealed that Iodine Deficiency Disorders are mostly due to environmental iodine deficiency resulting in poor iodine content in foods and water.

The principle underlying cause of environmental iodine deficiency is essentially reduced iodine content of the soil. Glaciers, floods and changes in the course of rivers, contribute to leaching out of iodine from soil. The food crops grown on iodine deficient soil will naturally be deficient in iodine and people subsisting solely on these foods will run the risk of developing goitre (Hetzel, 1989; Clements, 1985).

2.5 Dietary sources of iodine

Deosthale *et al.* (1990) stated that among the commonly consumed Indian foods, food stuffs of animal origin has the highest level of iodine. In the plant foods nuts and oilseeds followed by spices and condiments were rich in iodine, while fruits and vegetables on fresh weight basis were very poor in iodine content. Though not rich in iodine cereals contribute more than 75 per cent of the daily intake of iodine because they are consumed in large quantities.

According to Kothari (1990) iodine is also available to the people through consumption of sea-salt and sea foods. Iodine content varies from 3 to 8 mcg/g of iodised salt.

Orbis (1997) revealed that iodised salt is the primary food source of iodine. 'Kelp" is the most common vegetable seafood that is a rich source of iodine. Dairy products and plants grown in soil that is rich in iodine are also good sources.

Milk is an important source of iodine in the Western countries where compounds rich in iodine are used to sterilise the udders of the cows (Pandav, 1998).

Kourtras *et al* (1985) pointed out that the richest source of iodine is seaweed and consequently among animal products, seafish that feed on sea-weed form the richest source

of iodine. Fish is considered to have been chosen by nature as a good source of dietary iodine. A study conducted by Sreeranula and Rao (1990) to analyse the iodine content of fish collected from different parts of coastal India indicated that Indian fish on an average are rich in iodine content (1-10 mcg/g on dry weight basis). The iodine content of shell-fish and crabs is much more than other fish (12-30 mcg/g on dry weight basis). No significant regional differences were noted in the iodine concentration in marine fish.

NIN (1995) reported that the iodine content of various regional diets range from 170 to 300 mcg/day cereals and pulses together contribute significantly to the daily intake of iodine. But the iodine loss in mixed diet ranges between 37 and 70 per cent. The iodine intake is much less in India (100 to 160 mcg/day) as compared to other countries viz. Netherlands 210 mcg - Sweden 312 mcg, England 323 mcg, Finland 340 mcg, USA 1000 to 2000 mcg. The study also revealed that the iodine content of fish range between 25 to 50 mcg/100g.

A study conducted in NIN (1995) observed that among the plant foods, the millet sorghum has more iodine (73 mcg/100g). Black gram in pulses (48 mcg/100g) and mustard in oil seeds (55 mcg/100g) also have relatively higher iodine.

2.6 Prevention of goitre

According to IJCP's medinews (1996) goitre continue to be a major public health problem in India. Pandav *et al.* (1988) reported that the only way to combat the problem of goitre is to provide iodine to the community.

The author also opined that prevention of goitre can be achieved by fortification of food items with iodine or by direct iodine supplementation and if necessary by discharging people from consuming foods known to contain high levels of goitrogens. Sajgo *et al* (1990) pointed out that universal salt iodisation is the public health measure of choice for eliminating Iodine Deficiency Disorders safely. Raheena (1997) indicated that salt is an ideal vehicle for addition of a micronutrient such as iodine because common salt is an integral part of the food of every man. rich or poor, high or low. Swaminathan (1998) suggested that the consumption of iodised salt is the most effective and cheapest method to control the problem.

Sheila (1994) opined that the technology of salt iodisation is low cost and well established. The iodisation of salt is done with KI or KIO_3 at a level that would enable the population to meet their daily requirement of 150-200 mcg of iodine (Ninan. 1997).

Stanbury (1994) revealed that potassium iodate is used more frequently as it has the advantage of being stable even under unfavourable conditions. The author also reported that National Institute of Nutrition has identified calcium carbonate or magnesium carbonate as additive to increase the shelf life of iodised salt.

A study conducted by Delong *et al* (1989) revealed that in hyper endemic areas iodine can be most effectively supplemented by iodised oil administration. The author also reported that oil iodised with iodine is available for oral or intramuscular injections. Iodised oil injection is a low cost. safe and acceptable method of iodine prophylaxis.

According to Raheena (1997) iodisation of oil is done by adding iodine to vegetable oils. which contains 38 per cent of iodine by weight.

Cao *et al* (1994) reported that iodised water is also used for combating iodine deficiency.

According to Stanbury (1994) water and bread are alternate vehicles for iodine. Hetzel (1992) pointed out that iodised bread is another way by which iodine can be taken.

NFI (1983) observed that tablets of potassium containing 10 mg of potassium iodide were distributed to infants. children and young adolescents for the prevention of goitre.

MATERIALS AND METHODS

3. MATERIALS AND METHODS

An investigation on 'Dietary profile of goitre patients' was carried out mainly to assess the socio economic, dietary and health profile of goitre patients.

3.1 Area of study

Goitre patients attending the thyroid clinic of the Trivandrum Medical College Hospital were selected for the study.

3.2 Selection of subjects

One hundred patients belonging to rural areas and visiting the hospital for the first time were selected for the study through purposive sampling technique.

3.3 Conduct of study

The study comprised of the following aspects.

1) Socio economic survey of goitre patients.
2) Dietary pattern and food consumption pattern.
3) Assessment of actual quantity of food consumed.
4) Clinical examination and grading of goitre patients.
5) Estimation of iodine content in drinking water and urine samples collected from goitre patients.

3.4 Methods and materials used

The methods and materials used to study the above aspects are detailed below.

3.4.1 Socio economic survey of goitre patients

Nutritional status is an indicator of social well being of a community (Krishna. 1988) and nutritional status is influenced by factors such as psychological. socio cultural and physiological (Suter and Hunter. 1980). Social factors like religion. occupation. economics. education. beliefs and culture are also reported to have important bearing on health.

Sirshi (1985) has pointed out that to assess the socio economic status. details pertaining to the type of family. family size. monthly income and caste are to be ascertained.

Joshi *et al* (1993) reported that statistically significant differences were found in the prevalence of endemic goitre in relation to different religions and caste groups. different occupations of the parents or guardians of children and types of houses used for living.

Interview method was selected for the study since this method was reported to be a suitable way to proceed systematically and quickly to collect information. Gupta (1987) reported that interview is a two way method which

permits an exchange of ideas and information and explains that the information received from an interview schedule is more reliable as the accuracy of statement can be checked by supplementary questions whenever necessary. Hence this method was used to collect information. In this method there is a face to face interchange between the interviewer and respondent before eliciting information. An interviewer administered questionnaire also ensures answers to more complex questions. completion of all questions and an explanation of problems (Eastwood. 1997).

A socio economic survey was conducted to collect information regarding the type of family. size of family. family income. expenditure on food. employment status of family and per capita income of the family of the goitre patients. The schedule formulated for the above data collection were pre-tested prior to administration is presented in Appendix I.

3.4.2 Dietary pattern and food consumption pattern

According to Swaminathan (1985) diet 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. Suitably structured oral questionnaire was used to collect information from all the

patients about the type and quantity of food consumed (Appendix - II). A food use frequency score sheet was also included in the diet survey schedule since the frequency of use of different food groups would give an indication to the adequacy of the family diet pattern, as observed by Nelson (1995). Food use frequency was measured on a 4 point scale. On the basis of the frequency of use, the foods were classified into 4 groups and scored as given below.

Frequency of use	Score
Not at all	1
Occasionally	2
More than twice in a week	3
Daily	4

The total scores for each of the food groups were calculated (Reaburn *et al.*, 1979) and the formula is given in Appendix - III.

3.4.3 Assessment of actual quantity of food consumed

In order to study the actual food intake of the goitre patients selected 24 hr recall method which was conducted with suitably structured questionnaires (Pennington, 1988).

In this recall method of oral questionnaire diet survey, a set of "Standardised cups" suited to local conditions

were used. The individuals interviewed were asked a series of questions to ensure recollection and description of all foods and drinks consumed in the 24 hours before the interview with emphasis on food consumption meal-by-meal. The schedule used for recording actual food intake is presented in Appendix - IV.

Kamath (1986) had defined nutritional status as the state of health enjoyed as a result of nutrition. So it is important to have information regarding the diets actually eaten by the individual for assessing the nutritional adequacy.

The nutritive value of foods consumed were calculated using the food composition tables of ICMR (1999).

3.4.4 Clinical examination of goitre patients

According to Swaminathan (1993) clinical examination is the most important part of nutritional assessment as one gets direct information of the signs and symptoms of dietary deficiency prevalent among the people.

The clinical examination of the patients were done with the help of a qualified physician using a check list. The details are given in Appendix - V.

Using the check list the investigator collected the information regarding the various types of diseases of goitre patients. The clinical symptoms of goitre exhibited by the

Plate a. Diffuse colloid goitre

Plate b. Multinodular goitre

patients were collected and severity of the disease were also identified.

According to Prema (1988) there are different types of goitre and the changes differ depending upon duration of deficiency.

Depending upon the severity, the goitre patients were graded into different groups such as diffused colloid goitre, multinodular goitre and toxic goitre with the help of a qualified physician.

3.4.5 Estimation of iodine content in drinking water and urine samples collected from goitre patients

The iodine content of drinking water collected from resident areas of goitre patients were quantitatively estimated by the standard procedure suggested by ASTM committee (1977).

The iodine content of urine samples collected from goitre patients were analysed as per the method suggested by Dunn *et al* (1993).

3.4.6 Analysis of data

3.4.6.1 Developing a "quality of life index" based on selected socio economic variables

Socio economic variables selected for calculating the index were caste, educational status of the respondent, total

monthly income of the family, percapita income, monthly expenditure on food along with calorie and protein intake of the goitre patients. Each of the variables were rated by giving scores. The scores given for each parameter ranged from 0 to 7 depending on the variations observed within the families studied. The details are given in Appendix VI. Following the method suggested by Dhanasekaran (1991) a Physical Quality of Life Index (PQLI) was developed. Scores assigned for each parameter for a family when summed up would give the total score for that family. Sum total of the score of a family would give the physical quality of life index of that particular family. Maximum score that can be obtained by a family would be 37. Based on the total score obtained, the families were classified into 3 groups, viz. families with a PQLI between 10 - 13, families with a PQLI between 13 - 16 and families with a PQLI greater than 16. PQLI developed was statistically tested with socio economic, dietary and health profile variables.

3.4.6.2 Developing Nutritional Status Index (NSI)

NSI of the selected patients were also computed in the present study. For developing the nutritional status index of the goitre patients, their nutrient intake such as calorie, protein, calcium, iron, vitamin A, B1, B2, niacin, vitamin C and urinary iodine content were taken into consideration.

Suppose K_{ij} be the observation corresponding to the j^{th} variable for the i^{th} sample Wj = $1/si^2$. si^2 being the variance of the i^{th} variable based on a sample of N size the nutritional status of i^{th} individual is calculated as follows:

Ni = K_{wi} x ij.

i = 1. 2 ..... N

N = Number of respondents

K = Number of variables

NSI developed was also tested against socio economic, dietary and health profile variables.

The statistical tools such as mean, frequency, correlation and chisquare variation were also used for the analysis of the collected data.

RESULTS

4. RESULTS

A study was conducted to assess the "Dietary profile of goitre patients" attending the thyroid clinic of Medical College Hospital, Trivandrum. The data gathered were analysed and the results are described under the following subtitles.

4.1 Socio economic profile of goitre patients

4.2 Dietary pattern and food consumption pattern

4.3 Assessment of actual quantity of food consumed

4.4 Clinical examination and grading of goitre patients

4.5 Iodine content in drinking water and urine samples collected from goitre patients

4.1 Socioeconomic profile of goitre patients

The socio economic profile of the goitre patients were studied in accordance to their social, educational and economic status as these have an influence on the dietary profile of the goitre patients.

Table 1

Age wise distribution of goitre patients

Sl.No.	Category (Years)	Percentage
1.	Upto 15	7
2.	16-30	69
3.	31-45	11
4.	Above 45	13
	Total	100

The above table revealed that 69 per cent of the goitre patients belonged to the age group of 16-30. Thirteen per cent of the patients belonged to the age group above 45 years and 11 per cent belonged to the age group of 31-45 and 7 per cent belonged to the age group of upto 15.

Table 2 depicts the sex wise distribution of goitre patients.

Table 2

Sex wise distribution of goitre patients

Sl.No.	Category	Percentage
1.	Female	94
2.	Male	06
	Total	100

It was found that 94 per cent of the goitre patients were females and only 6 per cent were males.

Table 3

Association between type of goitre and sex wise distribution of goitre patients

Sex	Diffuse colloid goitre	Multinodular goitre	Toxic goitre	Total
Female	56	33	5	94
Male	4	1	1	6
				100

x^2 1 = 1.25

Table 3 indicated that 56 per cent females had diffuse colloid goitre. while 33 per cent females had multinodular goitre and 5 per cent females had toxic goitre. The data also revealed that about 4 per cent males had diffuse colloied goitre. While 1 per cent male had multinodular goitre and another 1 per cent had toxic goitre.

Religion and caste wise distribution of goitre patients is given in Table 4.

Table 4

Distribution of goitre patients based on religion and caste

Sl. No.	Category	Male No.	Female No.	Total
1. Religion	Hindu	04 (05)	71 (95)	75
	Muslim	0	17 (100)	17
	Christian	02 (25)	06 (75)	08
2. Caste	Forward	03 (12)	23 (88)	26
	OBC	03 (06)	51 (94)	54
	SC	0	20 (100)	20

The figures in parenthesis indicate percentage

The data revealed that 75 per cent of the patients were Hindus. seventeen patients were Muslims and 8 per cent of the patients were Christians. The table also revealed that among the Hindu patients. 95 per cent were females and 5 per cent were males. All the Muslim patients who attended the thyroid clinic were females. It was also noted that among the

Christians. 75 per cent were females and 25 per cent were males.

Among the 100 patients surveyed, 54 per cent came under other backward classes and 26 per cent were from forward classes. Scheduled castes constituted 20 per cent of the total population studied. None of the goitre patients belonged to scheduled tribes.

The table also indicated that all the scheduled caste patients were females. Among the other backward classes 94 per cent were females and 6 per cent were males. Forward class constituted 88 per cent of females and 12 per cent of males.

Table 5

Educational status of goitre patients

Sl.No.	Qualifications	Number	Percentage
1.	Illiterate	05	05
	a) Female	05	100
2.	Primary	09	09
	a) Female	09	100
3.	Upper primary	24	24
	a) Male	01	04
	b) Female	23	96
4.	High School	41	41
	a) Male	05	12
	b) Female	36	88
5.	College level	21	21
	a) Female	21	100

It was observed that 41 per cent of the patients had attained high school level education. About 24 per cent of the patients had attained upper primary level education. It was also noted that 21 per cent of the patients had attained college level education. About 9 per cent of the patients had attained lower primary level education and 5 per cent patients were illiterate (Table 5).

The table also described that all the illiterate patients (5 per cent) were females. It was also observed that all the college level educated goitre patients were females. Among the upper primary educated goitre patients, 96 per cent were females and 4 per cent were males. Among the high school educated goitre patients 88 per cent were females and 12 per cent were males.

Educational status of patients were found to have positive significant correlation with percapita income spent on food (0.2054), income spent specifically on food items like vegetables, milk and milk products (0.2631, 0.2554). But there was negative significant correlation between education and income spent on roots and tubers (0.2909) (Appendix VII).

Table 6

Distribution of families based on type of family and family size

Sl.No.	Category	Number	Percentage
1) Type of family	Nuclear family	74	74
	a) Male	06	08
	b) Female	68	92
	Joint family	26	26
	a) Female	26	100
2) Family size	03 members	11	11
	a) Female	11	100
	04 members	39	39
	a) Male	02	05
	b) Female	37	95
	05 members	25	25
	a) Male	03	12
	b) Female	22	88
	More than 5 members	25	25
	a) Male	01	04
	b) Female	24	96

Table 6 reveals the distribution of families based on type of family and family size. Seventy four per cent of the goitre patients belonged to nuclear and 26 per cent belonged to joint family. Among the nuclear families, 92 per cent were females and 8 per cent were males.

The data regarding the family size of the goitre patients revealed that 39 per cent belonged to family having 4 members, 25 per cent belonged to family having 5 members and 25 per cent constituted family having more than 5 members. It was also noted that 11 per cent belonged to family having 3 members.

Among the family having 3 members all of them were females. Among family having more than 5 members. 96 per cent and 4 per cent were females and males respectively. Ninety five per cent of females and 5 per cent of male patients belonged to family having 4 members. It was also observed that 88 per cent of females belonged to family having 5 members.

The statistical analysis of the data observed that family size had positively significant correlation with number of adults in the family (0.6090), number of children in the family (0.2705), number of employed persons in the family (0.3070), income spent on food items like cereals (0.4297), pulses (0.2421). There was negatively significant correlation of family size with percapita income (0.2202) and percapita income spent on food (0.4316) (Appendix VII).

Table 7 represents the distribution of families based on number of adults and children in the family.

Table 7

Distribution of families based on number of adults and children in the family

	Number	Percentage
a) Number of adults	02	38
	03	22
	04	18
	More than 4	22
b) Number of children	0	22
	01	24
	02	41
	More than 2	13
Total		100

Out of the hundred patients surveyed, 38 per cent of families were having 2 adult members in the family where as 22 per cent were having 3 adult members. It was also found that another 22 per cent were having more than 4 adult members while 18 per cent were having 4 adults in the family.

The table also indicated that 41 per cent of the families were having 2 children and 24 per cent of families were having only one child. About 13 per cent of families were having more than 2 children and twenty two per cent of families were not having children.

Statistical analysis of the data revealed that number of adults in the family had positive significant correlation with family size (0.6090), number of employed persons in the family (0.2636). income spent on different food items like cereals (0.3375) and fish (0.2872). But there was negative significant correlation with percapita income (0.1962) and percapita income spent on food (0.2211)

Number of children in the family were found to have positive significant correlation with family size (0.2705). But there was negative significant correlation between number of adults in the family (0.4934).

Table 8

Distribution of families based on employment status

Number of employed persons	Percentage
01	84
02	15
More than 02	01
Total	100

As indicated in Table 8, 84 per cent of the patients belonged to families with one employed person. Fifteen per cent of the patients came under families with two employed persons where as only 1 per cent of the patients constituted families with more than 2 employed persons.

Statistical analysis of the data revealed a positive significant correlation of number of employed persons in a family with family size (0.3070), number of adults in the family (0.2636), family income (0.2225), income spent on food (0.2359), income spent on different food items like cereals (0.2899), vegetables (0.2261) and fish (0.2211) (Appendix VII).

Table 9

Distribution of families based on economic status

Monthly income	Percentage
1000 - 1500	46
1501 - 2000	35
2001 - 2500	11
More than 2500	08
Total	100

It was observed that 46 per cent of the families of goitre patients had a monthly income of Rs.1000 to 1500. Thirty five per cent families had a monthly income of Rs.1501 to 2000 and 11 per cent had a monthly income of Rs.2001 to 2500. Only 8 per cent of the families had a monthly income of above Rs.2500 (Table 9).

Statistical analysis of the data revealed a positive significant correlation of income of the family with number of employed persons in the family (0.2225), percapita income

(0.9200), income spent on food (0.9557), percapita income spent on food (0.5224), income spent on various food items like cereals (0.2291), pulses (0.2623), vegetables (0.4528), fruits (0.3512), milk (0.2405) and fish (0.2120). There was negative correlation of income of the family with income spent on roots and tubers (0.1975). There was positive correlation of income of the family with education (0.1400) (Appendix VII).

Table 10

Distribution of families based on percapita income

Percapita income	Percentage
Less than 300	13
300 - 400	57
401 - 500	13
More than 500	17
Total	100

As shown in Table 10, 57 per cent of the families have a percapita income of Rs.300 to 400. Thirteen per cent have per-capita income of Rs.401 to 500. It was also noticed that another 13 per cent have per capita income of less than Rs.300.

Statistical analysis of the data revealed that percapita income had positive significant correlation with family income (0.9200), income spent on food (0.4808), percapita income spent on food (0.6656), income spent on

vegetables (0.4303), milk (0.2482) and fish (0.2087). There was negative significant correlation with family size (0.2202), number of adults in the family (0.1962) and income spent on roots and tubers (0.2479) (Appendix VII).

The hundred goitre patients were grouped into 3 categories based on the physical quality life index developed. Few variables like caste, educational status, family income, percapita income, monthly food expenditure, calorie and protein intake were considered for developing physical quality life index. The physical quality of life index for each respondents was worked out by summing the scores obtained for the variables individually. Based on this index the respondents were classified in to three groups and the distribution is presented in Table 11 and Fig. 1.

Table 11

Distribution of respondents based on Physical Quality of Life Index (PQLI)

Distribution of respondents	PQLI (Range)	Per cent
Group I	10 - 13	13
Group II	13 - 16	70
Group III	> 16	17
Total		100

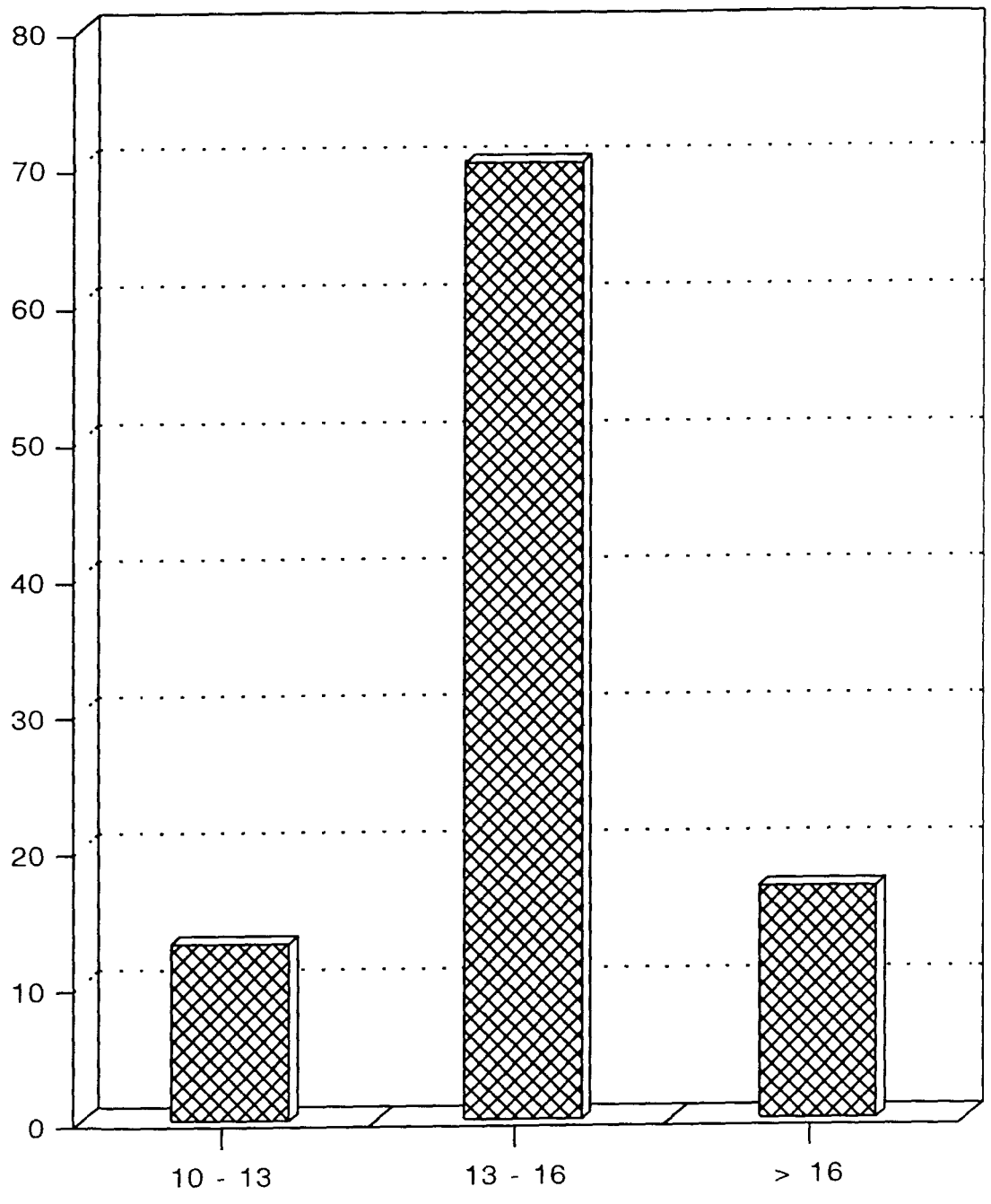

Fig. 1. Distribution of respondents based on physical quality of life index (PQLI)

As indicated in the table. seventy per cent respondents were categorised under Group II with PQLI in the range 13 to 16 and thirteen per cent were categorised under Group I with PQLI 10 to 13 per cent. Seventeen per cent respon-dents surveyed were classified under Group III.

Statistical analysis of the data revealed that physical quality of life index had significant correlation with other variables like age (-0.2153), education (0.6633), number of adults (0.2512). percapita income (0.2402). income spent on food (0.4262). percapita income spent on food (0.4968), income spent on roots and tubers (-0.2732). income spent on vegetables (0.3361). income spent on fruits (0.3540), income spent on milk (0.3889). income spent on fish (0.1971), intake of nutrients like calorie (0.2956). protein (0.2753) and iron (0.1975) (Appendix VIII).

4.2 Dietary pattern and food consumption pattern

Dietary pattern and food consumption pattern of goitre patients were assessed with regard to expenditure pattern on various food items. food habits. frequency of use of various food items and frequency of use of goitrogenic foods.

Table 12 depicts the monthly food expenditure pattern of families.

Table 12

Monthly food expenditure pattern of families

Food expenditure pattern in Rs.	Percentage of families
500 - 1000	25
1001 - 1500	54
1501 - 2000	15
More than 2000	06
Total	100

It is obvious from Table 12 that 54 per cent of families spent Rs.1001 to 1500 on food, while 25 per cent of families spent Rs.500-1000 on food. Fifteen per cent of the families spent Rs.1501 to 2000 on food whereas only 6 per cent spent more than Rs.2000 on food.

Statistical analysis of the data revealed that positive significant correlation of income spent on food with number of employed persons in the family (0.2359), family income (0.5657), percapita income (0.4808), percapita income spent on food (0.5933), income spent on cereals (0.3531), vegetables (0.4734) fruits (0.4544), green leafy vegetables (0.2546), egg (0.3479), fish (0.3250) and milk (0.4900) (Appendix VII).

It was clear from the Table 13 that 52 per cent spent Rs.200 to 300 per capita monthly income on food, whereas

25 per cent spent percapita income of Rs.301 to 400 on food/month. About 12 per cent spent percapita income of less than Rs.200 on food every month. Only 11 per cent spent more than Rs.400 percapita income on food monthly.

Table 13

Distribution of families based on percapita income on food/month

Percapita income on food/month	Percentage
Less than 200	12
200 - 300	52
301 - 400	25
More than 400	11
Total	100

Statistical analysis of the data revealed that positive significant correlation of percapita income spent on food every month with education (0.2054), income of the family (0.5244), per capita income (0.6656), income spent on food (0.5933), income spent on fish (0.2884), vegetables (0.5642), green leafy vegetables (0.4048) and milk (0.4754) (Appendix VII).

Table 14

Expenditure pattern on various food items (in Rs.)

Food items	Less than 100	100-200	201-300	301-400	401-500	501-600	601-700	701-800	NIL
Cereals	-	-	25	50	20	5	-	-	-
Pulses	86	13	1	-	-	-	-	-	-
Roots and tubers	18	78	4	-	-	-	-	-	-
Vegetables	38	53	6	-	3	-	-	-	-
Fruits	92	4	-	-	-	-	-	-	4
Green leafy vegetables	67	-	-	-	-	-	-	-	33
Milk and milk products	31	47	7	10	1	-	-	2	2
Fish	9	42	43	-	3	-	-	-	3
Meat	31	10	3	-	-	-	-	-	56
Egg	55	4	1	-	-	-	-	-	40
Fats and oils	55	43	2	-	-	-	-	-	-
Sugar and jaggery	98	2	-	-	-	-	-	-	-

As it can be seen from Table 14, 50 per cent of the families spent Rs.301 to 400 on cereals. Twenty five per cent spent Rs.201 to 300 on cereals, while 20 per cent spent Rs.401 to 500 on cereals and only 5 per cent spent Rs.501 to 600 on cereals. It was noted that 86 per cent spent less than 100 on pulses, while 13 per cent spent Rs.100 to 200 on pulses and only one per cent spent Rs.201 to 300 on pulses. It was also observed that about 78 per cent spent Rs.100 to 200 on roots

and tubers and 18 per cent spent less than Rs.100 on roots and tubers where as 4 per cent spent Rs.201 to 300 on roots and tubers. The table revealed that 53 per cent spent Rs.100 to 200 on vegetables and about 38 per cent spent less than Rs.100 on vegetables. It was also noted that 6 per cent spent Rs.201 to 300 on vegetables and 3 per cent spent Rs.401 to 500 on vegetables. As depicted in the table. 92 per cent spent less than Rs.100 on fruits. while 4 per cent spent Rs.100-200 on fruits. It was also noted that 4 per cent did not spend money for buying fruits. Sixty seven per cent spent less than Rs.100 for green leafy vegetables while 33 per cent did not spent money for green leafy vegetables. It was observed that 47 per cent spent Rs.100 to 200 on milk and milk products. while 31 per cent spent less than Rs.100 on milk and milk products. While 7 per cent and 10 per cent spent Rs.201 to 300 and Rs.301 to 400 on milk and milk products respectively. Only one per cent spent Rs.401 to 500 on milk and milk products. Two per cent spent Rs.701 to 800 on milk and milk products and 2 per cent did not spend money for milk and milk products. It was clear from the table that 43 per cent spent Rs.201 to 300 on fish. About 42 per cent spent Rs.100 to 200 on fish. Nine per cent spent less than Rs.100 on fish. While 3 per cent spent Rs.401 to 500 on fish and 3 per cent did not spend money for fish. It was found that 56 per cent did not spend any money for meat. While 31 per cent spent less than Rs.100 on meat. But 10 per cent spent between Rs.100 to 200 on meat and

only 3 per cent spent Rs.201 to 300 on meat. The table depicted that 55 per cent spent less than Rs.100 on egg. About 40 per cent did not spend money for egg. Four per cent spent Rs.100 to 200 for egg and 1 per cent spent Rs.201 to 300 for egg. It was observed that 55 per cent spent less than Rs.100 on fats and oils. Forty three per cent spent Rs.100 to 200 on fats and oils. Only 2 per cent spent Rs.201 to 300 on fats and oils. Ninety eight per cent spent less than Rs.100 on sugar and jaggery and only 2 per cent spent Rs.100 to 200 on sugar and jaggery.

An enquiry into the food habits of goitre patients under study revealed that 97 per cent were non vegetarians and only 3 per cent were vegetarians.

Data collected to assess the frequency of use of energy rich food items in the daily diet are given in Table 15.

Table 15

Frequency of using energy rich foods

Food items	Daily	More than twice in a week	Occasionally
Cereals	100	-	-
Roots and tubers	86	05	09
Sugars and jaggery	100	-	-
Fats and oils	30	70	-

It was noticed that cereals, sugar and jaggery was used daily by all the patients. Considering the frequency of use of tubers, 86 per cent included roots and tubers daily in their diet. On an average, 9 per cent included tubers occasionally and 5 per cent included tubers more than twice in a week in their diet.

On assessing the frequency of use of fat and oils, 70 per cent of the patients included fats and oils more than twice in a week in their diet.

Data regarding the frequency of use of protein rich foods is revealed in the Table 16.

Table 16

Frequency of using protein rich foods

Food items	Daily	More than twice in a week	Occas-ionally	Not at all
Pulses	05	22	73	-
Fish	83	10	04	03
Egg	05	10	82	03
Meat	-	-	92	08
Milk and milk products	96	-	04	-

It was found that 73 per cent included pulses occasionally in their diet, while 22 per cent of the patients included different pulses more than twice in a week and only

5 per cent included pulses daily in their diet. Data revealed that 83 per cent included fish daily in their diet, whereas 10 per cent included fish more than twice in a week in their diet. It was also noted that 4 per cent included fish occasionally in their diet and 3 per cent never included it in their diet. It was observed that 82 per cent of the patients included egg occasionally in their diet. while 10 per cent included egg more than twice in a week in their diet. About 5 per cent used egg daily in their diet and 3 per cent never used egg in their diet. On an average 92 per cent included meat occasionally in their diet and 8 per cent never included meat in their diet. None of the selected goitre patients included meat daily in their diet. Ninety six per cent of the patients included milk and milk products daily in their diet and 4 per cent included milk occasionally in their diet. The statistical analysis of the data revealed that there is a positive correlation between frequency of using fish in the diet and iodine content of urine (0.1452) (Appendix VII).

Table 17

Frequency of using vitamins and mineral rich foods

Food items	Daily	More than twice in a week	Occasionally
Vegetables	57	26	17
Fruits	05	15	80
Green leafy vegetables	03	16	81

The data regarding the frequency of use of vitamins and mineral rich foods described that 57 per cent included vegetables daily in their diet. About 26 per cent used vegetables more than twice in a week and 17 per cent included vegetables occasionally in their diet. It was revealed that a highest per cent ie. 80 per cent used fruits occasionally in their diet. Other 15 per cent included fruits more than twice in a week in their diet.

Green leafy vegetables were occasionally used by 81 per cent of the families. About 16 per cent used green leafy vegetables more than twice in a week and only 8 per cent included green leafy vegetables daily in their diet (Table 17).

Table 18

Frequency score of different food items

Food items	Score
Cereals	100
Pulses	58
Roots and tubers	94
Vegetables	85
Fruits	56
Green leafy vegetables	56
Milk and milk products	98
Meat	48
Fish	93
Egg	54
Fats and oils	65
Sugar and jaggery	100

Based on the scores obtained for different food items. it was revealed that cereals, sugar and jaggery obtained a maximum score of 100. followed by milk and milk products and roots and tubers with a score of 98 and 94 respectively. Fish and vegetables obtained scores of 93 and 85 respectively. Fats and oils obtained a frequency score of 65. Pulses and fruits obtained a frequency score of 58 and 56 respectively. Green leafy vegetables obtained a score of 56. Egg and meat obtained a frequency score of 54 and 48 respectively (Table 18).

Data gathered to study the frequency of use of goitrogenic foods in the daily diet is presented in Table 19 (Fig. 2).

Table 19

Frequency of using goitrogenic foods

Goitrogenic foods	Daily	More than twice in a week	Occasionally	Not at all
Tapioca	85	02	13	-
Cabbage	-	31	69	-
Cauliflower	-	-	09	91

Eighty five per cent of goitre patients consumed tapioca daily. while 13 per cent included tapioca occasionally. Only 2 per cent included tapioca more than twice in a week in their diet. It was found that 69 per cent of goitre patients used cabbage occasionally in their diet. It was also noted

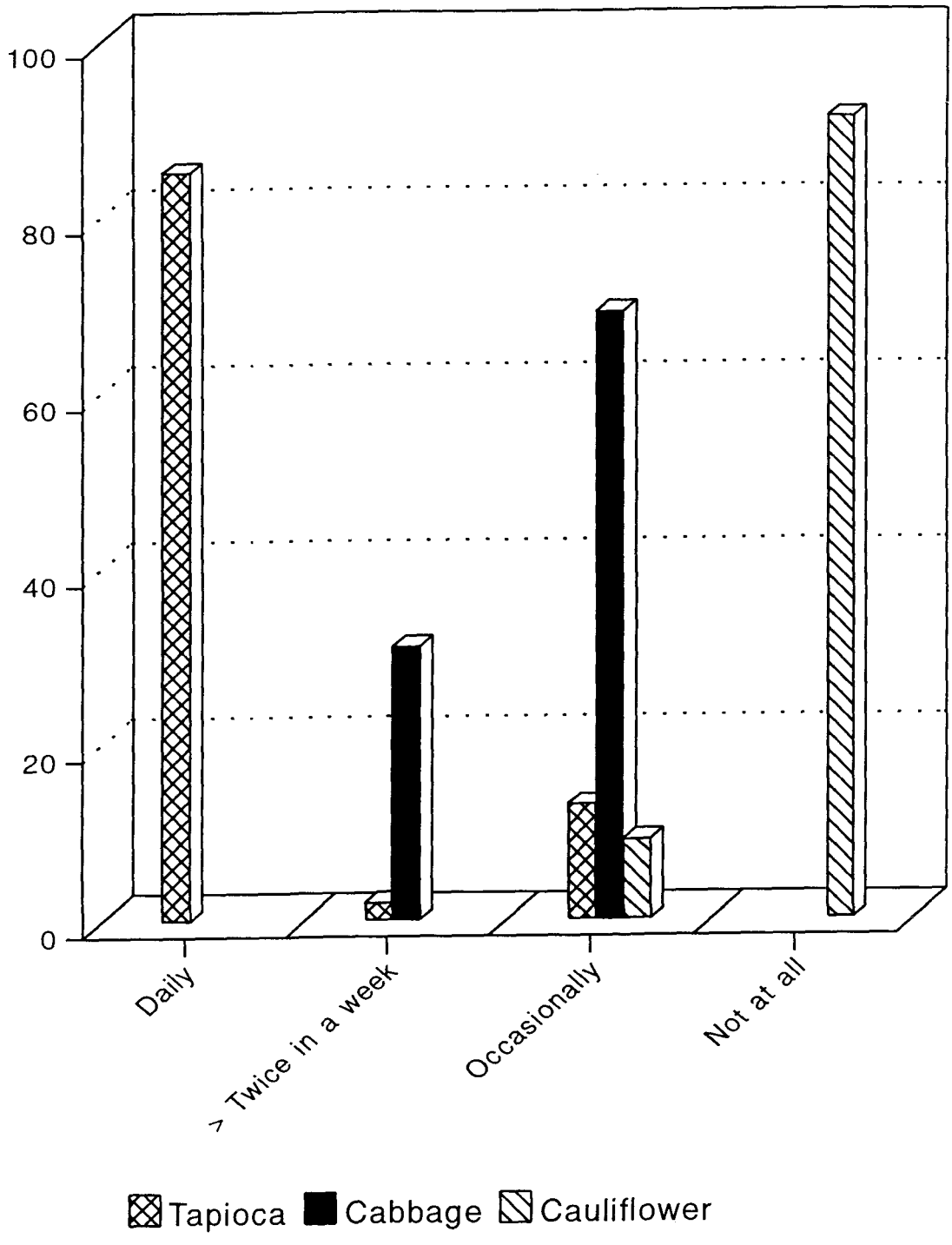

Fig. 2. Frequency of using goitrogenic foods

that 31 per cent included cabbage more than twice a week in their diet. But none of the goitre patients included cabbage daily in their diet.

Table 19 also described that 91 per cent never used cauliflower in their diet and only 9 per cent included cauliflower occasionally in their diet.

Table 20

Frequency score of using goitrogenic foods

Goitrogenic foods	Frequency score
Tapioca	93
Cabbage	57
Cauliflower	27

Table 20 depicts the frequency score for goitrogenic foods. The frequency score of using tapioca was 93 and frequency score for cabbage and cauliflower were 57 and 27 respectively.

Table 21

Association between type of goitre and frequency of use of tapioca

Frequency of using tapioca	Diffuse colloid goitre	Multinodular goitre	Toxic goitre	Total
Daily	49	30	6	85
More than twice in a week	2	0	0	2
Occasionally	9	4	0	13

$x^2_1 = 0.7352$

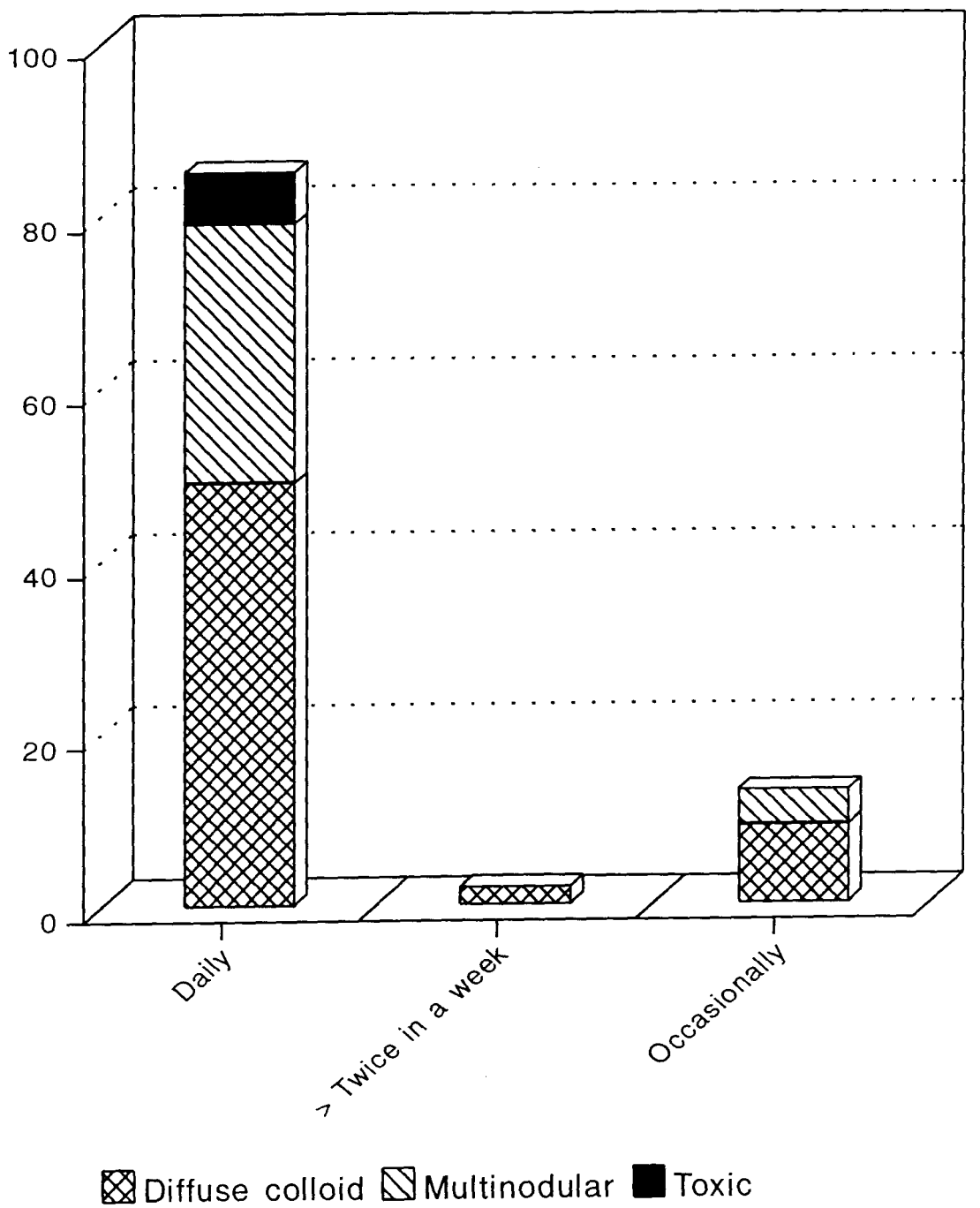

Fig. 3. Association between type of goitre and frequency of using tapioca

Table 21 showed that 49 had diffuse colloid goitre who used to consumed tapioca daily, where as 30 per cent had multinodular goitre who also consumed tapioca daily and 6 per cent who consumed tapioca daily had toxic goitre. The data also revealed that 2 per cent had diffuse colloid goitre who consumed tapioca more than twice in a week. Another 9 per cent and 4 per cent who consumed tapioca occasionally and had diffuse colloid and multinodular goitre respectively (Fig. 3).

Table 22 gives details of purchase of goitrogenic foods.

Table 22

Purchase of goitrogenic foods

Goitrogenic foods	Places of purchases		
	From home garden	From near by shop or market	From other field
Tapioca	05	93	02
Cabbage	-	100	-
Cauliflower	-	09	-

Table 22 revealed that 98 per cent of goitre patients purchased tapioca from market or from near by shop. while 5 per cent got it from their home garden and another 2 per cent purchased it from neighbouring fields. The data also revealed that one of the goitrogenic foods, cauliflower was, purchased by only a small per cent of goitre patients ie. 9 per cent from near by shop or market.

Table 23

Distribution of tapioca in the meal pattern and consumption pattern

Category	Percentage
Once daily	36
Twice daily	63
Thrice daily	01
As a staple food instead of rice	
As a main item in the diet	100

On assessing the tapioca meal frequency patterns of the goitre patients. it was found that 63 per cent consumed tapioca twice in a day. while 36 per cent consumed tapioca once in a day and only 1 per cent consumed tapioca thrice in a day (Table 23).

It was also noted that cent per cent of goitre patients consumed tapioca as a main item in the diet. None of them consumed tapioca as staple food instead of rice.

Table 24

Association between type of goitre and tapioca meal pattern

Tapioca meal pattern	Diffuse colloid goitre	Multinodular goitre	Toxic goitre	Total
One day	21	14	1	36
Twice daily	39	19	5	63
Thrice daily	0	1	0	1

$x^2 = 45.09^{**}$

The Table 24 revealed that 39 per cent of the patients had diffuse colloid goitre among those who consumed tapioca twice daily, while 19 per cent had multinodular goitre and 5 per cent had toxic goitre. The data also reported that 21 per cent of the patients had diffuse colloid goitre among those who consumed tapioca once in a day. Whereas, 14 per cent had multinodular goitre. One per cent each had toxic goitre and multinodular goitre among those who consumed tapioca thrice daily.

The method of cooking tapioca by goitre patients is depicted in Table 25.

Table 25

The method of cooking tapioca

Method	Distribution of subjects Percentage
Boiled	96
a) Boiling and draining of the cooking water once (in a covered vessel)	69
b) Boiling and draining of the cooking water twice (in a covered vessel)	27
Dried	04
Total	100

It was observed that about 96 per cent consumed tapioca in the boiled form.

The patients are following the traditional method for cooking tapioca ie. boiling and draining of the cooking water.

The table also depicts the fact that among the patients. 69 per cent used boiling method for cooking tapioca. in a covered vessel and drained of the cooking water once, while 27 per cent followed boiling method in a covered vessel and drained of the cooking water twice. Only 4 per cent consumed tapioca in dried form. None of them consumed tapioca as chips. flour or pappads. The patients were not in the habit of using cooking methods such as steaming and frying.

4.3 Assessment of actual quantity of food consumed

Actual food intake of the patients were assessed by one day recall method. This method enables to determine the quality and quantity of foods consumed by an individual and to locate adequacy and inadequacy.

From the data obtained by recall method the raw equivalent of the foods consumed were computed. The nutritive value of foods consumed were calculated using the food composition tables of ICMR (1999).

Table 26 and Fig. 4 represents the mean of actual food intake of goitre patients.

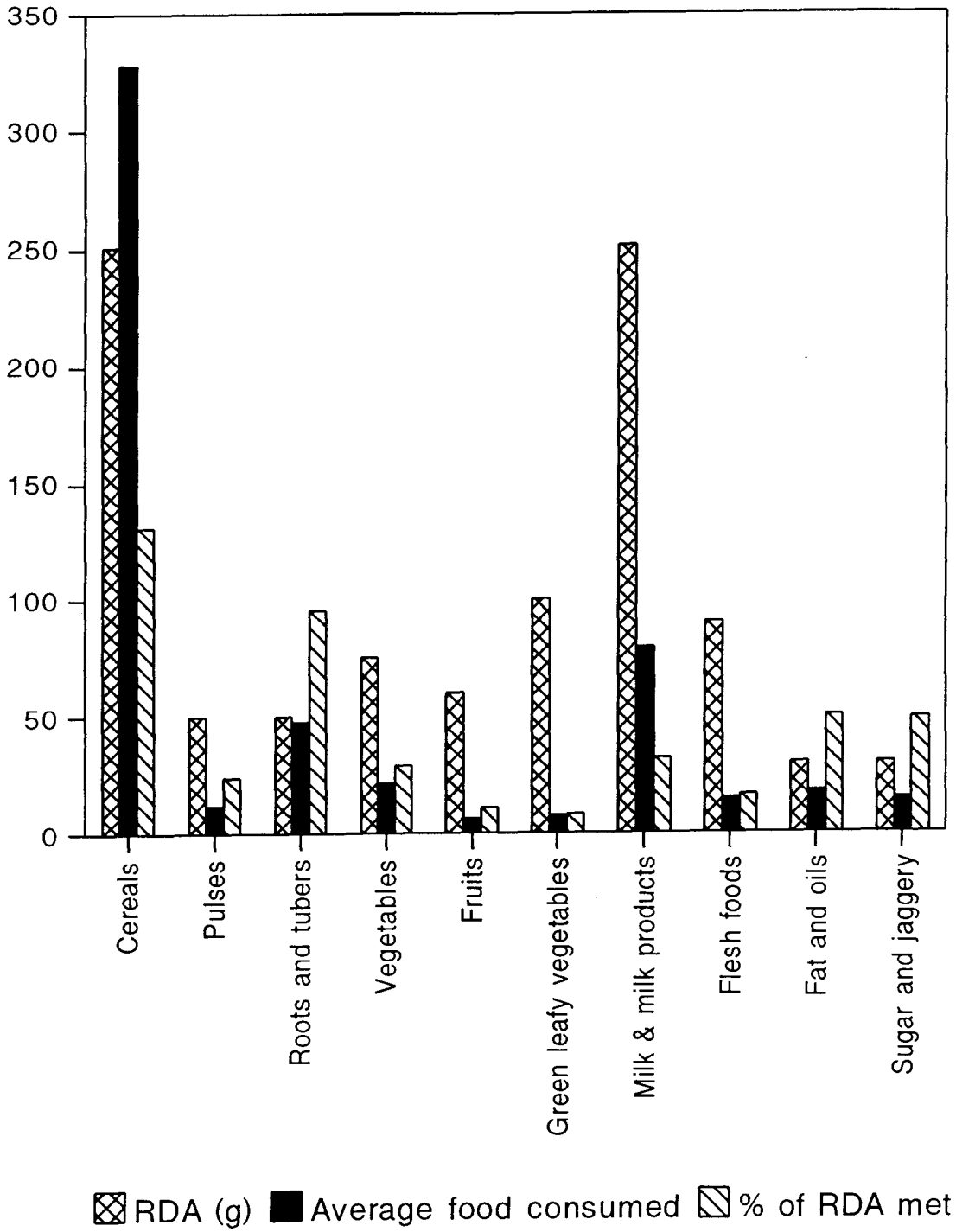

Fig. 4. Actual food intake

Table 26

Actual food intake of goitre patients

Food items	RDA (g)	Average quantity of food consumed (g)	Percentage of RDA met
Cereals	250	327.4	131
Pulses	50	12.0	24
Roots and tubers	50	47.4	95
Vegetables	75	21.4	29
Fruits	60	6.4	11
Green leafy vegetables	100	7.8	8
Milk and milk products	250	78.8	32
Flesh foods	90	14.8	16
Fats and oils	35	17.6	52
Sugar and jaggery	30	14.7	49

Among the various food items consumed by the respondents. the intake of cereals far exceeded the requirements suggested by ICMR (1999). The intake of food items like pulses. vegetables. fruits, green leafy vegetables. milk and milk products and flesh foods were very poor and the consumption rate were below 40 per cent of the RDA. Intake of roots and tubers were sufficient to meet 95 per cent of the RDA. The consumption of fats and oils, sugar and jaggery were adequate to meet 52 and 49 per cent of RDA respectively.

The mean nutrient intake of the respondents per day is presented in Table 27.

Table 27

Mean nutrient intake of goitre patients

Nutrients	RDA	Average intake of nutrients	Percentage of RDA met
Calorie (k cal)	2225	1635.4	74
Protein (g)	50	32.0	64
Calcium (mg)	400	235.4	59
Iron (mg)	30	18.0	60
Vitamin A (mcg)	600	323.9	54
Thiamine (mg)	1.1	0.9	79
Riboflavin (mg)	1.3	0.4	62
Niacin (mg)	14	13.1	94
Vitamin C (mg)	40	29.4	74

The nutrient intake of the respondents indicated that the diets are low in all nutrients when compared with RDA. Calorie intake met about 74 per cent whereas, protein intake met 64 per cent of the requirements suggested by ICMR (1999). Niacin intake met about 94 per cent of RDA. The intake of calcium, iron, vitamin A and riboflavin were below 65 per cent of the RDA.

4.4 Clinical examination and grading of goitre patients

Information regarding the health status of goitre patients were collected with reference to types of goitre,

symptoms of goitre. number of affected members in the family and details of other diseases of patients.

Depending upon the severity, goitre is graded into different types of goitre.

Table 28 and Fig. 5 depicts the type of goitre.

Table 28

Distribution of subjects according to the type of goitre

Types of disease	Percentage
Diffuse colloid goitre	60
Multinodular goitre	34
Toxic goitre	06
Total	100

The table shows that 60 per cent had diffuse colloid goitre, 34 per cent had multinodular goitre and 6 per cent had toxic goitre. The statistical analysis of the data revealed that there is a positive correlation between types of goitre and mode of use of tapioca by the goitre patients. However the correlation was not significant (0.0706). A negative significant correlation was also observed between type of goitre and the iodine content of drinking water (0.7404) and also between iodine content of urine samples (0.7979) (Appendix VII).

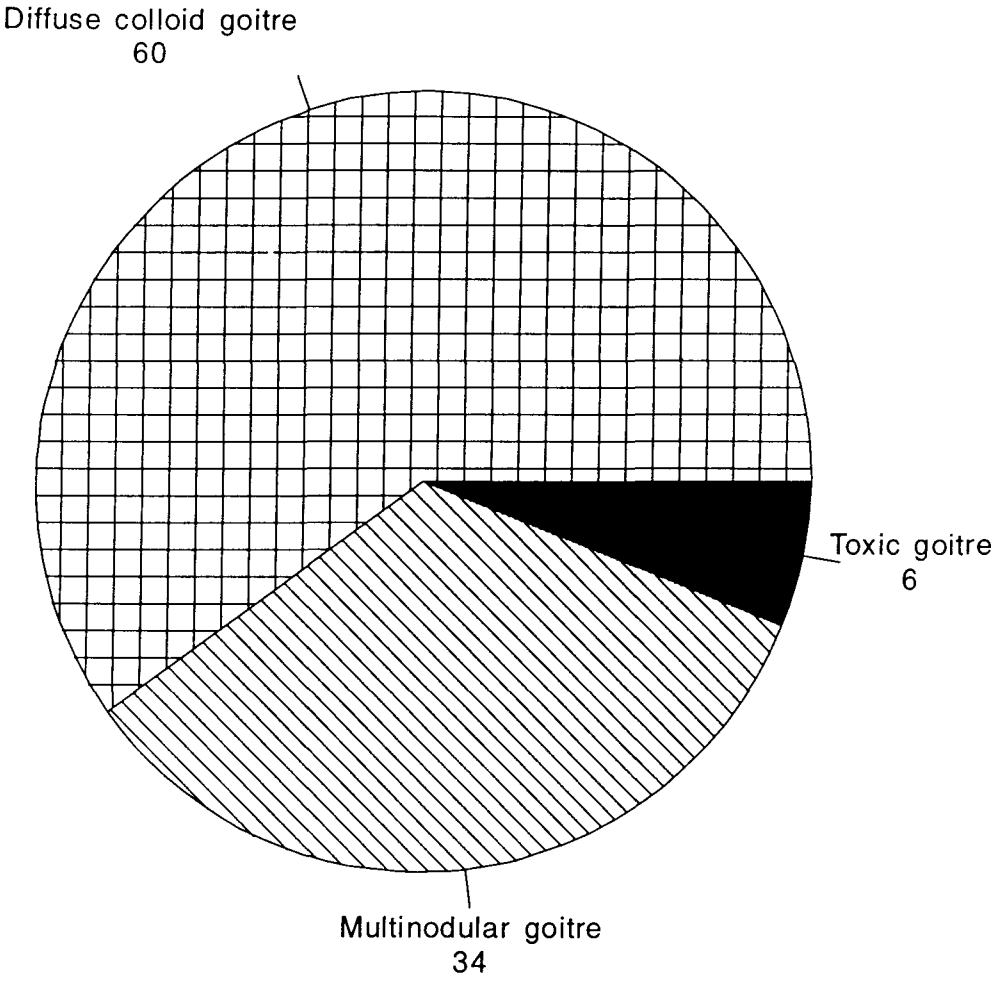

Fig. 5. Distribution of subjects according to types of goitre

Data regarding the symptoms of goitre exhibited by the patients revealed that 60 per cent had symptoms of neck enlargement. palpitation and tremour. Whereas 40 per cent had neck enlargement. palpitation tremour and dysphagia.

It was observed that 98 per cent families were not having any other family members with goitre. while in 2 per cent of families. one person was found affected by goitre in addition to the selected patients.

It was also observed that 80 per cent of the patients had anaemia and 20 per cent had dental decays.

4.8 Iodine content in drinking water and urine samples collected from goitre patients

The iodine content of water samples collected from goitre patients were estimated and the values are presented in Table 29.

Table 29

Iodine content of drinking water of goitre patients (N = 100)

Range of values (mcg/l)	Distribution of patients (Percentage)
Less than 2	8
2 - 3	87
3 - 4	5
Total	100

It was noticed that 33 per cent of the goitre patients used well water for drinking purposes and 1 per cent used municipality water as source of drinking water.

The results of analysis of iodine content of drinking water samples revealed that 87 samples had an iodine content in the range of 2-3 mcg/l. The iodine content of the drinking water of 8 per cent of the patients were less than 2 mcg/l and 3-4 mcg/l of iodine in the drinking water of 5 per cent. The mean iodine content of drinking water was found to be 2.48 mcg/l.

Table 30

Association between type of goitre and iodine content of drinking water samples

Iodine content	Diffuse colloid goitre	Multinodular goitre	Toxic goitre	Total
Less than 2	0	6	2	8
2 - 3	55	28	4	87
3 - 4	5	0	0	5

$X^2_1 = 52.88^{**}$

Data presented on Table 31 revealed that 55 per cent with diffuse colloid goitre used drinking water containing iodine in the range of 2-3 mcg/l, whereas 28 per cent with multinodular goitre used drinking water with an iodine content of 2-3 mcg/l and 4 per cent with toxic goitre used drinking

water with iodine content 2-3 mcg/l. About 5 per cent with diffuse colloid goitre used drinking water with iodine content of 3-4 mcg/l and 6 per cent with multinodular goitre and 2 per cent with toxic goitre also used drinking water with iodine content of less than 2 mcg/l.

Table 31

Iodine content of urine samples of goitre patients (N = 100)

Range of values (mcg/dl)	Distribution of patients (Percentage)
Less than 5	15
5 - 7	70
7 - 9	15
Total	100

It was observed from the table that 70 per cent of the goitre patient's urine samples had iodine content of 5-7 mcg/dl. While 15 per cent had iodine content of less than 5 mcg/dl and another 15 per cent had iodine content of 7-9 mcg/dl.

Statistical analysis of the data revealed a positive significant correlation of urinary iodine content with iodine content of drinking water (0.5939) of the subjects (Appendix VII).

Table 32

Association between types of goitre and urinary iodine content

Urinary iodine content (mcg/dl)	Diffuse colloid goitre	Multi-nodular goitre	Toxic goitre	Total
Less than 5	0	11	4	15
5 - 7	45	23	2	70
7 - 9	15	0	0	15

$X^2_1 = 14.06^{**}$

The Table 32 revealed the fact that 45 per cent of the subjects also had diffuse colloid goiter had a urinary iodine content in the range of 5-7 mcg/dl. About 23 per cent of the subjects who mad multinodular goitre and 2 per cent of toxic goitre patients also had a urinary iodine content in the range of 5-7 mcg/dl. while 11 per cent multinodular and 4 per cent toxic goitre patients had a urinary iodine content of less than 5 mcg/dl and 15 per cent diffuse colloid goitre patients had a urinary iodine content in the range of 7-9 mcg/dl (Fig. 6).

Nutritional status index for each respondent was worked out using actual nutrient intake and urinary iodine content of goitre patients. The details are presented in the Table 33.

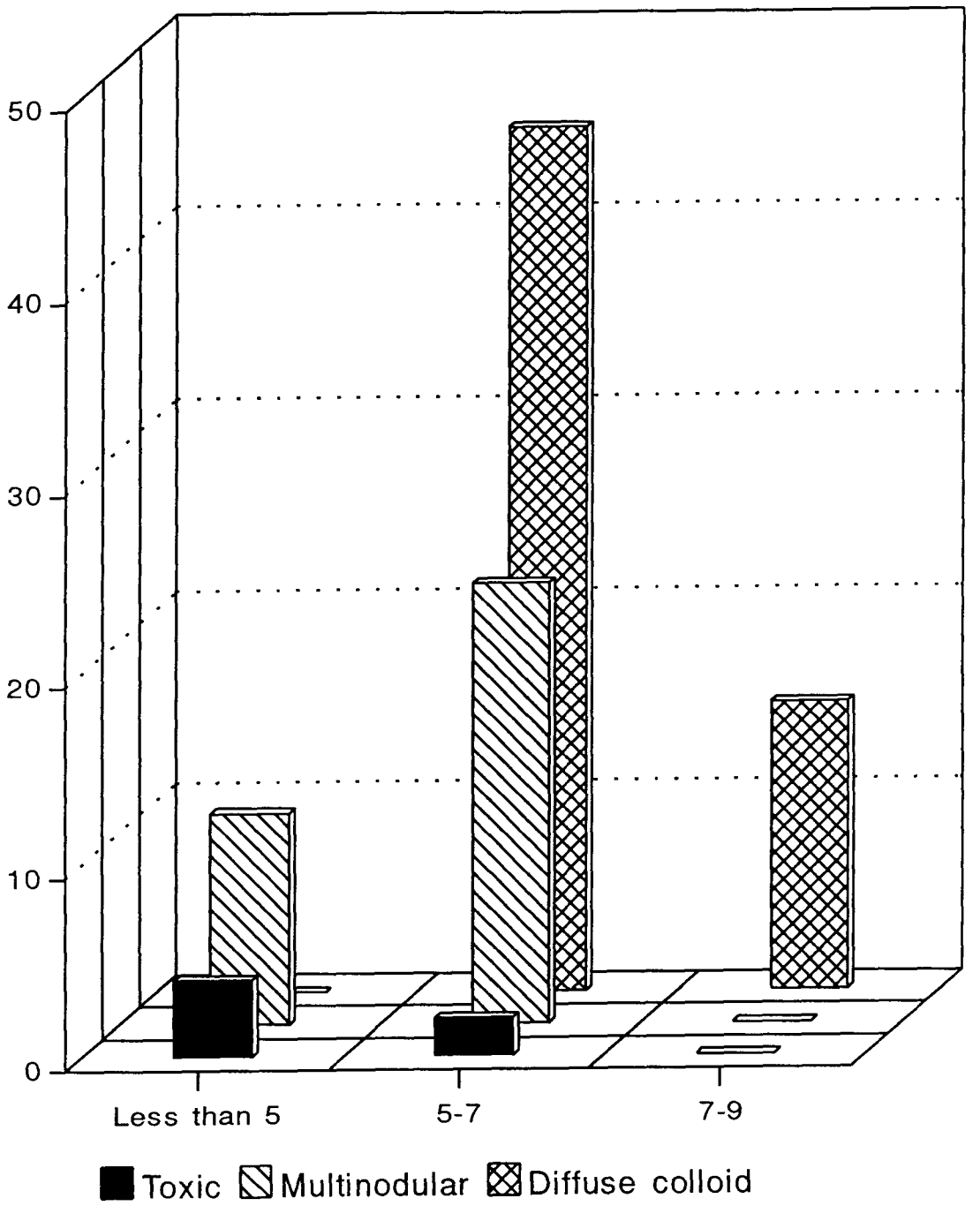

Fig. 6. Association between type of goitre and urinary iodine content

Table 33

Distribution of respondents based on Nutritional Status Index

NSI	Percentage
56 - 69	13
70 - 84	68
More than 84	19
Total	100

The table revealed that 68 per cent respondents had NSI in the range of 70 to 84, while 19 per cent, had NSI in the range of above 84. Only 13 per cent had NSI in the range of 56 to 69.

Statistical analysis of the data revealed that nutritional status index had a significant correlation with other variables like age (-0.2480), roots and tubers (-0.0.2196), greenleafy vegetables (0.2037), frequency of use of pulses (0.2469), type of goitre (-0.6257), urinary iodine content (0.9227) and intake of nutrients like calorie (0.6086) and protein (0.3604) (Appendix IX).

DISCUSSION

5.0 DISCUSSION

This chapter encompasses a critical appraisal of the salient findings of the study entitled "Dietary profile of goitre patients" and the discussion is presented under:

5.1 Socio economic profile of goitre patients.

5.2 Dietary pattern and food consumption pattern.

5.3 Assessment of actual quantity of food consumed.

5.4 Clinical examination and grading of goitre patients.

5.5 Iodine content in drinking water and urine samples collected from goitre patients

5.1 Socio economic profile of goitre patients

Socio economic factors have a definite bearing on the dietary habits of the people and there by on their dietary intake and nutritional status. Derby (1976) reported that among the various factors affecting the nutritional status of an individual diet with its close association with socio economic factors emerge as an important force of influence.

Sirshi (1985) had suggested that in order to assess the socio economic status, details pertaining to the type of family, family size, monthly income and caste are to be ascertained. Ndaba and O'keefe (1985) had reported that poor socio economic conditions are the root cause of most of the

malnutrition problems observed. Devadas and Eswaran (1986) had opined that food habits of the people depended on availability of foods and food availability was observed to be influenced by climate, socio economic conditions and cultural environment. As reported by Devadas *et al* (1980) there is an increasing awareness of the relationship between malnutrition and socio economic factors. Ghosh (1989) opined that social factors like religion, occupation, economic status, education, beliefs and culture had important bearing on health.

Sex and age have a profound influence on the incidence of goitre. It may be because of the fact that iodine requirement varies with sex and age. The present study revealed that majority of the patients suffering from goitre belonged to the age group of 16-30 years. Only a small per cent belonged to the age group of upto 15 years and above 45 years. Iodine requirement varies with age and physiological conditions. Busi and Leela (1999) revealed that age has strong influence on nutrient intake. Similar trend of the present study was also observed by Prema (1997). The author had reported that the affected populations were mainly in the prime stages of life with 16 per cent upto 15 years, 60 per cent in the age group of 16 to 30 years and 18 per cent in the age group of 31 to 45 years.

In the present study most of the surveyed goitre patients were females. Busi and Leela (1999) and Rao and

Lakshmi (1990) reported that sex has a strong influence on the incidence of goitre. The observation in the present study is also in line with the salient findings of Rao and Lakshmi (1990). In the present study most of the surveyed patients were females. The reason for this may be the enhanced demand of iodine around puberty and during child bearing period in the females. A study conducted by Joshi *et al* (1993) in rural areas of Meerut on prevalence of goitre indicated that goitre was more among females as compared to males. Similar trend was observed by several workers (Prema, 1988; Kimiagar *et al.*, 1989; Ray *et al.*, 1989; Choksi *et al.*, 1990; Kelly *et al.*, 1999).

After assessing the religion and caste of the goitre patients, it was found that majority of the patients were Hindus with a predominance of other backward classes. The study also revealed that most of the female patients belonged to Hindu religion and other backward caste. In the reports of the Kerala Statistical Institute (1992) it has been revealed that Thiruvananthapuram district has a majority of population who follow Hindu religion probably this may be the reason for higher percentage. Religion and caste wise break-up of the community as observed by Arora (1991) found that religion plays a dominant role in the process of socialization and it maintains the stability of the social system and social relationships. The author also reported that caste is an

unique institution of Indian society. According to Joshi *et al* (1993) statistically significant differences were found in the prevalence of endemic goitre in relation to different religions and caste groups. Hindus constitute 57 per cent of the total population in rural Kerala (Kannan *et al.*, 1991). The same trend is noticed in the present study when religion and caste wise break up of the goitre patients are taken into consideration. It may be because of all of the respondents were from rural areas. The findings of the present study, are in tune with the study conducted by Boora *et al* (1999) on preadolescent goitre patients; which revealed that majority of the respondents belonged to the middle caste.

Educational status and literacy rate have been proved to be powerful determinants of nutritional status as it may influence the awareness about importance of good nutrition, which can affect food choice. A study conducted by Prema (1988) revealed that 29 per cent of goitre patients had education upto upper primary school level and 26 per cent had studied upto high school level. However, in the present study majority had obtained high school level education. The study also revealed that most of the respondents who attained high school level education were females. The present study also revealed a highly positive and significant correlation existed between education and percapita income spent on food. It may be due to the fact that educational status may improve the

awareness of nutrition, which can also affect the percapita income spent on food.

Type of family and family size have an influence on the dietary habits of goitre patients. The family system in India is changing at a fast rate. Most of them are following nuclear family system instead of traditional joint family system. The present study clearly indicated that most of the patients belonging to nuclear family were females. It might be attributed to the fact that modern concept of nuclear family has gained much momentum in rural areas. Boora *et al* (1999) have indicated that majority of the goitre patients in Hissar district also belonged to nuclear families.

Family size had an important bearing on the nutrition of its members. The present study indicate that most of the goitre patients belonging to 4 members family were females. According to Park (1991) the average family size in India is four. The above fact in the present study is in accordance with the findings of Boora *et al* (1999). The statistical analysis of the data revealed that family size had a significant negative correlation with percapita income spent on food.

On assessing the number of adults and children in the families of the patients, it was found that in majority of the

families there were 2 adults and 2 children. However Park (1997) had reported that the demographic profile of India is fast changing and is characterised by adult population forming 60 per cent and young population (below the age of 15 years) forming 40 per cent. The statistical data revealed a negative significant correlation between number of adult members in the family of goitre patients and percapita income spent on food.

Regarding the employment status of the patients, it was observed that majority of the family had only one employed person. A highly significant and positive correlation was found between number of employed persons and family size of the patients. According to Reddy *et al* (1993) the employment status of the population is an important determining factor with respect to health and nutritional status.

The economic status directly or indirectly influence the purchasing power, standard of living and quality of life. In the present study, economic status of the familes indicated that majority of them had a monthly income in the range of Rs.1000-1500. Only a small per cent were having more than Rs.2500 per month. The economic status has a profound influence on nutrient intake. Similar trend was noticed in the study of Thimmayamma *et al* (1982). The author opined that when the income is below Rs.1000 the energy intake is below 1500 kcal and protein intake is below 40 g/day. When the income is between Rs.1000 to 3000 the energy intake and protein intake is

respectively 2000 kcal and 50 g/day. The above finding was further supported by Rahman *et al* (1999) who reported that lower the socio economic status of families, higher was the intake of cereals and lower was the intake of foods of animal and vegetable origin. The salient findings of the study is also in tune with that of Boora *et al* (1999).

The present study indicated that most of the families had a per capita income of Rs.300 to 400. In National Sample Survey also (1988) similar results were observed. In the present study most of them belonged to Group II with PQLI 13 to 16.

5.2 Dietary pattern and food consumption pattern

Food is the major vehicle for improving the nutrition of people and hence assessment of food consumption and dietary habits of the people is very important. Dietary intake is found to be markedly influenced by income level.

The present study revealed that majority of the families spent Rs.1001 to 1500 on food. It is an accepted fact that poor households will spent higher proportion of income on food. Lipton (1989) in his study on under nutrition and poverty had reported similar results. Expenditure on food is generally associated with various socio economic factors. The present study observed a positive significant correlation

between income spent on food and income of the family. Wong (1985) had also found a direct relationship between family income and expenditure on food.

However, factors like food preferences, availability of food items in the locality, knowledge of nutritional values of certain food items, relative prices of food articles and urgency of non-food expenses were also found to determine the food expenditure pattern.

In the present study most of the respondents spent Rs.200 to 300 as percapita income on food. Similar trend was observed by Anon (1989).

Cereal intake shows an increasing trend with lower economic status. In the present study the expenditure of different food items revealed that large portion of their income spent on food is mainly for cereals. Majority of the families spent Rs.301 to 400 on cereals. Menon (1980) in a study among the coastal areas of Trivandrum found that 76 per cent of the income is spent on carbohydrate rich foods like cereals. Similar trend in expenditure was also observed among Kannikkar families by Felsy (1989).

Cereals were important staple food and contributes major share of the food expenditure pattern. Parvathy and Babitha (1989) found that cereals especially rice continued to

be the major staple food item among South Indians. In the present study also, rice being the staple food of Keralites, accounted for the major expenditure on food.

On assessing the expenditure pattern of pulses, it was found that about 86 per cent spent less than Rs.100 on pulses. It may be because of high cost of pulses and ignorance of the respondents about its nutritional importance. The study was supported by Anon. (1987) who had found that in rural areas of Uttarpradesh the consumption of pulses was occasional due to ignorance.

Roots and tubers form an important daily food for Keralites. In the present study most of the subjects spent Rs.100-200 on roots and tubers. A study conducted by Prema (1988) had also revealed a similar trend.

The present study also indicated that 53 per cent spent Rs.100-200 on vegetables and a majority of the families spent less than Rs.100 on fruits. A large per cent spent less than Rs.100 for green leafy vegetables. The present study was supported by Godawari *et al* (1987) who had found that in Tamil Nadu, 4 per cent of the families did not spent any amount on leafy vegetables and others spent less than 6 per cent of their expenditure on it.

In Kerala most of the families included fish as a main item of their diet. The expenditure on fish may influence

the iodine intake. Prema (1997) indicated that only wealthy consumers may get adequate amounts of iodine if they are non vegetarians and can afford to buy seafood in plenty and in Kerala more than 60 per cent of the population cannot be identified under this category.

The present study also revealed that majority of the families did not spent any money for buying meat. It may be attributed to the fact that because of their low economic status they cannot afford expensive food items such as meals.

The study revealed that majority of the respondents were non vegetarians. Food habits have influence on nutrient intake. Similar trend was observed by Prema (1997) among goitre patients.

Food use frequency assessment was made to reveal any possibility of unusual consumption of food items including goitrogens (Kimiagar *et al.*, 1990). Frequency of use of different food items have an influence on dietary pattern. The present study indicated that in all the families the daily diet mainly comprised of energy rich foods like cereals especially rice. The salient findings of the present study was supported by Johnson *et al* (1994). The author has also reported that the daily diet of most of the women comprised of food articles like cereals especially rice. This is also in accordance with the study of Srinivasan *et al* (1991) and Prema (1988).

Roots and tubers especially tapioca have a profound influence on the incidence of goitre. According to NNMB (1994) tapioca is the most commonly consumed tuber by the population of Trivandrum. It may be because of its easy availability and comparative low cost when compared to other tubers. In the present study most of the families included roots and tubers in their daily diet. Similar trend was also reported by Prema (1988).

Protein rich foods like pulses, fleshy foods, milk and milk products contribute 58 per cent of daily intake of iodine. Hence protein rich foods have an influence on iodine intake. The present study revealed that most of the subjects included fish and milk daily in their diet but the quantity was insufficient and other protein rich foods included occasionally in their diet. Similar trend was also observed by Kung *et al* (1996) and Vahab (1997) that 51 per cent of the subjects took sea water fish daily but iodine rich fishes like shrimps, crab etc. never included in their diets.

Although most of the subjects included fish daily in their diet. they have developed goitre. It may be because of the reason that most of the iodine is lost during cooking. NIN (1995) reported that 58 per cent of the iodine content in fish is lost by boiling and 20 per cent is lost by frying. The statistical analysis of the data revealed that there was a positive correlation between frequency of using fish and iodine

content of urine samples of goitre patients. Oldham *et al* (1995) have also reported that total fish consumption has a statistically significant positive effect on urinary iodine content.

Vitamins and mineral rich foods have an influence on nutritional status of consumers. The present study indicated that most of the families included green leafy vegetables and fruits occasionally in their diet and 57 per cent included vegetables daily in their diet. According to Srinivasan *et al* (1991) rural families of Tamil Nadu included some vegetables in the diet but fruits were found to be the neglected item of the diet. Vegetables are fair sources of iodine. In the present study 57 per cent included vegetables in their diets, but they were iodine deficient in iodine. This may be due to environmental iodine deficiency. In regions subject to frequent flooding, the soil may be stripped off its iodine and the food crops, vegetables and fruits grown in the region will be deficient in iodine. Similar observations were also reported by NIN (1995).

Goitrogenic foods have an influence on the incidence of goitre. Diets of certain goitrous population include foods which contain substances with experimentally proven goitrogenic activity (Rao and Lakshmi, 1990). The present study revealed that most of the patients included goitrogenic foods like

tapioca daily in their diet. The present study is in line with the study of Poulose (1997) who had found that majority of the people in the districts of Kottayam and Idukki are consumers of tapioca. Tapioca contain hydrocyanic acid and leads to the formation of goitre. Parvathy (1987) and Prema (1988) had reported that goitre can be caused by eating goitrogenic foods such as cassava which contain hydrocyanic acid. Gaithan (1990) reported that cabbage and cauliflower contain naturally occurring goitrogenic compounds. The present study also revealed that most of the respondents included cabbage occasionally in their diet. In a study conducted by Vishma (2000) revealed that the people in Nedumangad area included cabbage occasionally in their diet.

On assessing the purchase of goitrogenic foods it was observed that most of them purchased goitrogenic foods from market or from near by shops. Prema (1988) indicated that Keralites depend on other States for the supply of different food articles including food grains, fruits and vegetables, the parent soil of which is unknown to us.

The tapioca consumption pattern itself may have an influence on the incidence of goitre. In the present study majority of the respondents were in the habit of consuming tapioca daily atleast twice a day. The present study is in line with the study of Prema (1988) who had found that majority of the goitre patients had two meals containing tapioca.

Prema (1988) had also observed that majority of the goitre patients consumed tapioca as a substitute for rice. However in the present study, most of the respondents consumed tapioca as a main item in the diet and not as a substitute for rice.

Method of cooking of tapioca may influence the incidence of goitre. The present study indicated that most of the respondents consumed tapioca in the boiled form. Similar trend was also reported by Parvathy (1987). It was found that most of the respondents were in the habit of boiling tapioca in a covered vessel and were discarding the cooking water once. Vishma (2000) had also observed the same practice.

5.3 Assessment of actual quantity of food consumed

Actual food intake may have a profound influence on iodine intake. The present study revealed that only the intake of cereals far exceeded the RDA. The intake of roots and tubers were marginally adequate. The intake of food items like pulses, vegetables, fruits, green leafy vegetables, milk and milk products and flesh foods were very low compared to RDA. The study was supported by Chadha *et al* (1995) who found higher intake of cereals and lower intake of pulses, vegetables, fruits, flesh foods and fat and oils by the rural population. Gopalan and Kaur (1989) observed that the common feature of the diets of the low income group is the low intake of protective

foods like pulses, vegetables, fruits, milk and flesh foods including fish.

The study revealed that calorie and protein intake were below 75 per cent of RDA. Niacin and vitamin A intake were marginally adequate. Other nutrients such as calcium, iron, thiamine, riboflavin and vitamin C were very low compared to RDA. The present study is also in line with that of Srinivasan *et al* (1991) who had reported that deficiencies were observed with respect to energy, protein, vitamin A, ascorbic acid and riboflavin. The above salient findings of this study are agreement with the study of Kimiagar *et al* (1990) who found that 38 per cent of the goitre patients received less than 80 per cent of the recommended intake for energy and 62 per cent less than 80 per cent of the recommended vitamin A intake. Calorie intake may have an influence on iodine absorption. According to Ingenbleek (1986) protien energy malnutrition has been demonstrated to play a role in thyroid dysfunction. Vitamin A intake has also been found to influence the incidence of goitre. According to Osman and Fatah (1981) low vitamin A in the diet was one of the factors contributing to the high incidence of goitre.

5.4 Clinical examination and grading of goitre patients

According to Swaminathan (1993) clinical examination is the most important part of nutritional assessment as one

gets direct information of the signs and symptoms of dietary deficiency prevalent among people.

Goitre is distributed widely on the subcontinent with varying degrees of severity (Parvathy, 1987). Depending upon the severity goitre is graded into different types and the changes differ depending upon duration of deficiency.

On assessing the types of goitre the study revealed that most of the patients had diffuse colloid goitre. A study conducted by Prema (1988) on "prevalence of goitre and associated factors in Trivandrum" revealed that the occurrence of colloid goitre was 20 per cent.

5.5 Iodine content in drinking water and urinary urine samples collected from goitre patients

Karmarkar (1990) had opined that iodine deficiency definitely exists in varying levels in the country based on the physiological parameters ie., urinary iodide excretion and the iodine content of water.

Iodine content of drinking water is considered to be an indicator of environmental iodine status (Brahmam, 1998). In the present study majority of the respondents were in the habit of drinking well water. The study was supported by Pandav *et al* (1989) who had found that 10 per cent of daily requirement of iodine is fulfilled from natural water.

Iodine content of drinking water is found to influence the incidence of goitre. Natural iodine is available through drinking water. The present study indicated that most of the patients used drinking water with an iodine content of 2.3 mcg/l. The mean iodine content of drinking water was 2.48 mcg/l. A study conducted by Mukharjee *et al* (1990) also reported similar results.

The iodine content of urine gives an indication of the severity of goitre. The present study indicated that most of the respondents had a urinary iodine content in the range of 5-7 mcg/dl. A study conducted by Malik *et al* (1998) showed that the median urinary iodine excretion levels was 7 mcg/dl. Similar result was also reported by Bhardwaj *et al* (1997).

Suter and Hunter (1980) have reviewed that nutritional status was influenced by factors such as psychological, socio cultural and physiological factors. In the present study most of the respondents were observed to be in deficient nutritional status. According to Dood and Godhia (1992) nutritional status of all adolescents with iodine deficiency was found to be poor as compared to well-nourished counter parts.

SUMMARY

SUMMARY

The study entitled 'Dietary profile of goitre patients' comprises information on the influence of various socio economic and dietary pattern on the development of goitre among the respondents.

The study was conducted among 100 goitre patients, all attending the thyroid clinic of Medical College Hospital, Trivandrum for the first time.

The dietary profile of the patients was evaluated through socio economic profile, dietary pattern and food consumption pattern, actual food intake and clinical examination of the goitre patients. The iodine content of drinking water and urine samples were also assessed.

During the study a number of factors which might have contributed to the poor dietary pattern were observed and these factors are highlighted below.

The socio economic profile of the goitre patients indicated that most of the respondents were in the age group of 16-30 and most of them were females.

It was observed that the respondents surveyed were mainly Hindus (Other backward classes) with high school level of education.

Majority of the respondents were residing in nuclear families with family size of 4.

Most of them belonged to 2 adult members family with 2 children. The families of the respondents were having only one employed person.

On assessing the economic status of the families, majority of the families had a monthly income that ranged between Rs.1000 to 1500 and mainly with a percapita income of Rs.300 to 400.

Based on PQLI, the respondents were grouped into 3 categories and most of the patients belonged to Group II with PQLI 13-16.

Data collected on dietary pattern and food consumption pattern observed that most of them spent the major part of their income on food ie. Rs.1001 to 1500/month.

Among the expenditure on various food items, most of them spent Rs.301 to 400 on cereals, less than Rs.100 on pulses, Rs.100 to 200 on roots and tubers, Rs.100 to 200 on vegetables, less than Rs.100 on fruits, green leafy vegetables, egg, fats and oils, sugar and jaggery, Rs.100 to 200 on milk, Rs.201 to 300 on fish. The respondents did not spent any money for buying meat.

Data regarding the food habits indicated that most of them were non vegetarians. On assessing frequency of using different food items, most of them used energy rich foods like cereals, roots and tubers, sugar and jaggery daily in their diet. Among the protein rich foods fish and milk (insufficient quantity) used daily, but pulses, egg and meat were used occasionally in their diet. Most of them used mineral and vitamin rich foods like vegetables daily in their diet. Green leafy vegetables and fruits were used occasionally by most of the surveyed respondents.

Considering the frequency score, cereals, milk, roots and tubers with a high frequency score.

Data gathered regarding the frequency of using goitrogenic foods revealed that tapioca was used daily and cabbage was used occasionally among most of the surveyed goitre patients.

The data on tapioca meal and consumption pattern indicated that the patients included tapioca twice daily as a main item in the diet. Tapioca meal and consumption pattern had significant association with type of goitre.

Most of them followed boiling method for cooking tapioca in a covered vessel and discarded the cooking water once.

On assessing the actual food intake, it was noticed that cereal intake was more than the RDA and intake of other food items were lower than the RDA. The mean nutrient intake revealed that the nutrient were lower than the RDA.

Data gathered on clinical examination of goitre patients indicated that most of them were mainly with diffuse colloid goitre with symptoms of palpitation, swelling and tremour. Majority of the families were not having any other members with goitre.

Data gathered on the iodine content in drinking water and urinary samples confirmed the presence of low iodine content in water and urine. Most of them used well water for drinking purposes with an iodine content of 2-3 mcg/l. Majority of the goitre patients had an urinary iodine content of 5-7 mcg/dl.

An enquiry about the nutritional status index of goitre patients revealed that most of the respondents were observed to be in deficient nutritional status.

Based on the above results, the following conclusions are arrived

1. The surveyed goitre patients were mainly with a habit of taking inadequate amount of iodine rich foods.

2. Goitre patients included mainly of goitrogenic foods like tapioca as a main item in the daily diet which hinder the absorbtion of iodine from other foods in the diet.

3. The analysis of iodine content of water and urine samples collected from surveyed patients also confirmed low iodine content in the water and urine.

Recommendations

Based on the above observations the following suggestions and recommendations are given to improve the iodine content in the diet of goitre patients. Dietarysupplementation of iodine (iodisation of salt) is the best way to prevent iodine deficiency disorders like goitre.

Education and communication is one of the most important method of IDD control.

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APPENDICES

APPENDIX - I

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF AGRICULTURE

DEPARTMENT OF HOME SCIENCE, VELLAYANI

SCHEDULE USED FOR ASSESSING SOCIO ECONOMIC PROFILE OF THE GOITRE PATIENTS

1. Name of the respondent
2. Address
3. Age
4a. Religion
4b. Caste
5. Educational qualifications of the respondent
6. Type of family
7. Family size
8. Number of adults in the family (actual)
9. Number of children in the family (actual)
10. Number of employed persons in the family (actual)
11. Total income of the family per month (actual)
12. Percapita income of the family (actual)

APPENDIX - II

SCHEDULE USED FOR COLLECTING DIETARY PATTERN AND FOOD CONSUMPTION PATTERN OF THE GOITRE PATIENTS

1. Name of the respondent
2. Total income on food expenditure
3. Percapita income spent on food
4. Expenditure pattern on different food items
    a) Cereals
    b) Pulses
    c) Roots and tubers
    d) Vegetables
    e) Fruits
    f) Greenleafy vegetables
    g) Milk and milk products
    h) Egg
    i) Fish
    j) Meat
    k) Fats and oils
    l) Sugar and jaggery
5. Food habit of the respondent

6. Frequency of using different food items
    a) Cereals
    b) Pulses
    c) Roots and tubers
    d) Vegetables
    e) Fruits
    f) Greenleafy vegetables
    g) Milk and milk products
    h) Egg
    i) Fish
    j) Meat
    k) Fats and oils
    l) Sugar and jaggery
7. Frequency of using goitrogenic foods
    a) Tapioca
    b) Cabbage
    c) Cauliflower
8. Place of purchase of goitrogenic foods
9. Meal pattern of tapioca
10. Consumption pattern of tapioca
11. Mode of use of tapioca
12. Different methods of cooking tapioca

APPENDIX - III

KERALA AGRICULTURAL UNIVERSITY

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DEPARTMENT OF HOME SCIENCE, VELLAYANI

FORMULAE FOR MAKING FOOD USE FREQUENCY TABLE

$$\text{Score} = \frac{R_1S_1 + R_2S_2 + \ldots\ldots\ldots + R_nS_n}{N}$$

S_n = Scale of rating

R_n = Percentage of respondents selecting a rating

N = Maximum scale rating

APPENDIX - IV

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF AGRICULTURE

DEPARTMENT OF HOME SCIENCE, VELLAYANI

SCHEDULE USED FOR ASCERTAIN THE ACTUAL FOOD INTAKE OF THE GOITRE PATIENTS (24 HOUR RECALL METHOD)

1. Name of the respondent :

Types of food preparation	Raw quantity of each ingredient (gm)	Total cooked amount (gm)	Individual intake (Cooked volume) (gm)

APPENDIX - V

KERALA AGRICULTURAL UNIVERSITY

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DEPARTMENT OF HOME SCIENCE, VELLAYANI

SCHEDULE USED TO ELICIT HEALTH PROFILE OF THE GOITRE PATIENTS

1. Name of the respondent
2. Types of goitre
3. Clinical symptoms of goitre
4. Other clinical symptoms
   a) Anaemia
   b) Angular stomatitis
   c) Bitot's spots
   d) Teeth carries
   e) Night blindness

APPENDIX VI

KERALA AGRICULTURAL UNIVERSITY
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DEPARTMENT OF HOME SCIENCE, VELLAYANI

Schedule used for developing Physical Quality of Life Index

Caste	Scheduled Caste (0), Scheduled Tribe (1), Other backward communities (2), Forward communities (3)
Educational status	Illiterate (0), Lower primary (1), Upper primary (2), High School (3), S.S.L.C (4), Pre-Degree (5), Graduate (6), Post Graduate (7)
Family income in Rs. (monthly)	$\leq$ 1000 (0) 1001-2000 (1) 2001-3000 (2) 3001-4000 (3) 4001-6000 (4) 6001-8000 (5) 8001-10000 (6) >10000 (7)
Percapita income in Rs. (monthly)	$\leq$ 100 (0) 101-500 (1) 501-900 (2) 901-1300 (3) 1301-1700 (4) 1701-2100 (5) 2101-2500 (6)
Calorie intake/day (kcals)	$\leq$ 1800 (0) 1801-2100 (1) 2101-2400 (2) 2401 - 2700 (3) $\geq$ 2701 (4)
Protein intake/day (g)	$\leq$ 40 (0) 41-45 (1) 46-50 (2) 51-55 (3) 56 - 60 (4) 61-70 (5)
Monthly food expenditure expressed as percentage of income	$\leq$ 50 (0) 51-55 (1) 56-60 (2) 61-65 (3) 66 - 70 (4) 71-75 (5) 76-80 (6) 81-85 (7) 86-90 (8)

APPENDIX - VII

Correlation among selected variables

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	X_{20}	X_{21}	X_{22}
X_1	1.0000																					
	*																					
X_2	-0.2890	1.0000																				
X_3	-0.0555	-0.0834	1.0000																			
			*																			
X_4	-0.0463	0.0516	0.6090	1.0000																		
			*	*																		
X_5	-0.0680	-0.1489	0.2705	-0.4934	1.0000																	
			*	*																		
X_6	-0.0517	0.0029	0.3070	0.2636	0.0511	1.0000																
						**																
X_7	-0.0319	0.1400	0.0570	0.0211	0.0985	0.2205	1.0000															
			**	**			*															
X_8	0.0213	0.1204	-0.2202	-0.1962	0.0411	0.1237	0.9200	1.0000														
						**	*	*														
X_9	-0.0960	0.1133	0.1448	0.1333	0.1479	0.2359	0.5657	0.4808	1.0000													
		**	*	**			*	*	*													
X_{10}	-0.0566	0.2054	-0.4316	-0.2211	-0.1026	-0.0899	0.5244	0.6656	0.5933	1.0000												
			*	*		*	**		*													
X_{11}	-0.0646	-0.0701	0.4297	0.3375	0.0452	0.2899	0.2291	0.0834	0.3531	0.0338	1.0000											
			**				**															
X_{12}	-0.1720	0.1134	0.2421	0.1327	0.1348	-0.0010	0.2623	0.1803	0.1743	0.1944	0.1761	1.0000										
		**					**	**														
X_{13}	-0.0570	-0.2909	0.1168	0.1055	0.0529	0.0315	-0.1975	-0.2479	-0.0975	-0.1770	-0.0517	0.0446	1.0000									
		*				**	*	*	*	*	**	*										
X_{14}	-0.0957	0.2631	0.0362	0.0404	-0.0051	0.2261	0.4538	0.4303	0.4734	0.5642	0.2172	0.2643	-0.1855	1.0000								
							*	*	*	*		*	*	*								
X_{15}	-0.0706	0.1941	-0.0493	-0.0114	0.0591	-0.0429	0.3512	0.4038	0.4544	0.5734	0.0995	0.4019	-0.2744	0.4686	1.0000							
				*					*	*				*	*							
X_{16}	-0.1571	-0.0029	-0.1340	-0.2010	0.0610	-0.0244	0.0762	0.1735	0.2546	0.4048	0.0285	0.0508	-0.0878	0.3107	0.4013	1.0000						
		*					**	**	*	*	**		**	*	*	*						
X_{17}	-0.1104	0.2554	0.0493	-0.0664	0.1490	0.0276	0.2405	0.2482	0.4900	0.4754	0.2110	0.1692	-0.2525	0.4855	0.3866	0.3283	1.0000					
				*		**	**	*	*	*												
X_{18}	0.1049	0.0325	0.1795	0.2872	-0.1006	0.2211	0.2120	0.2087	0.3250	0.2884	0.1016	-0.0136	-0.0171	0.0204	0.1079	-0.0260	0.0111	1.0000				
		**					*	*		*			*	*	*		*					
X_{19}	0.0139	0.2344	-0.1376	0.0015	-0.1844	0.0115	0.2577	0.2994	0.1488	0.3395	0.0895	-0.0085	-0.6791	0.3047	0.2911	0.1322	0.4031	0.0814	1.0000			
X_{20}	0.0934	0.0742	0.0750	0.0380	-0.0321	-0.0151	-0.1636	-0.0681	-0.1249	-0.0916	0.0726	0.0456	0.0369	-0.1537	-0.1052	-0.1138	-0.1060	-0.1532	-0.1040	1.0000		
							**							**						*		
X_{21}	0.0017	0.0717	0.0471	0.0256	0.0438	-0.0242	0.2089	0.1761	0.1203	0.1028	-0.1387	0.1829	0.0339	0.2134	0.1505	0.0697	0.0509	0.1139	0.0663	-0.7404	1.0000	
																				*	*	
X_{22}	-0.0572	-0.0961	-0.0014	-0.0644	-0.0482	-0.0320	-0.0880	0.0536	0.0725	0.0992	-0.0914	0.0002	-0.0081	0.1377	0.0870	0.0559	0.1535	-0.0463	0.1122	-0.7979	0.5933	1.0000

Appendix VII continued

X_1 - Age

X_2 - Education

X_3 - Family size

X_4 - Number of adults

X_5 - Number of children

X_6 - Number of employed persons

X_7 - Family income

X_8 - Percapita income

X_9 - Income spent on food

X_{10} - Percapita income spent on food

X_{11} - Income spent on cereals

X_{12} - Income spent on pulses

X_{13} - Income spent on roots and tubers

X_{14} - Income spent on vegetables

X_{15} - Income spent on fruits

X_{16} - Income spent on greenleafy vegetables

X_{17} - Income spent on milk and milk products

X_{18} - Income spent on fish

X_{19} - Frequency of using tapioca

X_{20} - Type of goitre

X_{21} - Iodine content of water

X_{22} - Iodine content of urine

APPENDIX - VIII

Correlation of PQLI with other variables

	PQLI	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}
PQLI	1.0000 **															
X_1	-0.2153 *	1.0000														
X_2	0.6633	-0.2890	1.0000													
X_3	-0.0973	-0.0555	-0.0834	1.0000 *												
X_4	0.0935	-0.0463	0.0516	0.6090 *	1.0000 *											
X_5	0.0295 **	-0.0517	0.0029	0.3070	0.2636	1.0000 **										
X_6	0.2512 **	-0.0319	0.1400	0.0570 **	0.0211 **	0.2225	1.0000 *									
X_7	0.2402 *	0.0213	0.1204	-0.2202	-0.1962	0.1237 **	0.9200 *	1.0000								
X_8	0.4262	-0.0960	0.1133 **	0.1448 *	0.1333 **	0.2359	0.5657 *	0.4808 *	1.0000 *							
X_9	0.4968	-0.0566	0.2054	-0.4316 *	-0.2211 *	-0.0899 *	0.5244 **	0.6656	0.5933 *	1.0000						
X_{10}	0.0625 *	-0.0646	-0.0701	0.4297	0.3375	0.2899	0.2291 **	0.0834 **	0.3531	0.0338	1.0000					
X_{11}	-0.2732 *	-0.0570	-0.2909 *	0.1168	0.1055	0.0315 *	-0.1975 *	0.2479 *	-0.0975 *	-0.1770 *	-0.0517 *	1.0000				
X_{12}	0.3361 **	-0.0957	0.2631	0.0362	0.0404 *	-0.2261 **	-0.4538 **	0.4303 **	0.4734 *	0.5642	0.2172	-0.1855	1.0000			
X_{13}	0.1971 *	0.1049	0.0326	0.1795	0.2872	0.2211	0.2120	0.2087	0.3250	0.2884	0.1016	-0.0171	0.0204	1.0000 *		
X_{14}	0.2956 *	0.1795	-0.0615	-0.0203	0.1013	0.0476	-0.0472	0.1065	0.0949	0.1289	0.1836	-0.0470	-0.0223	0.2328	1.0000 *	
X_{15}	0.2752	0.1190	-0.0051	-0.0633	0.0464	0.0289	0.0741	0.1543	-0.0044	0.1512	0.1769	-0.0901	-0.0630	0.1815	0.8213	1.000

X_1 - Age

X_2 - Education

X_3 - Family size

X_4 - Number of adults in the family

X_5 - Number of employed persons in the family

X_6 - Family income

X_7 - Percapita income

X_8 - Income spent on food

X_9 - Percapita income spent on food

X_{10} - Income spent on cereals

X_{11} - Income spent on roots and tubers

X_{12} - Income spent on vegetables

X_{13} - Income spent on fish

X_{14} - Calorie intake

X_{15} - Protein intake

APPENDIX - IX

Correlation of NSI with other variables

	NSI	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
NSI	1.0000														
X_1	-0.2480**	1.0000													
X_2	-0.0974	-0.0555	1.0000												
X_3	0.0058	-0.0319	0.0570	1.0000											
X_4	0.0131	0.0213	-0.2202**	0.9200*	1.0000										
X_5	0.0433	-0.0566	-0.4316*	0.5244*	0.6656*	1.0000									
X_6	0.0659	-0.0616	0.4297*	0.2291**	0.0834	0.0338	1.0000								
X_7	-0.2196**	-0.0570	0.1168	-0.1975**	0.2479**	-0.1770	-0.0517	1.0000							
X_8	0.0976	-0.0957	0.0362	0.4538*	0.4303*	0.5642*	0.2172**	-0.1855	1.0000						
X_9	0.2037**	-0.1571	-0.1340	0.0762	0.1735	0.4048*	0.0285	-0.0878	0.3107*	1.0000					
X_{10}	0.0128	0.0689	0.1444	-0.0940	-0.1514	-0.2206	-0.0025	0.1795	-0.1217	-0.1543	1.0000				
X_{11}	-0.6257**	0.0934	0.0750	-0.0681	-0.1249	-0.0726	0.0456	0.0369	-0.1537	-0.1138	-0.0848	1.0000			
X_{12}	0.9277*	-0.0572	-0.0014	0.6886	0.0536	0.0992	-0.0914	-0.0081	0.1377	0.0599	-0.1654	-0.7979*	1.0000		
X_{13}	0.6086*	0.1795	-0.0203	0.0472	0.1065	0.1289	0.1836	-0.0470	-0.0223	-0.0482	0.0009	0.0695	-0.1950	1.0000	
X_{14}	0.3664*	0.1190	-0.0633	0.0741	0.1543	0.1512	0.1769	-0.0901	-0.0603	-0.0225	-0.1013	0.0941	-0.1784	0.8213*	1.0000

X_1 - Age

X_2 - Family size

X_3 - Family income

X_4 - Percapita income

X_5 - Percapita income spent on food

X_6 - Income spent on cereals

X_7 - Income spent on roots and tubers

X_8 - Income spent on vegetables

X_9 - Income spent on greenleafy vegetables

X_{10} - Frequency of using cabbage

X_{11} - Type of goitre

X_{12} - Urinary iodine content

X_{13} - Calorie intake

X_{14} - Protein intake

ABSTRACT

DIETARY PROFILE OF GOITRE PATIENTS

By
SHEEJA KAMAL

ABSTRACT OF THE THESIS

Submitted in partial fulfilment of the requirement for the degree of

Master of Science in Home Science
(Food Science and Nutrition)

Faculty of Agriculture
Kerala Agriculture University

Department of Home Science
COLLEGE OF AGRICULTURE
Vellayani, Thiruvananthapuram

2000

ABSTRACT

The study entitled 'Dietary profile of goitre patients' comprises information on the socio economic, dietary and health profile of goitre patients.

The study was conducted among 100 goitre patients, all attending the thyroid clinic of Medical College Hospital, Trivandrum for the first time.

The socio economic profile of the goitre patients indicated that most of the respondents were in the age group of 16-30 and most of them were females.

The respondents surveyed were mainly Hindus (other backward classes) with high school level of education.

Majority of the respondents were residing in nuclear families with 4 family members and families of the respondents were having only one employed person.

Most of the families had a monthly income that ranged between Rs.1000 to 1500 and mainly with a percapita income of Rs.300 to 400.

Based on PQLI, the respondents were grouped into 3 categories and most of the patients were in the category of PQLI 13-16.

Data collected on dietary pattern and food consumption pattern observed that most of them spent the major part of their income on food ie. Rs.1001 to 1500/month.

Among the expenditure on various food items, most of them spent Rs.301 to 400 on cereals, Rs.201 to 300 on fish and Rs.100 to 200 on roots and tubers.

On assessing, the frequency of using different food items, most of them used energy rich foods like cereals, roots and tubers, sugar and jaggery daily in their diet. Among the protein rich foods fish and milk (insufficient quantity) used daily in their diet.

Frequency of using goitrogenic foods revealed that tapioca was used daily among the most of the surveyed goitre patients. The data on tapioca meal and consumption pattern indicated that the most of the surveyed patients included tapioca twice daily as a main item in the diet.

Most of them followed boiling method for cooking tapioca in a covered vessel and discarded the cooking water once.

On assessing the actual food intake, it was noticed that cereal intake was more than the RDA. The mean nutrient intake revealed that the nutrients intake were lower than the RDA.

Clinical examination of goitre patients indicated that most of them were mainly with diffused colloid goitre with symptoms of palpitation, swelling and tremour.

Data gathered on the iodine content in drinking water and urinary samples confirmed the presence of low iodine content in water and urine.

An enquiry about the nutritional status index of goitre patients revealed that most of the respondents were observed to be in deficient nutritional status.