

Prevalence of Hypertension in Diabetes Mellitus  
and the Impact of Diet Counselling on  
Selected Subjects

BY

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## Introduction

## INTRODUCTION

"Many a disease can be arrested following a healthy way of life and diet"

--Charak Sanhita

Great philosophers have stressed that health is the greatest of all possessions, a priceless treasure, but a treasure that is rarely appreciated, until it is lost. Health is one of the fundamental requirements of man, and the foundation for the physical, emotional, mental, social and economic development of the nation. Health is a precious asset for everyone of us and everyone of us likes to enjoy a good health (Sidhu, 1983).

In this scientific era, metabolic and other disease conditions are widespread in all populations and cultures and continue to be a source of distress, impaired productivity and diminished quality of life for significant number of people and their families (World Health Forum, 1988).

Diabetes is a major health problem known to affect more than 30 million people. It contributes significantly to premature death and prolonged illhealth (WHO Expert Committee, 1985).

Diabetes has been defined as a genetically and clinically heterogenous group of disorders all of which

shows glucose intolerance. It is characterised by a partial or total lack of functioning insulin and alterations in carbohydrate, protein and fat metabolism. About 400,000 cases are diagnosed annually, most of whom are over 40 years of age and are also affected by one or more chronic conditions of the vascular system including, heart disease, high blood pressure, neuropathy, nephropathy and retinopathy (Robinson, 1986).

The causes of diabetes are manifold and often unknown. In most cases, it probably results from the interaction of environmental factors in genetically susceptible individuals. (WHO Expert Committee, 1980).

Diabetes tends to run in families and is more common in individuals who are obese compared with those who are nonobese (Kozak, 1982).

Diabetes is classified as insulin dependent diabetes mellitus (IDDM), if the patients are lean, have rapid onset of symptoms and are ketosis-prone and non-insulin dependent diabetes mellitus (NIDDM) who have insidious onset of the disease, are average or overweight and do not require insulin for prevention of ketoacidosis and control of hyperglycemia (WHO Expert Committee on Diabetes Mellitus, 1980).

An eight year long study in a Bombay hospital showed that the incidence of diabetes was 0.79-0.98 per cent of the total adult admissions in the hospital and the incidence of complications was found to be 77.83 per cent (Patel, 1983 and 1985). The incidence of diabetes mellitus in Madras was found to be 9.8 per cent (Sankaranarayanan, 1983). A population study in Pondicherry showed that prevalence of Diabetes was 1.8 per cent and out of this, 11 per cent had a family history of diabetes. (Chandrasekhar, 1984).

The clinical causes of diabetes and the prognosis for health and life of the diabetic are now largely determined by the so-called complications of the disease. The characteristic progressive damage to the eyes, kidneys and nerves and the heightened susceptibility to heart disease, gangrene and stroke are most probably a direct consequence of inadequate control of the metabolic disorder, but it is not yet settled to what extent they evolve independently (WHO Expert Committee, 1980). Denervation, drying and cracking of the skin of the feet, increase vulnerability to infection (Josylin, 1987).

Diabetes mellitus and hypertension are common chronic conditions that frequently coexist. Hypertension is approximately twice as common in individuals with diabetes as in those without it (Statement On Hypertension in Diabetes, 1987).

Around 26 per cent of the diabetic patients suffer from hypertension (Sadikot, 1989). Diabetic women have a increased tendency to develop hypertension than diabetic men (Reaven, 1990). In Bombay, hypertension was detected in 54.89 per cent and most patients were in the age group of 51-60 years (Jain and Patel, 1983). About 75 per cent of cases of diabetics with hypertension have diabetes for less than 10 years (Patel, 1982).

The management of diabetes is both a medical and a dietetic problem so the physician and the dietitian should cooperate in advising the patient. Whatever, the line of treatment, diet forms the main pillar of support and drugs and exercises are complementary (Isaac, 1986). A correct diet is more important to a diabetic than change of air and scenery (Lawrence, 1985).

Extensive studies have shown that, a high carbohydrate and a high fiber diet therapy together with restriction of salt <sup>for</sup> hypertensive diabetics, controls the diabetes, as well as hypertension and hyperlipidemia (Viswanathan, 1985 and Peiris, 1982). In the last decade, reduction to ideal body weight has been emphasised as the most important dietary treatment for non-insulin dependent diabetes mellitus (Stevens, 1985).

Patient education can be defined as a process designed to influence the health related behaviour of

patients (Anderson, 1988). There is an increasing amount of evidence to suggest that patient education for people with a chronic disease is an essential component of effective disease management (Steven Mazzuca, et al, 1986). So, dietary counselling and nutrition education are thus recognized as key elements in educational programmes designed for diabetic patterns (Viswanathan, 1985).

As diabetes mellitus and hypertension are two chronic conditions, that co-exist together in many patients, the study was conducted with the following objectives: To

- (i) Find out the prevalence of hypertension in selected 100 diabetes patients
- (ii) Study the dietary habits of the patients
- (iii) Give diet counselling to the selected ten patients who are hypertensive diabetics and
- (iv) Assess the impact of diet counselling in selected patients

Reviews of Literature

## II REVIEW OF LITERATURE

The review of literature related to the study on 'Prevalence of hypertension in diabetes mellitus and the impact of diet counselling' on selected subjects' is dealt with under the following headings:

- A. Diabetes - a degenerative disease
- B. Incidence and prevalence of diabetes
- C. Problems of diabetes with hypertension
- D. Dietary management in diabetes
- E. Need for diet counselling and methods of diet counselling

### A. Diabetes - a degenerative disease

Diabetes has been defined as a genetically and clinically heterogenous group of disorders all of which show glucose intolerance. It is characterised by a partial or total lack of functioning insulin and alterations in carbohydrate, protein and fat metabolism according to Robinson (1986).

Idiopathic or primary diabetes mellitus may be defined as a hereditary disease of metabolism, in which there is an inadequate supply of effective insulin, characterised by disturbances of carbohydrate, fat and protein metabolism and by microangiopathy, macroangiopathy and neuropathic changes (Arulraj, 1988).

Raheja and Sheilesh Jain (1984) have stated that diabetes today may be defined as too much glucose in the blood. It is not a single disease, but a heterogenous group resulting from many environmental and some heredity factors. These factors acting jointly not only result in increased glucose in blood but also during the course of the disease affect the blood vessels particularly those of eyes, kidneys, heart, brain and lower extremities and cause damage to the nerves. Diabetics have increased susceptibility to infections, particularly those affecting skin, urinary tract, external genitals and respiratory system. Pulmonary tuberculosis and delayed wound healing is fairly common (Bansal, 1980 and Sathe, 1984).

Diabetes is a major cause of disability through its complications of retinopathy, nephropathy, neuropathy and large blood vessel disease. According to WHO Expert Committee Report on diabetes mellitus (1980) and Batra (1987) these complications may lead to blindness, kidney failure, coronary thrombosis, gangrene of the lower extremities and some times amputation. Present evidence suggests that some of these complications may be lessened or prevented by improved metabolic control of the diabetics, as well as by general health measures.

Fernando (1987) states that the complications seen among the young diabetics are no different from those seen

in other countries. Nerve, eye and kidney problems are common threats to health and life. Evidences have accumulated to show that elevated blood lipids are associated with atherosclerosis and that people with diabetes have 2-3 times greater incidence of atherosclerosis and risk of death from cardiovascular diseases says Beebe (1987).

There is a close and intimate relationship between advancing age, diabetes and atherosclerosis. Stout (1990) states that atherosclerosis and its complications in the heart, brain and lower limbs become more common with advancing age. Diabetes also becomes increasingly prevalent with advancing age and predisposes to premature and accelerated atherosclerosis.

According to Keen (1982), Diabetes mellitus associated with an increased incidence of both microangiopathy and macroangiopathy, including coronary insufficiency, cerebrovascular diseases and peripheral vascular occlusion. Aging, sex, duration of diabetes, obesity, hypertension, hyperlipidemia, age at onset of diabetes and smoking are thought to be risk factors for development of these diabetic complications (James, 1981 and Pinart, 1977).

Patel (1985) has stated that the incidence of complications of Diabetes in Bombay was found to be 77.83%.

Jaspan (1987) states that the complications such as blindness, renal failure, neuropathy, amputation, coronary artery disease and stroke in patients with Diabetes can be minimised or avoided by carefully monitoring and controlling the patients blood glucose levels.

#### B. Prevalence and Incidence of Diabetes Mellitus

Diabetes recognises no boundaries. It is a major health problem known to affect about 2 per cent of the population (Karkal, 1984).

According to Ahuja (1979), the prevalence of Diabetes in India is 1.8%. Raheja (1986) states that the prevalence amongst Indians has increased sharply to 1.5% in rural population and it is greater than 3.0% in large urban centres, rising alarmingly between 8.0-2.2% in immigrant Indians. This rise has been particularly rapid in the last decade (Mather et al. 1987 and Ekoe, 1986).

In America in a community based study, Wingard et al. (1990), has found out that the prevalence rate is 14.7% in men and 11.2% in women. The overall prevalence rate in rural Saudi Arabia was 4.3%. There was a rise in prevalence with age and higher income groups. The overall prevalence in women (5.9%) was twice as that of men (2.9%) (Fatani, 1987).

According to Shukla (1987), there is a preponderance of male over female diabetics in India, while it is the other way in the West. There are more than 10 million persons with diabetes in the country. Davis (1983) states that nine million of these cases of diabetes are obesity induced. The prevalence of Diabetes in a rural population of Pondicherry was found to be 1.8% (Chandrasekhar, 1984).

The incidence of Diabetes in a Bombay private hospital was found to be 0.79% (Patel, 1983) and in four other general hospital was 0.98%. A study by Sankaranarayanan (1983), shows that the incidence of Diabetes is 1.2% in rural population and 2% in urban population. The incidence of Diabetes in Madras was found to be 9.8% (Thirumoorthy, 1983).

The incidence of Diabetes in and around Bardoli was found to be 4.4% (Shah, 1987). Shankaranand (1982) states that one per 100 in the adult population has Diabetes mellitus.

### C. Problems of Diabetics with hypertension

Diabetes and hypertension are common chronic conditions that frequently coexist (Statement on hypertension in Diabetes, 1987). Hypertension is approximately twice as common in individuals with diabetes as in those without it. The prevalence of hypertension increases with age

according to National Diabetes Data Group (1985). As in the general population, hypertension occurs more frequently in Diabetic men than in Diabetic women less than 50 years of age and more frequently in women than men greater than 50 years of age.

The incidence of hypertension in Diabetic patients varies from 14.7% to 54.57% (Patel, 1982 and Gupta, 1980). In a study by Jain and Patel (1983), Hypertension was detected in 54.89% of the Diabetic patients.

Christleib (1982) states that in all age groups with diabetes from 0-10 or from 15-25 years duration, the prevalence of hypertension was significantly higher and in females and older males was generally twice that of the comparative populations. Such studies leave little doubt that hypertension is more prevalent in the diabetic than in the non-diabetic population (Warren, 1981).

Hypertension contributes to the leading causes of morbidity and mortality in the diabetic population i.e. coronary heart disease, stroke, peripheral vascular diseases, lower extremity amputations and stage renal disease. It may also contribute to diabetic retinopathy states Tunbridge (1981) and Fuller (1983).

Diabetic nephropathy, as indicated by constant proteinuria, occurs in 10% of diabetic patients (National

Diabetes Data Group (1985). Although hypertension is not a necessary precursor of renal disease, the majority of patients who progress through renal insufficiency to renal failure ultimately develop hypertension (Drury, 1983; Hosteller, 1982).

According to Knowler et al. (1980) and Chahal (1985), a positive correlation exists between the presence of hypertension and retinopathy in patients with diabetes. It has been suggested that hypertension, particularly systolic elevations, contribute to the development of diabetic retinopathy. Kuller et al. (1985) opine that hypertension is a major risk factor for cerebral infarction. Strokes occurs two to six times more frequently in diabetic subjects. In diabetic subjects, stroke occurs twice as often in those who are hypertensive as in those who are normotensive (Simonson, 1988; Jarret, 1982 and Fuller 1983).

Shapiro (1984), states that patients who have both hypertension and diabetes are at substantially increased risk for developing coronary artery disease and peripheral vascular disease due to independent contributions of the two diseases. People with diabetes develop more atherosclerosis and at an earlier age than those without diabetes (Christlieb, 1982).

Burton (1985) suggests that obesity is more common in diabetic and hypertensive individuals than in the general population. Similarly peripheral vascular disease is 30 times more common in diabetic patients than in non-diabetic patients.

Hypertension develops two to four times more frequently in pregnant women who are diabetic than in pregnant women who are not diabetic, states Freinkel (1983) and Hare (1985).

#### D. Role of Diet in Diabetes

Lawrence and Ajgaonkar (1985) has stated that correct diet is more important to a diabetic than change of air and scenery. Diet plays a very important role in the management of Diabetes (Ajgaonkar, 1985).

According to American Diabetes Association (1987), the goals for dietary management of Diabetes are--

- Restore normal blood glucose and optimal lipid levels.

- prevent or delay the development of long term cardiovascular, renal, retinal, neurologic complications associated with Diabetes mellitus.

- Contribute to a normal outcome of pregnancies for women with diabetes.

- Maintain normal growth rate in children, and adolescents as well as the attaining and maintaining reasonable body weight in adolescents and adults.

- Provide adequate nutrition, for the pregnant women, the fetus and lactation. Stay consistent in the timing of meals and snacks to prevent inordinate swings in blood glucose levels for people using exogenous insulin.

- Determine a meal plan appropriate for the individuals life style and based on a diet history.

- Manage weight for obese people with NIDDM. Weight management involves specific changes in food intake and eating behaviour as well as increased activity level.

- Improve the overall health of people with Diabetes through optimal nutrition.

A diabetic has the same basic needs for all the nutrients as everyone else. However, a diabetic is unable to metabolise these nutrients as efficiently and rapidly as a normal person. Hence his diet has to be modified to some extent (Chandalia, 1987).

Restriction of total caloric intake to achieve ideal body weight is the primary dietary intervention recommended for NIDDM (NIH, 1988). Restriction of fat intake to less

than 30% of the total calories is also advised for diabetic patients (Knowlewski et al. 1987; National Diabetes Data Group, 1985; West, 1978).

There is no consensus on the proportion of carbohydrate needed in the diet for the management of Diabetes mellitus (Garg et al. 1988; Barnett, 1981; Nuttal, 1983; Reaven 1980; Wood and Bierman, 1986; Biermann, 1979).

Metabolic studies indicate that soluble forms of dietary fibre may curtail the glycemc response in people with Diabetes (Jenkins et al. 1979; Monnier, et al. 1978; LSRO 1987 and Polynard et al. (1980).

A study conducted by Riccardi (1988) showed that high fibre diet had a significant decrease on the post prandial blood glucose concentration. The average blood glucose concentration was also significantly decreased. Gabbe et al. (1982) concluded that fibre rich diet produced a significant reduction in mean serum glucose and the patients showed a normal glucose tolerance curve.

Individuals with diabetes as well as the general public are cautioned to avoid using too much sodium (Position Statement on Diabetes mellitus, 1990). Many population studies have shown that there is a positive correlation between blood pressure and sodium intake

(Kesteloot, 1980; Khaw and Barret-Connor, 1988; Taol 1984; Kok 1986).

Cholesterol should also be restricted to not more than 200 mg/day (Raheja, 1983). Smoking and alcohol should also be avoided by diabetic patients.

#### E. Need for Diet Counselling and methods of diet counselling

The management of diabetes is both a medical and a dietetic problem. Whatever the line of treatment, diet forms the main pillar of support and drugs and exercise are complementary (Sheila Isaac, 1986 and Ramdasmoorthy, 1988).

It has long been recognised that dietary advice plays an important role in the successful management of all diabetics. The management of Diabetes mellitus though under the overall control of the physician requires the active participation of the patient. A necessary prerequisite for successful treatment is that the patients accepts the diagnosis and learns adequately about the disease. Patient education is therefore of fundamental importance in the management of diabetes, opines Flood (1982).

It is now established that in the health care delivery of a diabetic, education plays a very prominent role not only in the patient to be educated about the disease as a whole, but his immediate household must also take part in understanding the problem, states Mohammed (1988).

Kandar (1988) points out that the major goals of therapy are normalisation of the metabolism of glucose and other nutrients and the prevention or delay of micro or macrovascular, and neurological complications. Increased knowledge of diet, nutrition and diabetes correlates well with good metabolic control, says Karam (1984).

According to Mazzuca (1986) there is an increasing evidence to suggest that patient education for people with a chronic disease is an essential component of effective disease management.

Funnel (1980) states that, diabetes education is able to assume responsibility for all aspects of the education process including assessment, teaching and follow up and take into account the individual needs presented by the older adult patients with diabetes.

Patient education is of fundamental importance in the management of diabetes (Viswanathan, 1985). A successful education programme involves certain cognitive and behavioural skills e.g. diet and self monitoring (Drury, 1982). Viswanathan (1981) and Martha Mitchell (1990) states that the better the patient's understanding of diabetes and of the therapeutic goals, the more will he be motivated to accept the regime and to maintain as normal a life as possible.

According to Schneider (1982), the selection of an in appropriate time and place for counselling may strongly affect success. Effective counselling involves more than giving the patient a meal plan. An atmosphere may be created that will motivate the learner to understand and follow the prescribed dietary pattern. The rapport established during the nutritional interview is important at this point, because a trusting relationship between the patient and the counsellor may improve the individuals's receptivity to diet instruction.

A discussion of the role of diet in the treatment of diabetes provides an appropriate introduction to the counselling session and often has a positive effect on compliance. The food exchange list is then introduced and the meal pattern which has been planned with the assistance of the patient is explained. For the first few weeks, patients should be encouraged to measure foods and eat.

Diabetic patients should be offered a clear understanding of their own individual dietary needs. They should feel competent to make dietary modifications in order to obtain improvements in health. Their dietary knowledge should equip them to lead normal and unrestricted social and professional lives (Raheja, 1988 and Lorenz, 1983).

Any education is better than none i.e. education in any form (e.g. pamphlets, films, lecture, behavioural modification techniques) is more likely to produce improved regimen compliance and physiologic outcomes than is routine chronic care without formal patient education (Posarac, 1980 and Mazzuca, 1982).

## Experimental Procedure

### III EXPERIMENTAL PROCEDURE

The procedure followed for the study on "Prevalence of hypertension in diabetes mellitus and the impact of diet counselling on selected subjects" are dealt under the following headings:

- A. Selection of the sample
- B. Selection of the tools and methods
- C. Imparting diet counselling to the patients
- D. Assessment of the impact of diet counselling

#### A. Selection of the sample:

The area selected for the study were Diabetes clinic in Ramnagar and the E.S.I. Hospital in Coimbatore. These two areas were selected because of the availability of samples, easy access and cooperation extended by the institution.

According to Gupta (1981), the simple random sampling refers to that sampling technique, in which each and every unit of the population has an equal opportunity as being selected as the sample. In simple random sampling, the items that get selected is first a matter of choice and personal bias of the investigator does not influence the situation.

A total number of 100 patients were selected randomly from the Diabetes clinic in Ramnagar and E.S.I. Hospital in Coimbatore. The patients were both male and female non-insulin dependent diabetics and within the age range of 40-60 years.

According to Harold Varley (1980), a fasting blood glucose between 130-200mg/100ml, is very suggestive of diabetes mellitus, whilst one over 200mg is almost diagnostic. The 100 patients whose blood glucose was over 130mg were thus selected for the study.

A subsample of 10 patients who were hypertensive diabetics were selected randomly. The hypertensive diabetics had a systolic pressure of more than 12mm Hg and diastolic pressure of more than 80 mmHg were taken as hypertensives (WHO Expert Committee Report on Hypertension, 1983). These subsamples were included for the diet counselling.

#### B. Selection of the method:

According to Wilkinson and Bandarkar (1982), information secured through interview technique, is more accurate than other methods, doubts of the respondents could be clarified and detailed information can be obtained by establishing a good rapport. Therefore, an interview schedule, given in Appendix I, was devised to obtain

information regarding the socio-economic status and dietary habits of the patients.

The checklist, as stated by Bailey (1982), is a simple device consisting of a prepared list of items. It is a type of questionnaire in the form of a set of categories for the respondent to check. A checklist given in Appendix II, was formulated to evaluate the nutritional knowledge of the patients before and after counselling. The checklist contained questions such as fibre rich foods sodium rich foods and foods that control the blood sugar level.

#### C. Diet counselling to the patients:

Diet counselling is a process which brings sound nutrition practices, regarding human needs and available food service to awareness (Lindsey et al. 1983). Among the various methods adopted to counsel the patients, one of the methods is individual counselling which is considered to be superior among the methods (Shaw, 1981). Therefore, individual diet counselling was given with the help of a chart and a diet sheet (Appendix III). The diet sheet included foods to be avoided and included, a list of sodium rich foods and a daily meal plan. The diet sheet was distributed to the ten subsample who were selected randomly.

If the diet counselling given is only by oral, the patient might not adhere to counselling so diet counselling can be given using aids like charts and exhibitions. This form of diet counselling has more impact. (Reed 1988 and Lasquerux 1987). An exhibition was put up. The chart presented in the exhibition depicted the symptoms of diabetes, prevalence of diabetes and the dietary calculation for diabetes. There was also a display of food materials to understand the various diets like 1500kcal and 1200 kcals for diabetics. The diet counselling was done for a period of 2 weeks.

#### D. Assessing the impact of diet counselling:

According to Kozak (1982), as a result of diet counselling, their dietary knowledge should equip them to lead normal and unrestricted social and professional lives and they should feel competent to make dietary modification. The checklist as shown in Appendix II, was used to evaluate the nutritional knowledge of the patients as a result of diet counselling.

#### Biochemical parameters:

The blood pressure and the blood glucose levels of the subsample of ten hypertensive diabetics, were measured before and after one month period of diet counselling to find out, the impact of diet counselling.

PLATE I - EXHIBITION

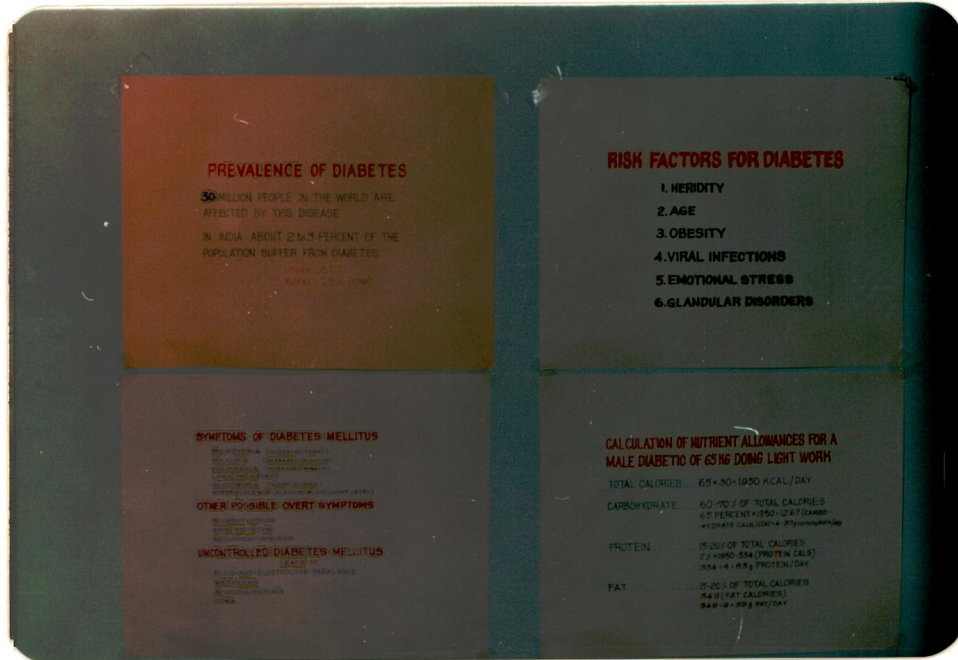


PLATE II - GIVING DIET SHEET TO THE PATIENT

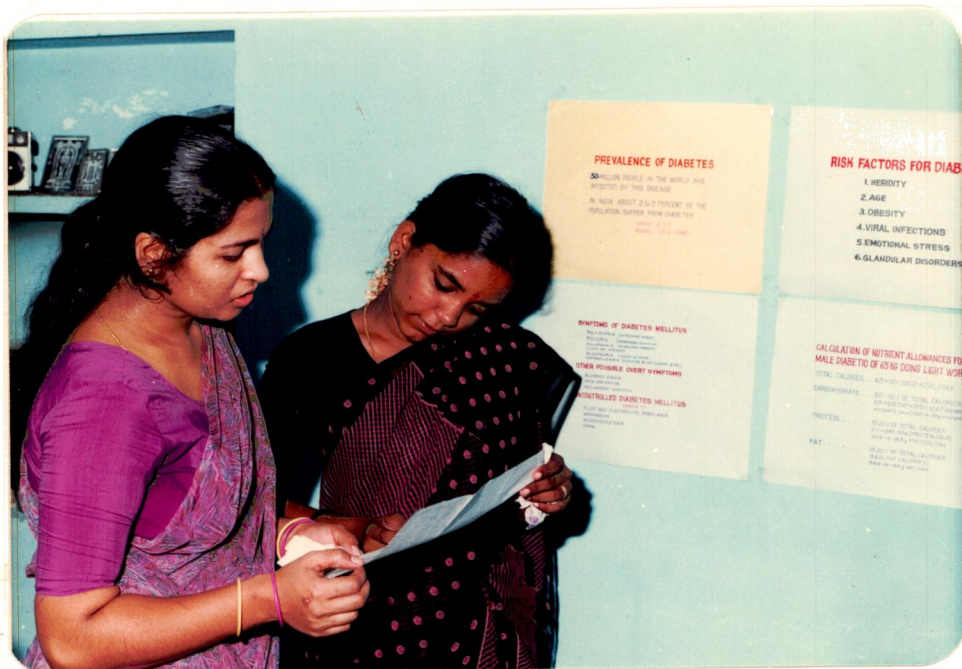




PLATE III - 1500 CALORIE DIABETIC DIET

#### Measurement of blood pressure:

The normal blood pressure levels in an adult is 120/80mmHg (Guyton, 1982). The blood pressure was recorded using the sphygmomanometer. The patients were seated comfortably in a chair, with their arms resting on the table. The hand cuffs was placed on the midarm and air was pumped and the mercury readings on the scale of the sphygmomanometer were noted for systolic and diastolic pressures.

#### Estimation of blood glucose:

The fasting and post prandial blood glucose levels of the 10 subsample hypertensive diabetic patients were measured before and after diet counselling by Folin-Wu method, which is given in Appendix IV.

## Results and Discussion

#### IV RESULTS AND DISCUSSION

The results obtained in the study on 'Prevalence of hypertension in Diabetes mellitus and the impact of diet counselling on selected subjects' are discussed under the following headings:

- A. Background information
- B. Clinical details
- C. Dietary habits
- D. Nutrition knowledge of the patients and
- E. Impact of diet counselling

##### A. Background information:

The background information obtained from the patients included age and sex of the patients, family size of the patients, economic status of the patients, literacy status of the patients and the expenditure pattern of the patients.

##### 1. Age and sex of the patients:

The age and sex of the selected 100 diabetic patients are given in Table I.

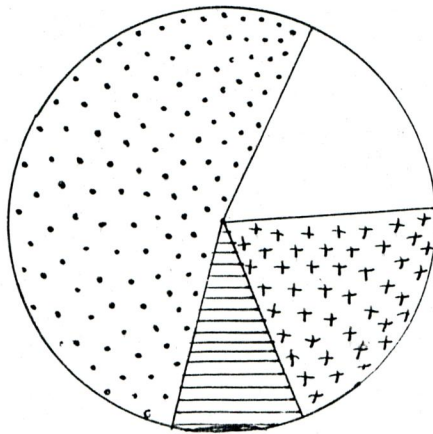
TABLE I  
AGE AND SEX OF THE PATIENTS

Sex	Age in years	Number of patients
Male	40-50	18
	50-60	52
Female	40-50	10
	50-60	20

According to Ahuja (1979), in India epidemiological studies showed male predominance. Accordingly, in the survey, the number of male patients was 70 while there were 30 females among the selected 100 diabetic patients.

Non insulin dependent diabetes mellitus usually occurs after the age of 35 years and are more prevalent in the age group of 50-60 years (Friedman, 1980). In the study conducted the number of males in the age group of 40-50 years was 18 and in the age group of 50-60 years was 52, wherein there were 10 female diabetics in the age group of 40-50 years and 20 in the age group of 50-60 years. The age and sex of the 100 selected diabetic patients are shown in Fig.1.

# AGE AND SEX OF THE PATIENTS



50-60 YRS FEMALES



40-50 YRS MALES



40-50 YRS FEMALES



50-60 YRS MALES

FIG I

## 2. Family size of the patients

It was found out that the majority of the 72 diabetic patients had the size of the family between 2-5. This was mainly due to the reason that most of the patients were from a nuclear family. Among the 100 diabetics, 25 patients had a family size of 5 - 8 while only 3 patients had a family size of more than 8. The reason for the big family size was that they belonged to joint families.

## 3. Literacy status of the patients

The literacy status of the 100 selected diabetes patients is given in Table II.

TABLE II

### LITERACY STATUS OF THE PATIENTS

Literacy status	Number of patients	
	Male	Female
Illiterate	19	6
Upto V standard	10	4
Upto X standard	10	8
Graduates/ Post-Graduates	31	12

It is evident from the above table that among both the male and the female diabetics, maximum number of

patients 31 and 12 respectively were graduates. Only 19 male diabetics and 6 female diabetics were illiterates. This may be due to the reason that even the people from lower class are ~~not~~ literate due to free education offered by the Government. Among the 70 male diabetics 10 had done only upto V standard and 10 upto X standard because of the economic constraints in the family and involvement in the business activity. Among the female diabetics, 4 had done upto V standard and 8 upto X standard.

#### 4. Economic status of the patients

This includes the source of income and the monthly income of the patients.

TABLE III

#### NATURE OF THE SOURCE OF INCOME

Source of income	Number of patients	
	Males	Females
Business	11	-
Labour	18	11
Employment	41	12
Housewives	-	7

Out of the 30 female diabetic patients surveyed, 23 were employed while 7 female were found to be housewives. Among 70 male diabetics 11 were businessmen, 18 were employed as labourers in industry and 41 were employed in government and other private firms as officers, administrators and supervisors at various levels.

TABLE IV  
ECONOMIC STATUS OF THE PATIENTS

Income in classification (HUDCO)	Number of patients
Upto 1500	26
1500-2500	23
Above 2500	51

It is evident from Table III that 51 patients had an income level of above Rs.2500. This may be due to the reason that only people at the high income level go to the doctor for the diagnosis of the diseases while those of the lower class could not afford to consult the doctor, thereby less number of patients were seen at lower income levels. Twenty six patients had a monthly income of upto Rs.1500, and 23 had an income between Rs.1500-2500.

5. Expenditure pattern of the patients

The expenditure pattern of the 100 diabetics surveyed is shown in Table V.

TABLE V  
EXPENDITURE PATTERN OF THE PATIENTS

Expenditure in per cent	Number of patients
Food 40-60	59
Above 60	41
Clothing: Below 10	17
10-15	42
Above 15	41
Housing: 2-3	56
3-4	33
Above 11	11
Education: Below 3	38
3-6	31
6-8	31
Others: 1-2	31
2-3	18
Above 3	51

Among the 100 selected diabetes patients, 59 diabetics spent 40-60 per cent of the income on food while 41 spent above 61 per cent on food. It was found out that patients from the low income spent more in food than patients from high income.

Out of the 100 diabetics, 17 spent below 10 per cent on clothing, 42 between 10-15 per cent and 41 spent above 15 per cent. 56 patients spent 2-3 per cent for housing, 33 patients spent 3-4 per cent while the remaining 11 diabetics spent above 4 per cent on housing. The people who belonged to the high income group had own houses and therefore they spent lesser for housing than low income people.

It is observed that 38 patients, spent below 3 per cent for education, 3-6 per cent was spent by 31 patients while 31 patients spent 6-8 per cent on education. The patients from the low income group did not spend much for the education since the education upto higher secondary was found to be free of cost and books were supplied by the government for the low income group.

Out of the 100 diabetics, 31 patients spent 1-2 per cent for their expenditures, such as recreation, 2-3 per cent was spent by 18 patients while 51 patients spent above 3 per cent.

#### 6. Height weight measurements of the patients

The height-weight measurements of the 100 diabetics according to sex is shown in Table VI.

TABLE VI  
ANTHROPOMETRIC MEASUREMENTS OF THE PATIENTS

Anthropometric measurements	Number of patients	
	Male	Female
Height in cm		
150-160	35	24
160-175	30	5
Above 175	5	1
Weight in Kg		
45-60	41	17
60-70	26	10
Above 75	3	3

From the study it was found out that most of the male and the female diabetics i.e. 35 and 24 were in the height range of 150-160cm, only 5 male diabetics and one female diabetic were above 175 cm while 30 male and 5 female diabetics were between 160-175 cm.

Accordingly 41 male diabetics and 17 female diabetics were within the weight range of 45-60 kg which was in accordance with the weight of Reference of men and women and 26 male and 10 female diabetics were between 60-75kg. In the study, it was found that 3 male diabetics and 3 female diabetics were above 75 kg and found to be overweight.

B. Clinical details

1. Blood sugar levels of the patients

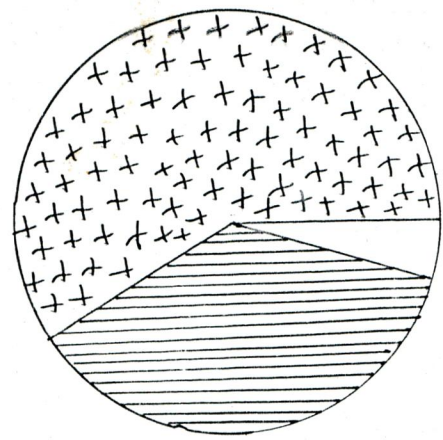
The blood sugar levels of the 100 diabetics are given in Table VII and also shown in Fig.2.

TABLE VII  
BLOOD SUGAR LEVELS OF THE PATIENTS

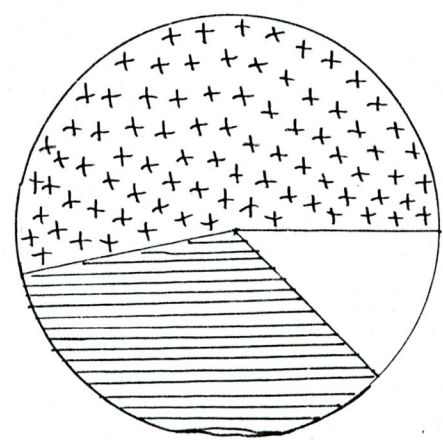
Blood sugar in mg%	Number of patients	
	Male	Female
Fasting		
130-180	42	16
180-225	26	10
Above 225	2	4
Post prandial		
250-300	54	19
Above 300	16	11

According to Harold Varley (1980), a blood sugar level of over 130mg is very suggestive of diabetes mellitus. Majority of the diabetes, 42 male diabetes and 16 female diabetics had blood glucose between 130-180 mg%. This is mainly due to the reason that most diabetics follow the diet prescribed carefully and also take proper medication. The type of food taken by the diabetics also

BLOOD GLUCOSE LEVELS [MALES]



BLOOD GLUCOSE LEVELS [FEMALES]






-  120 - 180 mg%.
-  180 - 225 mg%.
-  Above 225 mg%.

FIG. II

influence the blood sugar level. Starchy foods and sweets increase blood sugar level. Many patients avoided these food items, thereby maintaining the blood sugar level. 26 male diabetics and 10 female diabetics had blood glucose between 180-225 mg while only 2 male diabetic and 4 female diabetic had fasting blood sugar level of over 225mg%.

Among the 100 diabetics 54 males and 19 females had a post prandial blood sugar level between 250-300mg% while only 16 males and 11 females had a post prandial blood glucose of more than 300 mg%. The individual blood sugar levels of the 100 selected diabetic patients is given in Appendix V.

## 2. Blood pressure levels of the patients

The blood pressure levels of the 100 diabetic patients were measured and the prevalence of hypertension in diabetic patients was found out. The results are given in Table VIII and shown in Fig.3.

TABLE VIII  
BLOOD PRESSURE LEVELS OF THE PATIENTS

Blood pressure in mm/Hg	Number of patients	
	Male	Female
Normal (120/80)	51	22
Mild (130/90)	4	3
Moderate (140/100)	11	3
Severe (150/110)	4	2

The blood pressure levels were termed as normal, mild, moderate and severe as shown in WHO Expert Committee Report on Hypertension (1983).

Out of the 100 diabetic patients surveyed, 51 male diabetics and 22 female diabetics had normal blood pressure.

Hypertension is widely prevalent among diabetics. According to Sadikot (1989) around 26 per cent of the diabetic patients suffer from hypertension. In the study, it was found that 27 per cent of the diabetics suffer from hypertension which coincides well with the previous study. Out of these 27 patients, 19 were male diabetics and 8 were female diabetic patients.

Out of this, 7 had mild hypertension, 14 had moderate hypertension while 6 had severe hypertension. The blood

pressure levels of the 100 selected diabetic patients is given in Appendix V and the blood pressure levels are shown in Fig.3.

### 3. Causes for the occurrence of diabetes

#### a. Family history regarding the disease condition:

Diabetes and hypertension are two disease conditions that tend to run in families (Knourer, 1984). The incidence of diseases seen in family of the 100 diabetics patients was found out.

In the vast majority of diabetics, causes for the incidence of diabetes is not known. It may be a hereditary disease (Chandalia, 1981). Out of the 100 diabetic patients 25 had a positive family history of diabetes while 75 did not have a positive family history.

Among the 27 hypertensives, 12 had a positive family history, while 15 did not have a positive family history of hypertension.

#### b. Life style of the patients

It was found out that 28 male diabetics were smokers and the rest were non-smokers. Raheja (1985) has pointed out that the intake of alcohol should be restricted for a diabetic. In the study conducted, 85 of the diabetics were nonalcoholic while only 15 patients were alcoholic.

#### 4. Duration of the disease

Out of the 100 diabetic patients, 49 had diabetes between 1-5 years, 38 between 5-10 years and 13 had diabetes for a period of above 10 years.

Among the 27 hypertensives found out, 15 patients had hypertension between 1-5 years, 6 between 5-10 years and 6 had hypertension above 10 years.

It was found out that in most of the hypertensive diabetics, diabetes was the first to be diagnosed, while only in a few patients, hypertension was diagnosed before the diagnosis of diabetes.

#### 5. Association with other diseases

Diabetes is a disease condition which is often associated with other diseases. The association of diabetes with other diseases is given in Table IX.

TABLE IX  
DIABETES WITH OTHER PATIENTS DISEASES

Name of the disease	Number of patients	
	Male	Female
Heart	13	7
Kidney	3	1
Obesity	17	13
Others	16	6

Diabetics are prone to develop other diseases, specially those affecting kidney, heart, brain and other organs (Batra, 1987).

The reason for the occurrence may be due to heredity, stress and tension or wrong dietary pattern. The association of hypertension and diabetes in the patient increases the risk for heart diseases (Colwell, 1990). Out of the 100 diabetic patients, 13 male and 7 female diabetics had heart diseases while 3 male diabetics and one female diabetic had kidney disease such as kidney failure and nephritis.

Out of the 100 diabetics, 17 were obese among male diabetics and 13 were obese among female diabetics. Among the 100 diabetics 6 male and 6 female diabetics had foot problems and skin problems.

## 6. Monitoring of health

Out of the 100 diabetic patients surveyed, 94 assessed their improvement by monitoring the blood glucose level. Some patients monitored the blood glucose level weekly while most of the patients monitored the glucose level monthly. Viswanathan (1985) has stressed that as a part of diabetes patient's education, they should be taught the importance of monitoring the blood glucose on a periodic basis. Out of the 27 hypertensives, 15 measured the improvement by monitoring the blood pressure levels and 44 patients assessed their improvement by noticing the severity of symptoms such as frequency of thirst, hunger and urination.

### C. Dietary habits of the patients

Out of the 100 patients surveyed, 29 were vegetarians and 71 were non-vegetarians.

#### 1. Consumption of cereals

The type and amount of cereals consumed by the diabetic patients was found out and the results are shown in Table X.

TABLE X  
CONSUMPTION OF CEREALS

Cereals	Number of patients		
	25-50 (grams)	50-75 (grams)	Above 75 (grams)
Rice	31	41	28
Wheat	43	22	8
Others	-	40	10
	<u>3-4 slices</u>	<u>Above 4 slices</u>	<u>Alcoholics</u>
Bread	31	11	

The survey revealed that the cereals like rice, wheat and ragi were included daily as they are the staple food. Out of the 100 diabetic patients, 31 consumed rice between 25-50g, 41 between 50-75g and 25 above 75g daily.

Wheat was consumed daily by only 49 patients out of this, 43 consumed between 25-50g and 22 between 50-100g.

Apart from rice, wheat and ragi, the patients also included rava and wheat rava in their daily diet. The quantity was found to be the same as rice.

Out of the 100 diabetic patients, only 42 consumed bread. Out of this, 31 consumed between 3-4 slices while, only 11 consumed above 4 slices.

## 2. Consumption of pulses

The various pulses and the amount consumed by the diabetic patients are given in Table XI.

TABLE XI  
CONSUMPTION OF PULSES

Pulses	Number of patients		
	0-25 g	25-50 g	Above 50g
Bengal gram dhal	50	32	-
Blackgram dhal	-	69	26
Red gram dhal	-	77	15
Others	-	4	6

It was found that ~~the~~ among the pulses red gram dhal was consumed daily by the majority of 74 patients, followed by blackgram dhal and bengal gram dhal which was consumed by 55 and 25 patients respectively.

The other pulses like green gram dhal was consumed only weekly so as to increase the protein intake and also for a change in the menu.

It was noted that 77 and 66 patients had 25-50g of red gram dhal and black gram dhal whereas only 32 patients had bengal gram dhal in the range of 25-50g. This may be

because the bengal gram is usually used in combination with other pulses as in the preparations of Adai and for seamings therefore it is used only in small quantity of 25g daily.

It was also found out that, only 10 per cent of the people consumed green gram dhal weekly. Out of this, the patients consumed between 25-50g and only 6 patients above 75g of green gram dhal.

### 3. Consumption of vegetables

The various vegetables and the amount of vegetables consumed by the diabetic patients is given in Table XII.

TABLE XII  
CONSUMPTION OF VEGETABLES

Vegetables	Number of patients	
	50-100g	Above 100g
Roots and tubers	65	10
Green leafy vegetables	37	60
Other vegetables	83	17

Roots and tubers are the main foods that has to be avoided by a diabetic. Out of the 100 patients 75 diabetics consumed roots and tubers. Only 10 diabetics consumed above 100g while 65 consumed between 50-100g.

Out of the 100 diabetics, 45 consumed green leafy vegetables daily because of its fibre content and its economy and 60 diabetics consumed above 75g.

Among the 100 diabetics 83 consumed between 50-100g of other vegetables and only 17 consumed above 100g of other vegetables.

#### 4. Consumption of fruits

The fruits consumed by 100 diabetics are given in Table XIII.

TABLE XIII  
CONSUMPTION OF FRUITS

Fruits	Number of patients	
	1-3	Above 3
Banana	94	-
Apple	49	3
Orange	30	13

Schneider (1982) has stated that the diabetics can have one fruit exchange a day. Out of the 100 diabetics only 61, 11 and 25 consumed banana, apple and orange daily respectively. Only 3 patients consumed above 3 apples and only 13 consumed above 3 oranges.

### 5. Consumption of fleshy foods

Out of the 100 diabetic patients, only 71 patients were non-vegetarians. The consumption of fleshy foods is shown in Table XIV.

TABLE XIV  
CONSUMPTION OF FLESHY FOODS

Fleshy foods	Number of patients	
	1-2	Above 2
Egg	63	7
	50-100 g	Above 100g
Fish	48	5
Others	46	10

It is evident from the table that egg was consumed by maximum of 70 patients while other fleshy foods such as meat, fish and chicken were consumed by only 55 and 56 patients respectively. This may be due to the high cost of the other fleshy foods compared to egg. Only 7 patients consumed more than 2 eggs and only 5 and 10 patients consumed above 100g of fish and meat respectively.

## 6. Consumption of milk and milk products

Out of the various milk products, only milk and butter milk were consumed by the diabetics. Curds was avoided by the 100 patients because of its high fat content. The details of milk and butter milk consumption is given in Table XV.

TABLE XV

### CONSUMPTION OF MILK AND MILK PRODUCTS

Milk and milk products	Number of patients	
	$\frac{1}{4}$ - $\frac{1}{2}$ lts.	Above $\frac{1}{2}$ lts.
Milk	100	-
Buttermilk	9	1

All the patients consumed between  $\frac{1}{4}$ - $\frac{1}{2}$  litres. Mainly cow's milk was consumed by the patients because of its easy availability. Buttermilk was consumed in large quantity because of its low fat content. 95 patients consumed between  $\frac{1}{4}$ - $\frac{1}{2}$  litres of buttermilk while only one consumed above  $\frac{1}{2}$  litre of butter milk.

### 7. Consumption of oil

The different types amount of oil consumed by the 100 patients are shown in Table XVI.

TABLE XVI  
CONSUMPTION OF OIL

Oil	Number of patients
Groundnut oil	60
Gingelly oil	23
Coconut oil	9
Others	20
Amount in gms	
20-30	66
30-50	28
Above 50	6

Groundnut oil was consumed by maximum of 60 patients while coconut oil was consumed by the least number of 9 patients. Groundnut oil was used because of family practice and likes. Coconut oil was not used because of its high fat content. The other type of oil included Sanola and Safola and it was used because of its low cholesterol content.

The amount of oil consumed per day varied according to the methods of cooking used. It was found out that only 6 patients consumed above 50g. Maximum of 66 patients used only between 20-30g because it was advised to them by the doctors to reduce the fat intake.

#### 8. Methods of cooking foods

The various cooking methods used were boiling, frying, steaming and pressure cooking. Cereals, pulses, vegetables, egg and meat were mainly prepared by boiling and pressure cooking. Only vegetables, egg and meat were fried by 52, 32 and 28 patients respectively. It was found out that the methods of cooking were chosen according to the family practices and also according to the likes and dislikes of the family members.

#### 9. Consumption of sugar and saccharin

Among the 100 selected diabetic patients, 95 did not consume sugar with coffee or tea as the doctors advised the patients not to include sugar in the diet. Only 14 patients consumed saccharin with coffee or tea for sweetness.

## 10. Dietary guidelines

The details regarding dietary guidelines given to the patients are shown in Table XVII.

TABLE XVII

DETAILS REGARDING DIETARY GUIDELINES GIVEN TO THE PATIENTS

Dietary guidelines	Number of patients
<b>Instructions given by:</b>	
Doctor	30
Dietitian	68
Others	2
<b>Frequency of visit:</b>	
Once a week	4
Once a month	74
Others	12
<b>Method of instruction:</b>	
Chart	34
Lecture	17
Diet sheet	63
Exhibition	14
<b>Dietary guidelines given:</b>	
Less sugar	99
Less fat	78
High fibre	50
Others	3

Out of the 100 selected diabetes patients, 30 received dietary guidelines from doctor, 68 from the dietitian and two got the information from magazines and journals.

Among the 100 diabetics, 4 patients visited the doctor, once a week, 74 once a month and 12 once a year. The frequency of visit depended upon the advice given by the doctors and also the interest of the patients of their health.

The maximum of 63 patients were given diet sheet, 3 patients instructed through chart, 17 through lecture given by doctors and 14 through exhibition.

The dietary guidelines given to the patients included less sugar and high fibre to reduce the blood sugar level less fat to reduce the calorie intake and less salt for hypertensives to reduce the blood pressure.

#### D. Nutrition knowledge of the patients

##### 1. Awareness of the patients regarding the disease and the diet:

Out of the 100 diabetic patients, only 64 patients understood the reason for following the diet. The reason for this is as many patients belonged to the lower class and were illiterates, they could not understand the dietary guidelines given.

Among the 100 diabetic patients, only 54 patients knew the symptoms of diabetes which they listed as increased

thirst, increased hunger and increased frequency of irritation and 52 patients knew the symptoms of hypertension which were listed as giddiness, irritability and emotional outbreak.

2. Foods included and avoided by the patients for the disease condition:

The foods included and avoided by the diabetic patients are given in Table XVIII.

TABLE XVIII

FOODS INCLUDED AND AVOIDED BY THE PATIENTS

Foods	Number of patients
<b>Foods included:</b>	
Green leafy vegetables	95
Pulses	51
Wheat and ragi	64
<b>Foods avoided:</b>	
Roots and tubers	58
Sugar	95
Fat	59
<b>Foods restricted:</b>	
Rice	74
Egg	49
Meat	12

Among the 100 diabetics, 95 included green leafy vegetables, because it is rich in fibre, only 51 patients

included pulses frequently and 64 patients included wheat and ragi as it was advised by the doctor and the dietitian.

Among the 100 diabetics 58 avoided roots and tubers, because it was advised by the doctors. 95 avoided sugar and 59 patients avoided fat as it increased the calorie intake.

Rice was restricted by 74 patients and egg was restricted by 49 patients as it was rich in cholesterol. Meat was avoided by 12 patients as it was rich in fat and costly.

### 3. Inclusion of salt in the diet:

Out of the 100 diabetic patients, 96 patients included salt in the diet because they were not advised to restrict salt in the diet. As there were only 27 hypertensives among the 100 diabetics, it was found out that only lesser number of patients did not included salt in their diet.

### 4. Details regarding the dietary knowledge of the patients:

The dietary knowledge of the patients is given in Table XIX.

TABLE XIX

## DIETARY KNOWLEDGE OF THE PATIENTS

Foods	Number of patients
<b>Fibre rich foods:</b>	
Greens	98
Grams	46
Wheat and ragi	59
<b>Sodium rich foods:</b>	
Pickles	78
Meat	14
Milk	2
<b>Foods which control blood sugar level:</b>	
Bitter gourd	96
Plantain stem	49
Fenugreek	75

Out of the 100 diabetic patients surveyed, 98 knew that greens were rich in fibre and 46 had a knowledge that grams were rich in fibre. Among 100 diabetics, 59 included wheat and ragi in their diet because of their fibre content.

Pickles was indicated as sodium rich by 78 patients while 14 patients were aware that meat was rich in sodium. Only 2 patients knew that milk is rich in sodium.

Among the 100 diabetic patients 96 and 49 patients respectively indicated that bittergourd and plantain stem helped to control the blood sugar level and 75 patients were aware that Fenugreek reduced the blood sugar level.

E. Impact of Diet Counselling:

The impact of diet counselling was found out by measuring the blood sugar and blood pressure of the patients before and after counselling, calculating the nutrient intake of the patients and assessing the nutritional knowledge of the patients before and after counselling.

1. Blood sugar levels and blood pressure levels before and after counselling:

The blood sugar and blood pressure levels of the patients before and after counselling is given in Table XX.

TABLE XX

BLOOD GLUCOSE AND BLOOD PRESSURE LEVELS BEFORE AND AFTER  
COUNSELLING

Blood glucose in mg%						Blood pressure in mm/Hg					
Fasting			Post prandial			Systolic			Diastolic		
Before	After	Diff.	Before	After	Diff.	Before	After	Diff.	Before	After	Diff.
184	172	12	224	208	16	150	140	10	90	84	6
192	170	22	242	231	14	140	130	10	90	84	6
204	190	14	275	259	16	160	145	15	90	82	8
215	201	14	286	262	14	142	131	14	91	82	9
250	235	15	325	306	19	180	170	10	115	108	7
178	160	13	220	212	8	162	157	5	105	102	3
184	180	4	246	242	4	140	130	10	88	82	6
221	210	11	276	268	8	143	131	12	90	85	5
192	176	16	256	228	28	172	162	10	108	102	6
238	215	23	307	292	15	136	126	10	92	85	7
t Value	3.21*	$\bar{x}=14.4$ $\pm 5.20$		3.37**	$\bar{x}=14.2$ $\pm 6.41$		3.06*	$\bar{x}=10.6$ $\pm 1.32$		3.1*	$\bar{x}=6.3$ $\pm 1.55$

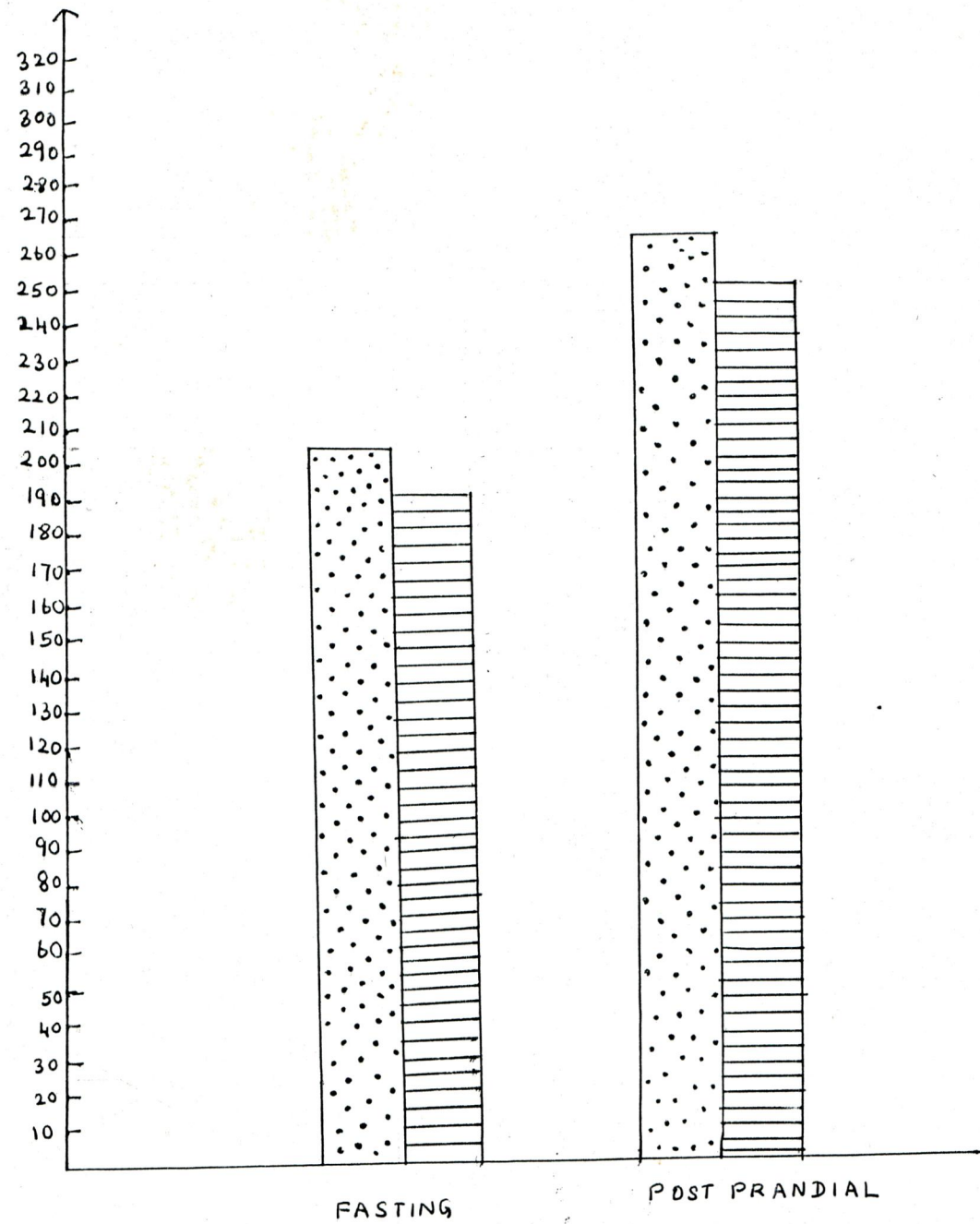
\*\* - Significant at 1% level

\* - Significant at 5% level

It is evident from the table that there is a significant impact on the blood sugar and blood pressure levels of the patients after counselling. There was a significant decrease of 14.3 in the blood sugar and 10.6 and 6.3 mmHg in systolic and diastolic blood pressure respectively of the patients. The reduction of the fasting blood glucose levels was significant at 1% level, while the post prandial blood glucose was significant at 5% level. Both the systolic and diastolic pressure were found to be reduced after diet counselling, and the change was significant at 1% level.

Drury (1982) has stated that diet counselling should equip the patients to modify their diet. It is evident from the table that the diet counselling given was effective. The impact of diet counselling on blood glucose and blood pressure levels is shown in Fig.4 and Fig.5.

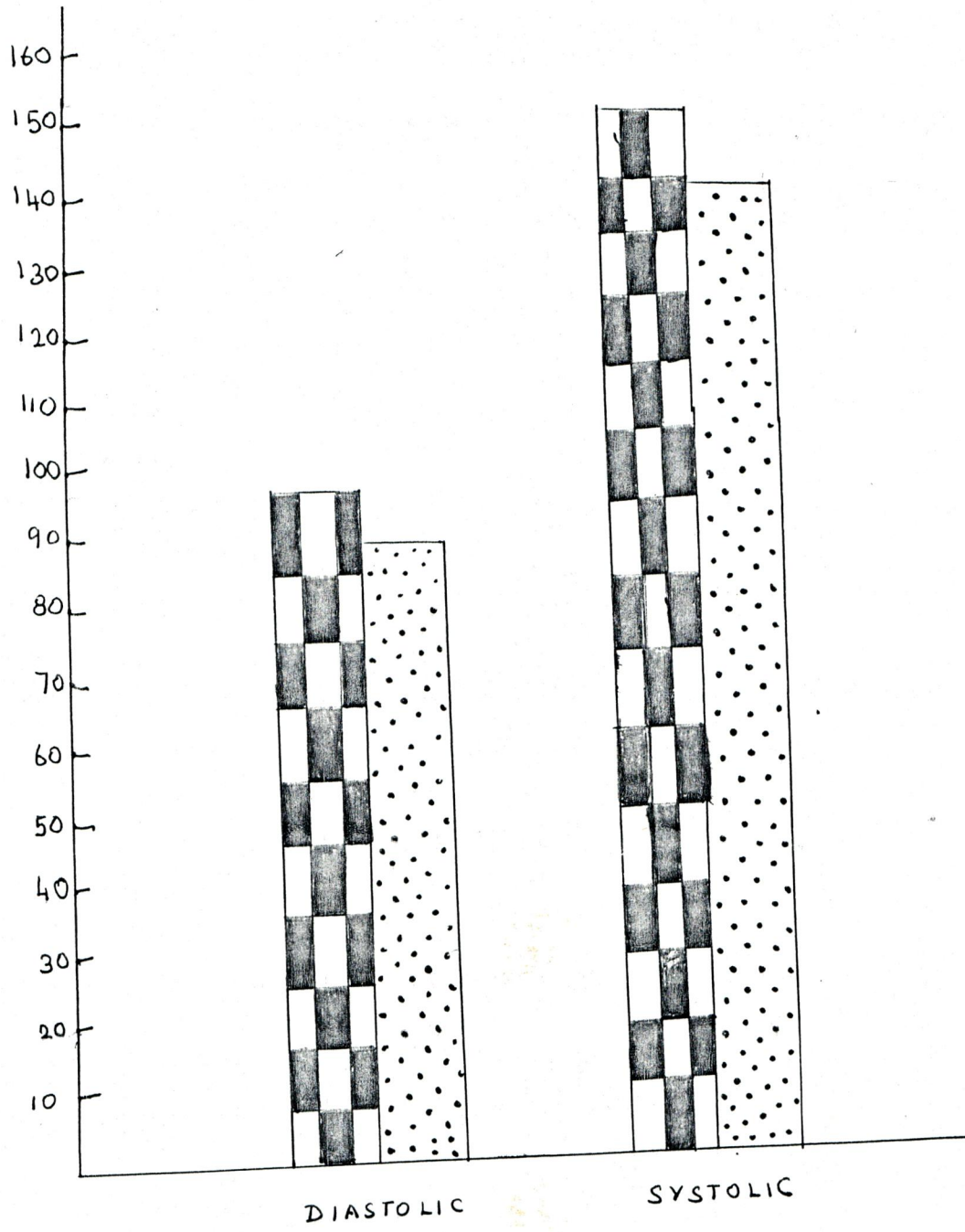
# MEAN BLOOD GLUCOSE LEVELS BEFORE AND AFTER COUNSELLING



BEFORE COUNSELLING  
AFTER COUNSELLING

FIG. IV

# BLOOD PRESSURE LEVELS BEFORE AND AFTER COUNSELLING



BEFORE COUNSELLING

AFTER COUNSELLING

FIG. V

2. Mean food and nutrient intake of the selected subsamples before and after counselling:

The mean food and nutrient intake of the selected subsamples of hypertensive diabetics are given in Table XXI.

TABLE XXI

MEAN FOOD AND NUTRIENT INTAKE OF THE SELECTED SUBSAMPLES BEFORE AND AFTER COUNSELLING

Food	Before counselling	After Counselling
Cereals	267.5 ± 33.6	245 ± 37.6
Pulses	52 ± 8.4	59 ± 8.6
Green leafy vegetables	94.4 ± 43.7	100 ± 23.6
Other vegetable and root vegetables	104 ± 19.9	65 ± 22.9
Fruits	54.3 ±	47.1 ± 7
Milk	300 ± 77.5	260 ± 48.9
Oil	22.5 ± 3.9	21.5 ± 3.7
<u>Nutrients</u>		
Calories	1635 ± 138.9	1483 ± 136.3
Protein	51.9 ± 5.6	51.06 ± 5.3
Fat	47.9 ± 7.1	46.1 ± 7.3
Crude fibre	4.2 ± 2.1	5.1 ± 1.5
Carbohydrate	266.3 ± 35.7	234.1 ± 33.8
Sodium	125.9 ± 47.9	120.8 ± 59

From the table, it is evident that there is a significant decrease in the amount of cereals consumed by the subsamples after counselling. There was also an increase in the intake of pulses and green leafy vegetables as it was advised to them to include pulses and green leafy vegetables in their diet as it is rich in fibre. The quantity of milk consumed was found to be decreased from  $300 \pm 77.5$  to  $260 \pm 48.9$ , as the patients were aware that milk is rich both in sodium and fat as a result of effective counselling.

There was a significant reduction in the calories consumed by the patients. The patients were aware of the importance of counselling a low fat and low carbohydrate food in controlling the blood sugar level. The fibre intake was slightly increased as the patients included a large quantity of pulses and green leafy vegetables. The sodium intake was slightly decreased as the patients, excluded sodium rich foods such as pickles and papads after counselling.

### 3. Assessment of the nutritional knowledge of the patient before and after counselling:

The nutritional knowledge of the patients was assessed before and after counselling with the help of a check list and the results are given in Table XXII.

TABLE XXII

ASSESSMENT OF NUTRITIONAL KNOWLEDGE OF THE PATIENTS  
BEFORE AND AFTER COUNSELLING

Foods	Answered by No. of patients	
	Before counselling	After counselling
<b>Foods avoided:</b>		
Roots and tubers	6	10
Fried foods	3	8
Sugar	6	10
<b>Foods included:</b>		
Green leafy vegetables	6	10
Wheat and ragi	4	10
<b>Fibre rich foods:</b>		
Greens	4	10
Pulses	2	8
Wheat and ragi	4	9
<b>Sodium rich foods:</b>		
Pickles	6	10
Meat	2	6
Milk	1	8
<b>Foods to control blood sugar level:</b>		
Bittergourd	6	10
Plantain stem	4	8
	6	10

The nutritional knowledge of the patients was found to be considerably improved after counselling. While 3-6 patients avoided roots and tubers, fried foods and sugar respectively before counselling, the majority of the patients 8-10 excluded these foods from their diets after counselling.

It was found that all the subsamples included green leafy vegetables, wheat and ragi liberally in their diet after counselling. According to Riccardi (1988), fibre reduces the blood sugar level. In the study, the number of patients who included fibre rich foods like greens, pulses and wheat increased after counselling as they realised that high fibre foods decreases both the fasting and post prandial blood sugar level.

All the 10 subsamples, excluded pickles from their diet, as it was rich of sodium and 8 patients reduced the quantity of milk consumed.

It was found that, the majority of the selected subsamples were aware that bittergourd, plantain stem and fenugreek, control the blood sugar level. Thus the counselling given was found to be effective.

## Summary and Conclusion

## V SUMMARY AND CONCLUSION

The study on prevalence of hypertension in diabetes mellitus and the impact of diet counselling on selected subjects was undertaken with the main objective to find the prevalence of hypertension in diabetes mellitus and to find out the impact of diet counselling.

In order to carry out this study 100 diabetics from Diabetes clinic in Ramnagar and E.S.I.Hospital in Coimbatore were selected. The interview schedule was used to elicit the background information, dietary pattern, anthropometric measurements and the clinical details. The diet counselling was given to selected 10 hypertensive diabetics by oral method using diet sheet, charts and exhibition for a period of 2 weeks. The nutritional knowledge of the patients was evaluated by using a check list. The impact of diet counselling was found out for the subsample of 10 hypertensive diabetics by measuring the blood glucose level, blood pressure level, food consumption pattern and nutritional knowledge of the patients before and after counselling.

The findings from the study are: 1. Out of the 100 diabetics, there were 70 male diabetics and 30 female diabetics. Among the male diabetics, 18 were in the age

group of 40-50 years, and 52 were in the age group of 50-60 years. Out of the 30 female diabetics, 10 were in the age group of 40-50 years, while 20 were in the age group of 50-60 years.

2. Among the 100 diabetics, 43 were labourers, 43 were employed in firms and 14 were businessmen. The majority of 51 patients had a monthly income of above Rs.2,500 while 26 and 23 had a monthly income of upto Rs.1,500 and Rs.1,500-Rs.2,500 respectively.

3. It was found that the per cent of income spent on food was high in low income group while patients from high income group, spent a major per cent of income for clothing and education.

4. Among the 100 diabetics, a majority of 44 patients were graduates and post graduates while only 25 were illiterate.

5. Among the 100 diabetics, a majority of 35 male diabetics, and 24 female diabetics, had a height range between 150-160cm while a majority of 41 male diabetics and 27 female diabetics had a standard weight between 45-60kg. Only 3 male and 3 female diabetics had a weight of above 75kg.

6. Out of the 100 diabetics a majority of 42 male and 16 female diabetics had blood glucose level between 120-180

mg%. Only 2 male and 4 female diabetics had blood glucose level of above 225mg%. Among 70 male diabetics, a majority of 54 patients and among the female diabetics, a majority of 19 patients had a post prandial blood glucose between 250-200mg%.

7. The study revealed that there were 27 hypertensives among the 100 selected diabetic patients, out of which 19 were males and 8 were females, only 4 male diabetics and 2 female diabetics had severe hypertension.

8. It was found that 25 diabetics had a family history of diabetes, while out of 27 hypertensives in the study, only 12 had a family history of hypertension.

9. There were only 28 smokers and 15 alcoholics among the 100 selected diabetic patients.

10. A maximum of 49 patients had the disease between 1-5 years and a maximum of 15 patients among the 27 hypertensives had the disease between 1-5 years. Only 13 patients had diabetes for above 10 years while only 6 patients had hypertension for a period above 10 years.

11. It was found out from the study that 20 patients had heart disease, 3 patients had heart disease, 3 patients had kidney disease, 30 were obese and 10 patients had foot and skin problems other than the diabetes mellitus.

12. Out of the 100 diabetic patients surveyed, 71 were non vegetarians and 29 were vegetarians.
13. The cereals consumed by the patients included rice, wheat and ragi while the pulses included red gram dhal, black gram dhal, green gram dhal and bengal gram dhal.
14. Only 75 patients, included roots and tubers while green leafy vegetables was included by 97 patients.
15. The fruits consumed by the diabetics included banana, orange and apple.
16. Egg was consumed by all the 71 non vegetarians, while only 53 and 56 patients respectively consumed fish and chicken. Maximum number of patients consumed between 50-100g.
17. All the 100 diabetic patients consumed between  $\frac{1}{4}$ - $\frac{1}{2}$  litres of milk daily while 99 consumed between  $\frac{1}{4}$ - $\frac{1}{2}$  litres of buttermilk.
18. The type of oil consumed by the diabetics included groundnut oil, safola and sanola. A majority of 66 patients consumed between 20-30g while only 6 patients consumed above 100g.
19. The main method of cooking adopted was boiling for cereals, pulses, vegetables and fleshy foods mainly vegetables, egg and meat were cooked by frying.

20. Among the 100 diabetics, 95 did not consume sugar while only 15 patients consumed saccharin.
21. Out of the 100 diabetic patients, 30 patients were given dietary advice by doctors, 68 patients by dietitians while 3 obtained the information from books and journals. The methods used for diet counselling were diet sheet, lecture and charts.
22. A majority of 96 patients included salt in their diet.
23. The foods included by the patients included green leafy vegetables, pulses, wheat and ragi, while the foods avoided included roots and tubers, sugar and fat. Rice and egg were restricted by a majority of diabetic patients.
24. The foods included by the patients to control the blood sugar level included bitterground, plaintain stem and fenugreek.
25. It was found out from the study that diet counselling had a significant impact which resulted in reduction in the blood sugar level and blood pressure levels of the patients. The difference was significant at 1% level.
26. There was a reduction in the amount of cereals, fruits and oil consumed, after counselling while the amount of consumption and green leafy vegetables increased after counselling.

27. The calories, protein, carbohydrate and sodium intake was decreased while the fibre intake increased after counselling.

28. The nutritional knowledge of the patients was found to be considerably improved after counselling.

It is concluded that diet counselling plays a very important role in the management of chronic diseases such as diabetes mellitus and hypertension. The diet counselling given should be effective in bringing about a significant and a desirable change in the dietary pattern of the patient.

#### Recommendations

1. Studies can be carried out by supplementing low sodium and high fibre foods in the menu of hypertensive diabetics which has a hypoglycemic and hypotensive effect on a long term basis.

2. Dietary department in the hospital can take an active participation in strengthening the diet counselling for the patients.

## Acknowledgement

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# Appendix

APPENDIX I

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION  
FOR WOMEN (DEEMED UNIVERSITY), COIMBATORE- 641 043

QUESTIONNAIRE TO ELICIT INFORMATION REGARDING THE SOCIO-  
ECONOMIC STATUS AND DIETARY PATTERN OF THE PATIENTS

1. Name of the interviewee: Address:
2. Age :
3. Sex :
4. Religion :
5. Type of family : Joint  Nuclear
6. Family background:

Name	Age	Relation	Sex	Occupation	Income per month
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7. Expenditure patterns:

Item	Amount	Percentage
1. Food		
2. Clothing		
3. Housing		
4. Transport		
5. Recreation		
6. Education		
7. Other expenses		

8. Clinical details:

- (i) Height (in cms)
- (ii) Weight (in kg.)
- (iii) Blood sugar (g/100ml) - Fasting  
Post Prandial
- (iv) Blood pressure systolic (mm of Hg)  
Diastolic (mm of Hg)

9. Do you smoke? Yes / No

10. Do any of your family members have

- (i) Hypertension
- (ii) Diabetes mellitus

11. How long do you have the disease?

(i) Hypertension

(ii) Diabetes mellitus

12. What are the other disease conditions you have?

1. Heart disease

2. Kidney disease

3. Obesity

4. Any others specify

13. Do you drink? Yes / No

14. How do you assess your improvement?

(i) Blood sugar

(ii) Blood pressure

(iii) Lessening of symptoms (i) Tremor

(ii) Perspiration

(iii) Frequent urination

(iv) Frequent thirst

(v) Any other

15. Vegerarian/Non vegetation:

16. Menu pattern:

	Breakfast	Lunch	Tea	Dinner
1st Day				
2nd Day				
3rd Day				

17. Food consumed:

Item	Frequency of consumption			Amount
	Daily	2-3 times Weekly	Fort- nigh- tly	

Cereals:

Rice  
Wheat  
Ragi  
Others

Pulses:

Bengal gram  
Dhal  
Black gram dhal  
Red gram dhal  
Green gram  
dhal  
Others

Vegetables:

Potato  
Other tubers  
Green leafy  
Vegetables  
Other Vege-  
tables

Fruits:

Banana  
Apple  
Pine apple  
Grapes  
Guava  
Any other

Fleshy foods:

Egg  
Meat  
Fish  
Chicken  
Any other

Milk and milk  
Products:

Milk  
Curds  
Buttermilk  
Any other

Others:

Biscuit  
Bread  
Pickle  
Tea  
Coffee  
Others

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18. Name of the oil consumed:

19. Amount of oil consumed per day:

Visible

Invisible

20. Method of preparation:

-----  
Cereals Pulses Vegeta- Fruits Meat Egg  
bles

-----  
Boiling

Baking

Frying

(i) Deep fat

(ii) Shallow  
fat

Steaming

Others  
-----

21. Do you take sugar with tea or coffee? Yes / No

22. If yes, how much do you take per day?

23. If no, do you take saccharin? Yes / No

24. By whom were you instructed regarding the diet?

(i) Doctor

(ii) Dietitian

(iii) Others

25. How frequently do you visit your doctor/dietitian?

26. By which method were you instructed about the diet?

(i) Chart

(ii) Counselling a) By lecture

b) By demonstration

c) Exhibition

d) Diet sheet

e) Any other

27. What were the dietary guidelines given?

28. Do you understand the reason for which you are following this diet?

APPENDIX II

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION  
FOR WOMEN (DEEMED UNIVERSITY), COIMBATORE 641 043

QUESTIONNAIRE TO ELICIT INFORMATION REGARDING THE NUTRITION  
KNOWLEDGE OF THE PATIENTS

1. Name : 4. Address:  
2. Age :  
3. Sex !
5. Do you know the symptoms of  
(i) Hypertension  
(ii) Diabetes mellitus
6. What are the food do you include for your condition?

Foods included

Reasons

7. Foods avoided

Reasons

8. Foods restricted

Reasons

9. Do you include salt in you diet? Yes / No

10. What are the fibre rich foods?

11. Mention the foods rich in sodium(Salt)

12. List the foods which help in controlling the blood sugar  
level

APPENDIX - III

AVINASHILINGAM INSTITUTE FOR HOMESCIENCE  
AND HIGHER EDUCATION FOR WOMEN,  
[DEEMED UNIVERSITY], COIMBATORE - 641043.

DIET FOR DIABETES PATIENTS  
WITH HYPERTENSION



## APPENDIX IV

### ESTIMATION OF BLOOD GLUCOSE (FOLIN-WU METHOD)

#### Principle

Blood is deproteinized and heated with alkaline copper reagent in folin tube and the cuprous oxide formed is treated with acid molybdate solution. When blue colour is got, the colour is compared with the standard calorimetrically at 600 mu.

#### Reagents

1. Sodium tungstate 10% dissolved 10.0 g of sodium tungstate in 100 ml of distilled water.

2. Phosphomolybdic acid solution - Dissolved 35 g of molybdic acid, 5.0 g of sodium tungstate in 200 ml of 10% sodium hydroxide and 200 ml of water and boiled vigorously for 20-40 minutes to remove the ammonia present on molybdic acid. Cooled and diluted to about 350 ml and added 125 ml of concentrated phosphoric acid and the volume was made upto 500 ml in a standard flask.

3. Alkaline copper tartarate: Dissolved 40 g of anhydrous sodium carbonate in 400 ml of water and transferred to a titer flask. Add 7.5 g of tartaric acid and after it added 4.5 g of crystallised, copper sulphate and made upto 1 litre.

4. Stock standard glucose solution: Dissolved 0.2 g of glucose in saturated benzoic acid and made upto 100 ml.

5. Working standard: 10.0 ml of the stock standard was diluted to 10.0 ml in a standard flask with distilled water.

6.  $2/3$  N Sulphuric acid - 3.2 ml acid in 196.3 ml water.

#### Procedure

Took 3.4 ml of distilled water and added 0.2 ml of blood and 0.2 ml of  $2/3$  N Sulphuric acid and then added 0.2 ml of sodium tungstate solution. Kept for 20 minutes and then centrifuged. Pipetted out 2.0 ml of the supernatant into a Folin-Wu tube. 0.2 ml to 1.0 ml of standard glucose solution was taken in a series of test tubes and added 2.0 ml of alkaline copper tartarate solution. Heated the tubes in a boiling water bath for 8 minutes. Added 2.0 ml of phosphomolybdate. Cooled and then mixed and made upto 12.5 ml with distilled water. The blue colour developed was read in a calorimeter at 600 mu. The amount of glucose present was calculated from the graph.

APPENDIX V

BLOOD GLUCOSE AND BLOOD PRESSURE LEVELS OF THE SELECTED  
DIABETIC PATIENTS

	BLOOD sugar		Blood pressure mm.Hg
	Fasting mg%	Post prandial mg%	
1.	132	262	130/90
2.	146	278	120/80
3.	234	321	121/32
4.	234	321	121/32
5.	135	256	122/32
6.	136	261	124/83
7.	134	268	120/80
8.	136	271	126/86
9.	238	271	120/80
10.	140	258	124/86
11.	184	276	122/81
12.	134	264	120/80
13.	191	242	121/80
14.	126	265	120/80
15.	122	256	124/82
16.	134	261	124/86
17.	131	258	150/110
18.	134	261	142/104
19.	159	286	122/81
20.	131	258	130/83
21.	172	289	120/80

22.	149	266	126/84
23.	198	303	134/92
24.	185	305	120/80
25.	192	308	122/81
26.	186	315	120/80
27.	192	196	155/116
28.	184	301	120/80
29.	198	298	136/94
30.	198	302	120/80
31.	238	310	140/102
32.	188	202	156/114
33.	186	276	140/94
34.	134	256	134/92
35.	142	268	123/81
36.	192	278	132/92
37.	134	268	120/80
38.	142	276	126/84
39.	136	258	120/80
40.	189	304	120/80
41.	135	259	142/102
42.	138	262	124/81
43.	146	278	131/92
44.	178	296	122/81
45.	134	258	132/92
46.	146	269	142/102
47.	172	296	120/80

48.	134	256	124/82
49.	136	262	124/72
50.	172	285	120/80
51.	162	264	126/84
52.	171	272	122/81
53.	186	282	140/102
54.	195	286	120/80
55.	134	246	120/80
56.	184	301	124/82
57.	192	302	142/101
58.	138	252	120/80
59.	146	265	120/80
60.	182	296	124/81
61.	228	334	126/80
62.	234	336	155/116
63.	221	315	124/82
64.	134	296	142/102
65.	196	302	160/115
66.	184	256	144/102
67.	226	299	120/80
68.	134	251	120/80
69.	148	254	142/101
70.	224	306	122/81
71.	184	279	120/80
72.	136	261	124/82
73.	204	284	120/80

74.	215	296	123/81
75.	144	255	124/82
76.	188	271	124/82
77.	142	252	126/85
78.	196	301	142/102
79.	172	268	120/80
80.	144	254	125/85
81.	196	301	122/81
82.	221	308	120/80
83.	136	251	124/82
84.	210	304	120/80
85.	148	265	120/80
86.	178	298	120/80
87.	221	319	156/116
88.	215	308	142/102
89.	134	258	120/80
90.	154	269	126/84
91.	136	258	128/86
92.	139	262	124/82
93.	178	297	120/80
94.	146	263	120/80
95.	164	279	126/84
96.	146	301	120/80
97.	250	325	122/81
98.	198	301	120/80
99.	142	252	120/80
100.	173	282	124/82

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