DEVELOPING DIET KITS FOR DIET COUNSELLING OF NON-INSULIN DEPENDENT DIABETICS AND ITS EVALUATION

by

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Introduction

INTRODUCTION

> Look to your health, and if you have it, Praise God and value it next to a good conscience; For health is the second blessing that we mortals are capable of; a blessing that money cannot buy.
>
> - Izaak Walton

Man has been preoccupied since the earliest times with the relationship between food and health. Nutrition and health are not synonymous, but without good nutrition health cannot be at its best (Thomas, 1988).

Only over the past 200 years with the development of science of nutrition has it become possible to make quantitative recommendations about the amount and type of food which should be eaten to maintain health. Good nutrition for an individual implies that he receives and utilizes a suitable metabolic mixture of all substances necessary for health.

In this modern and scientific era the prevalence of diseases have increased due to the changes in life style and eating habits even when people have become aware of the importance of good nutrition. The nutritional problems of major importance are obesity, anaemia, cardiovascular diseases, cirrhosis, diabetes mellitus, dental caries and gall-bladder diseases which to needs to be eradicated through necessary steps.

According to the data collected by WHO (1990) diabetes mellitus is the third commonest disease in the world next to cardiovascular disease and oncological disorders. Every fifth person in the world is suffering from diabetes directly or indirectly (Sharma, 1987).

The prevalence of diabetes mellitus is different in different ethnic population and in each group within the population (Hill, 1987).

In United States about 2% of the total population or 4 million people suffer from this disease. Although the exact prevalence in India is not known, various surveys indicate that 2 to 3% of the population suffer from this disease (Sharma, 1987). The overall disability rate in diabetes is 2 to 3 times higher than in non-diabetics. The overall life expectancy of a patient developing diabetes in later life lose 30% of their expected life span (Hill, 1987).

Of the 2% of the population suffering from diabetes in the world 80% suffer from non-insulin dependent diabetes and 20% from insulin dependent diabetes mellitus. So treating of patients with non-insulin dependent diabetes mellitus becomes important (Hill, 1987).

Non insulin dependent diabetes appears gradually, often without symptoms other than fatique and ill-defined complaints. Usually there are not rapid changes in the

blood glucose levels. If blood glucose levels are elevated then control of hyperglycemia may be a factor of importance in the prevention of complications. Complications of diabetes are common after some years duration of the disease and may affect the kidneys, eyes and the peripheral nervous system (Beck, 1982).

Prevention of the complications of NIDDM has become increasingly important because of their significant mortality and morbidity and the human and economic costs associated with them (Zimmet, 1988). So modified diet is the principal therapeutic agent that helps to prevent or control complications in non-insulin dependent diabetics.

Control of calorie intake to achieve normal weight is the primary objective of all NIDDM diets. By regulating the time and amount of food intake an attempt can be made to achieve a flat profile of blood glucose throughout day and night (Jenkins, 1987).

To achieve the purspose of modified diets, they must be followed as accurately and carefully as possible. Unlike medication, food is a part of everday life and so more regulations are needed. Food is not primarily associated with illness but it has many meanings besides that of satisfying hunger.

The dietary modification prescibed must be translated carefully into foods with which he is already

familiar and here, counselling the patient about his food becomes important (Marion, 1987).

A patient has no concept of how to measure his control, does not understand laboratory tests, effects of hyperglycemia, unable to use the food groups appropriately for his problem. so, a service which operates, on a one to one basis, tailors programmes and teaching, to specific life style, allows independence and constantly strives for better control is very much needed. Thus, counselling becomes necessary (Good, 1986).

The diabetic takes his disease lightly and is not prepared to be educated as he usually does not suffer from disability that prevents him from doing his daily work. So the need arises for the education of diabetic patients through continued counselling (Patel, 1990).

Counselling is an art by which the counsellor looks at problems through the eyes of the people who are to be counselled. It is a very complex process through which the counsellor should provide skillfull care and thoughtful guidance to gain confidence.

Today the concern of the health workers is in the maintenance as well as restoration of health of patients. Health care now-a-days includes the concept of continuity of care. To implement the continuity of care with respect to need, the diabetic patient requires counselling for proper

choice of food and preparation depending upon his restrictions along with his family members.

The aim of counselling is to give practical and continuing education and guidance with full support to the diabetic patient and his family. Life long adherence to a dietary regimen is required in NIDDM patients. So constant reinforcement and encouragement is necessary to help them follow the instructions given.

The approach adopted by a counsellor must offer best chance for adherence to the dietary plan. Most patients resist changes in diet. Further more, they resist being different from other people. A healthy mental attitude can be built by removing ignorance and motivating patients by placing responsibilities on them after teaching the techniques for long term effects (Vickery, 1986).

So an effective counselling programme need to be planned and evaluated to avoid wasteful exercise and also to acheive maximum benefits.

In traditional counselling the physician diagnoses the patient problem and formulates a dietary prescription, where a counsellor gives excellent advice to the patient orally (Ferguson, 1980). Counselling along with behaviour therapy strategies were followed to change the habits that were formed years back, by an other counselling method.

Counselling can be given on an one to one basis or in groups. An individualized counselling is very effective and the patients are relaxed and it gives time for both the patient and counsellor to put across their own points. The needs of patients can be assessed and response can be given appropriately.

In group counselling, a lot of information can be gathered from experiences of different patients but a close relationship between the patient and counsellor is not possible.

Counselling can be supplemented by the use of audio-visual aids which gives a support to the verbal information. Pamphlets, posters, checklists, food packets, food models, flip-charts, measuring cups and measuring spoons can be used to produce a longer impression in the minds of the patients.

A more recent counselling technique is by the use of micro computer. Computers are a remedy to the problem of time consuming instruction periods. Computers can be used widely in both clinical and educational components.

Thus, a wide variety of novel methods are available for utilising in the diet counselling process. The best method has to be found out so that the counselling process is made meaningful, wasteful exercise is avoided and learning made permanent.

Keeping the above all requirements in mind the present study has been undertaken,

Following are the objectives of the study:

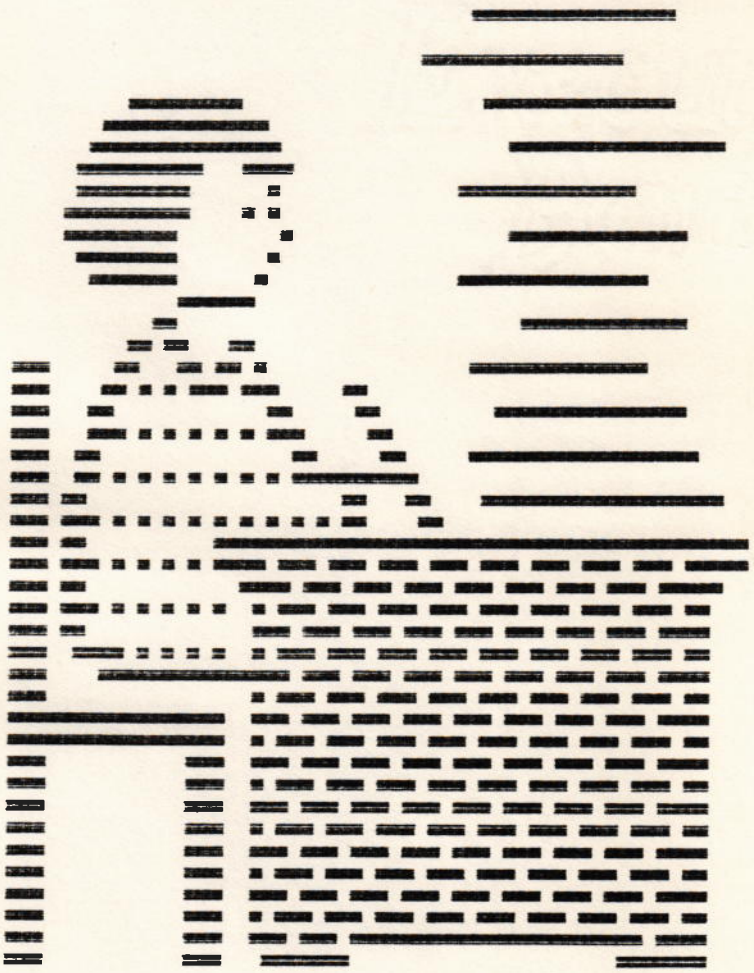
1. Select and study the food habits and other characteristics of a sample of 250 diabetic subjects.

2. Develop a diet kit and also a floppy disc through which diet counselling can be imparted, to diabetic subjects.

3. Conduct diet counselling for a sub-sample of 30 subjects for a period of 3 months.

4. Evaluate the impact of diet counselling by studying the parameters such as nutritional knowledge, body weight and blood glucose levels before and after diet counselling.

5. Find out the effective method of diet counselling.



REVIEW OF LITERAT

II. REVIEW OF LITERATURE

The review of literature pertaining to the study on "Developling diet kits for diet counselling of NIDDM patients and its evaluation" is presented under the following headings"

A. Diabetes mellitus : an introduction

B. 1. Diabetic diets and their trends

2. Dietary carbohydrate : Changed horizon

3. Dietary fats : an advancement

4. Dietary fibre : a new wave

C. Relationship of obesity and exercise with NIDDM

D. Nutrition counselling

1. Oral counselling

2. Computer counselling

A. Diabetes Mellitus : An Introduction

Diabetes mellitus is a global health problem affecting quite a number of people from all walks of life. Surveys carried out in different parts of the world have shown that 1.3% of the general population suffer from this disorder. The disease is present in the developed as well as the developing countries and the earlier belief that it is a disease of the affluent population is no longer correct (Regunath and Raghuramalu, 1992).

Diabetes mellitus affects humans at all stages of development. Every 5th person in the world is suffering from

diabetes directly or indirectly. Various surveys indicate that about 2-3% of the population of India suffer from this disease (Sharma, 1987).

Diabetes mellitus is caused by the deficiency in the secretion of insulin by pancreatic cells. Insulin dependent diabetes mellitus or Type I and non-insulin dependent diabetes mellitus or Type II comprise the most important classes of this disease. Non-insulin dependent diabetes mellitus (NIDDM) is that most common form and about 90-95% of the population suffer from this disease (Raghuramalu, 1990).

The number of diabetics seem to be increasing and there are a number of reasons for this. First, because people are living longer. Another factor is that the life expectancy of diabetics is increasing. Young diabetics now have a longer life and are able to bear children and also due to improved, wide screening procedures (Dunn, 1983).

In diabetes mellitus the symptoms that usually occur are a disturbed metabolism of carbohydrate, fat and protein. When the metabolic consequences are uncontrolled it results in hyperglycemia, glucosuria, muscle wasting, negative nitrogen balance, rapid weight loss, fat catabolism and accumulation of ketone bodies. Polyuria or frequent or large flow of urine, polydypsia and polyphagia are the common symptoms (Davis, 1986).

B. Diabetic diets and their trends

In the last 15-20 years there has been a revolution of thinking about diabetic diets and an important accumulation of human experimental data.

The ultimate goal for the management of the diabetic patient provides with a minimum of therapy a full and active life, glycemic equlibrium and the prevention of complication. Dietary control is an integral part of management for the diabetic with NIDDM. This may be accompanied, when necessary by insulin or oral hypoglycemic drugs. For individuals with NIDDM diet will not only control the disease but can also reverse it. For many of these individuals weight loss can serve to eradicate the disorder and proper diet, maintenance of a reasonable weight will prevent reoccurances (Aronson, 1990).

Effect of high protein low fat diet versus low protein and high fat diet on blood glucose and serum lipo protein and cholesterol metabolism was investigated in NIDDM patients. The patients were hyperglycemic, their very low density lipo protein levels, triglyceride levels were higher and HDL cholesterol levels lower. Lipoprotein fractions of patients remained unchanged in low protein diet (Anderson et al., 1987).

Worrd et al., (1982) report that a high carbohydrate diet tends to correct the decreased insulin receptor status in these patients. According to Garg

(1988) partial replacement of complex carbohydrate by MUFA in diets does not increase plasma LDL cholesterol and improve glycemic control and concentration of plasma triglyceride and HDL cholesterol.

Marshall et al (1991) state that high fat, low cholesterol diets are associated with the onset of non-insulin dependent diabetes mellitus. The consenses diet recommendation for diabetes throughout the world is high in complex carbohydrate and fiber and low in fat and cholesterol (Anderson, 1989).

2. Dietary Carbohydrate - changed horizon

Opinions vary concerning the exact quantity of carbohydrates in the diet of NIDDM patients. In any case all authors are unanimous that the mono and disaccharides should be limited and even removed, the intake of unrefined carbohydrates being optimal (Arky, 1986).

According to the recommendations of the British diabetic association carbohydrate should be made up for about 50-55% of the dietary energy intake, the majority of this coming from complex sources preferably foods naturally high in dietary fiber and hydrolysis resistant starch (Lean et al., 1991).

According to Krusteva et al, (1988) water soluble pectins, gums, polysaccharides and some hemicellulose taken by foods influence the blood levels of glucose and insulin

by forming a viscous layer in the gastro-intestinal tract diminishing glucose diffusion and absorption.

The study conducted by Cooper indicate that there are no medium-term metabolic contraindications to using a moderate amount of sucrose up to 28g as a sweetner in his diet. Small amounts of fructose and sorbitol can be regarded as free additions to a diabetic diet. Larger amounts should be counted as part of the carbohydrate in prescribed diet (Parills et al., 1988).

The distribution of carbohydrate in a day's diet is equally as important as to the total quantity. For patients who do not require insulin the day's carbohydrate should be divided equally in his three meals or four if he is accustomed to a bed time snack, so that the constant level of blood glucose can be maintained (Reaven, 1988).

3. Dietary fats - an advancement

Reduction of fat intake to 30-35% of energy remains an important goal which should help the low incidence of cardio vascular disease in people with diabetes and weight loss. Of this only 10% of the total energy should be saturated, 10% should polyunsaturated fatty acids and 10-15% may be of mono unsaturated fatty acids. Corner et al., (1991) suggests that the M U F A is a useful alternative energy source which has beneficial effects on glucose control and serum lipids. Cholesterol intake should not exceed 300 mg/day.

Animal fat reduction in diet is an important measure for a correction of the high level of VLDL and the hypertriglyceridemia. Philips and Collis (1985) have observed a sharp and fast improvement of hypertriglyeridemia and hypercholesterolemia when low-fat diet (20% energy from fats) was provided.

Culston (1991) opines that replacement of saturated fat with mono saturated and unsaturated fatty acids and reduction of dietary cholesterol in the context of a conventional diet result in the desired fall in the total low density lipo protein cholesterol without adverse effects of hyperglycemia and reduced HDL cholesterol concentrations.

4. DIETARY FIBRE - A NEW WAVE

Dietary fibre is the major new consideration in the nutritional management of diabetes. The fibre content of the diet is said to have a beneficial effect in the control of diabetes. Raw fruits and vegetables, whole wheat flour and cereals are important sources of dietary fibre and should be consumed daily (Anderson et al., 1989).

Current evidence suggests that high fibre diets especially soluble variety and soluble fibre supplements may offer more improvement in carbohydrate metabolism, lower cholesterol, LDL cholesterol and reduce the insulin demand. Slowly absorbed carbohydrates such as starches are preferable to rapidly absorbed carbohydrates (Aronson, 1989).

Azinge (1989) found out the use of bean in the dietary control of diabetes and it was due to the colloidal and febron composition, relatively high protein and low carbohydrate content which results in satiety, reduces the rate of gastric emptying and increases carbohydrate oxidation.

Studies also show that symptoms of hyperglycemia disappeared when guar was given in the diets of patients at about 15g daily (Lakhdar, 1988).

Diets enriched with wheat bran and guar gum induce 10-20% reduction in serum cholesterol and LDL in both normal and hypercholesterolemic subject.

An intake of up to 40g of fibre per day or 25 g per 1000 Kcal of food appears beneficial in many individuals. Fibre supplementation appears beneficial only if given when a diet comprises approximately half of the calories as carbohydrate. Foods should be selected with moderate to high amount of dietary fibre from a wide variety of choices to include both soluble and insoluble type of fibre (Vinik, 1988).

C. RELATIONSHIP OF OBESITY AND EXERCISE WITH NIDDM

A summarized world statistical data says that one of the important reasons for NIDDM is obesity and the other over eating (Arky et al., 1982). According to Morries (1981) obesity was more common than family history of

diabetes and that obesity posses the greater risk to the general population.

Fujimoto et al., (1991) concluded that those diabetics without a family history appear to be due to increased adiposity and associated larger specific regional fat deposits leading to diabetes. Elaffner (1991) also states that central adiposity was more strongly associated with diabetes incidence in women than in men and persons with 20% overweight develop diabetes two times more frequently than normal ones.

Hansen (1988) states that individuals with obesity show greater association with higher glucose excursions, exacerlated insulin resistence, increased abnormality of lipoprotin profile and higher cardio vascular risk. Weight reduction and improvement in blood glucose control through, dietary intervention for obese persons with NIDDM hold the greatest potential for reducing mortality and morbidity among them.

A low energy diet for a short time leads to reduction of hyperglycemia, even before body mass reduction has taken place. This effect was due to the carbohydrate restriction, but it could be also achieved by adequately decreased energy intake with a limitation of any of the three main nutrients (Walker, et al., 1988). Hypertriglyceridemia associated with obesity also strongly

decreased in calorie restricted diet as long as weight reduction continues (Havrankova et al., 1985).

Sunzov (1989) succeded using a low energy, high protein diet in reduction of body mass and insulin requirements in obese subjects with NIDDM.

In the past fasting in NIDDM was considered as contraindicated but now it is found that it is not harmful if fasting lasts for 2-3 weeks (Andreew, 1987).

WHO reports (1985) state that a basis for every prevention and management of NIDDM is, reduced diet combined with increased physical activity. People with diabetes derive many benefits from regular physical exercise. In individuals treated with diet alone, regulation of blood glucose during exercise is usually adjunct to diet to achieve weight loss and improved insulin sensitivity (Wheeler Mt et al., 1987).

According to Horton (1988) moderate exercise like walking can be tolerated by individuals on very low calorie diet. Regular exercise can be prescribed as an adjunct to calorie restrictions for weight reduction and as a means to improve insulin sensitivity in obese insulin resistant individuals.

D. NUTRITION COUNSELLING

Nutrition counselling is the total process of providing individualized guidance so that the client

acquires the ability to self-manage his/her own nutrition care (ie) successfully affect behaviour change that results in more healthful behaviours (Manson, 1982).

According to Snetsclaar (1981) nutrition education is only one component of nutrition counselling; it brings scientifically sound nutrition practices regarding human needs and available food sources to awareness.

Brill (1985) opines that nutrition education is evaluated in terms of knowledge base. Whereas nutrition counselling can be evaluated interms of behaviour changes plus knowledge base. More possession of knowledge does not ensure compliance of behaviour to integrate that knowledge.

Nutrition counselling is a period of transition. The transition is necessary and timely in view of our rapid changing society in what has been described as an era of convulsive change (Welch, 1986). There is no correct way to ccunsel, these is an appropriate sequence; assess, plan, implement, evaluate, readjust as necessary and follow up.

Assessment involves gathering and evaluating data that describe the client with respect to nutritional status, food behaviour life style, pertinent medical and physical information and environment. The assessment culminates with a conclusion upon which the plan is developed. The plan applies the principle of food and nutrition science within the context of the client's social, economic, psychological

and physical environment. Robinson and Lawler (1982) describe the plan as the "blue print for action".

Implementation implies that the client is able to assume independently the responsibility for planning, preparing and consuming appropriate meals. Evaluation is a co-operative action involving both the client and the counsellor (Vickery, 1986).

Being diagnosed as a diabetic can prove to be one of the more traumatic experience of a life time. Learning to take care of overall health and to gain control over the disease can mean the difference between debilitation and good health, suffering and well being, self pitying depression and psychological wellness. It may appear to be easier to opt for despair and immobility, but the long term results of positive attitude and motivation to change can include improved health and increased longivity (Aronson, 1989).

The diabetic patient needs to know about the nature of diabetes, importance of weight control and details of the dietary program. Insofar as diet is concerned, the diabetic needs to be taught the importance of timing of meals, the calorie content of foods, the amount of food to be consumed and how to prepare foods (Wey, 1980).

Hoppner (1984) opines that the satisfactory counselling of the patient includes individualized

instruction supplemented by group instruction. The patient must be involved throughout inorder to fully understand and adopt the programme necessary. Changing one's behaviour takes time and can be achieved only via long-term individualized efforts in most instance in which the client becomes involved. Nutrition counselling is effective only when a client accepts and practices improved behaviour.

Not only the patient but the members of the family must be included in counselling sessions because each member has to know that the diabetic patients diet is a normal one but regulated in quantity and timing (Robinson, 1986). Frequent follow up programmes are essential to reinforce motivation and to give added information.

1. **ORAL COUNSELLING:**

There is no one way or method to counsel patients. The method must be adapted to suit the patient. In oral counselling the patient is involved in planning of a program that he can reasonably follow. Changes in eating habit and dietary pattern and frequent adjustments are necessary until an acceptable pattern is involved (George, 1981).

Through the use of words, action and attitude the individual can be made aware of the counsellor's concern about resolving the dietary pattern. By allowing an individual to talk about what food means to him, the idea to begin counselling can be got. A person is more likely to

try and adopt a diet he or she had a part in revising (Krause, 1979).

Thomas (1988) suggests that most dietetic advice should be given in an one to one interview and there will be a chance for the person to discuss his problem. Patient will require considerable encouragement and interest from the counsellor if a permanent change in food habits is to be achieved.

Information can be passed from one person to another in a number of ways. The fundamental rule is the counsellor talking with people and not to them (Kreger, 1989). Most people remember things better if they have some visual as well as verbal instructions to recall (O'Brien, 1982).

According to Curwin et al., (1989) printed education material plays an important role in patient education. An effective patient education material contains the information that the patient needs to know and are written in terminology that can be read and understood. Leaflets and check lists are also often useful as they can help focus the audience attention and expand on ideas picked up during the session. Leaflets should compliment not replace, teaching but should have a relatively limited value (Thomas, 1988).

Standardized diet sheets are seldom applicable to the person's need. A sample menu can be given depending upon the patients dietary habits. Frequently a measuring cup or a measuring spoon can be used to help the patient vizualize the size of the serving of the food (Mazzeco-Caputo E et al., 1985).

2. COMPUTER COUNSELLING

Computer age technology is influencing all facets of clinical nutrition practice. Micro computers are being used in both clinical and educational component of dietetics (Robinson, 1982). They can store, retrive and manipulate information which the "user" provides; they do this using a specially designed set of instructions - the programme (Oexmann, 1983).

Computers are being used by dietetans internationally (Youngwrith, 1983) and will continue to be used (William and Burnets, 1984) in all aspects of dietetic work from data storage to nutrition education. Use of micro computer can carry on a friendly, informative dialogue with the patient (Adelman, 1983).

Computers can be a valuable adjunct to the process through which their ability to quickly analyse diet information and plan diets that meet patients specific nutrient requirements. The computer can teach patients about the background of their medical disorder, reinforce information about their therapeutic diet, help them to apply

diet requirements to their life style and show them how to make necessary diet change (Danford; 1989).

While selecting a computerized diet analyse system, we must consider present and future needs and select a system that is accurate, efficient and cost effective. The nutrient data base should be accurate, verified and periodically updated. Data entry on data base is easy and new recipes can readily be added to the nutrient data base (Dare, 1987).

Patient's instruction orally is time consuming and very often professional time constraints prevent the patient from obtaining adequate diet instruction and being tested for accurate comprehension. Micro computers can remedy this problem (Williard, 1982).

A computer yet cannot substitute for human clarification or interpretation of any information given.

METHODOLOG

III. METHODOLOGY

The methodology adopted in conducting the study on "Developing diet kits for diet counselling of non-insulin dependent diabetics and its evaluation" is presented under the following headings:

A. Selection of the area
B. Selection of the sample
C. Development of diet kits
D. Conducting the study
   1. Initial evaluation
   2. Conducting diet counselling
   3. Final evaluation
E. Evaluation of the selected methods of diet counselling

A. Selection of the area

Kovai Medical Centre and Hospital situated in the outskirts of Coimbatore city on Avinashi road was selected for conducting the study due to the following reasons.

1. The officials and physicians of the hospital were easily approachable, very co-operative and permitted the investigator to conduct this study.

2. A large number of patients were available which allowed greater choice in the selection of sample.

3. Well equipped laboratory was available for conducting biochemical estimations.

B. Selection of the sample

With the help of the diabetologist of Kovai Medical Centre and Hospitals, the investigator recorded the diabetics, as and when they visited the physician. Both IDDM and NIDDM patients who visited the doctor for the first time were selected, through random sampling procedure. Thus a total number of 250 sample were recorded for the general study.

From this 250 subjects a sub-sample of 30 diabetics were selected for diet counselling. The sub-sample consisted of only non-insulin dependent diabetics between 40 to 60 years of age and all were literates. This sub-sample was divided into two groups of 15 each with equal number of males and females. These two groups were referred as Group I and Group II. Group I was selected for oral diet counselling with diet kit developed by the investigator and Group II was given computer aided diet counselling.

C. Development of diet kits

The methods of diet counselling selected were oral diet counselling and computer aided diet counselling. Hence the diet kits necessary were developed.

1. Oral diet counselling kit

Oral diet counselling kit consisted of

a. Cups and spoons of standard size for measuring foods that have been cooked to gain knowledge on the amounts of foods to be consumed and visualize the portion size (Plate 1).

b. Exchange lists which indicated the amounts of different cooked foods that would supply same amount of calories (Appendix - III).

c. Sample menu supplying prescribed calories were formulated according to the individuals food habits were given for the use of the subjects (Appendix - IV).

d. Pamphlets with instructions to be followed by diabetics (Appendix - II).

e. Low fat recipes for diabetics (Appendix - V).

f. Diastix for testing of urine at home.

The investigator collected the information and materials necessary for the kit and developed the diet kit. The oral diet counselling kit is shown (Plate 1).

2. Computer aided diet counselling kit

The computer aided diet counselling kit consisted of the floppy which contained informations and instructions that are to be followed by a diabetic to plan his daily menu providing 1000 calories, exchange lists, a programme which helps the subjects to plan a day's diet according to calorie restriction, list of foods that are to be restricted and

LIST OF PLATES

PLATE I ORAL DIET COUNSELLING KIT

PLATE II COMPUTER COUNSELLING

avoided by the diabetics and advice on exercise and its importance.

The investigator developed the floppy for ccmputer aided diet counselling of Group II. The contents in the floppy are presented in Appendix - VIII.

D. Conducting the study

1. Initial evaluation

An interview schedule was specially designed (Appendix I) by the investigator to study the general characteristics of the selected 250 subjects. The questionnaire elicited information on details regarding the disease, food habits and pattern of meal consumption (Appendix I). The investigator personally interviewed the patients and recorded the data from the 250 subjects.

By administering questionnaire (Appendix - VII) prepared by the investigator the initial knowledge of the selected sub-sample of 30 subjects were evaluated. The fasting blood glucose levels were analysed through Glucose oxidase method using auto analyser (Marks and Lloyd, 1968). The procedure used in the analysing of blood glucose is described in Appendix XIV. Heights and weights were recorded for the sub-samples. To assess the food and nutrient intake of the sub-sample a 24 hours recall diet survey was also conducted.

2. Conducting diet counselling

After collecting the initial data the subjects were individually counselled through the two different methods. The subjects in Group I received oral diet counselling, where the investigator explained the modifications necessary in diet and personal habits. But the subjects in Group II were made to listen to the computer and thus education was provided. Group II received only computer - counselling and the investigators did not give any oral interpretation.

The subjects were asked to visit the hospital at a particular time and the investigator counselled each patient through the appropriate methods for about 1/2 hour to 1 hour for a period of three months. Each individual was given counselling atleast once a week. Each time instructions were repeated and doubts cleared.

3. Final evaluation

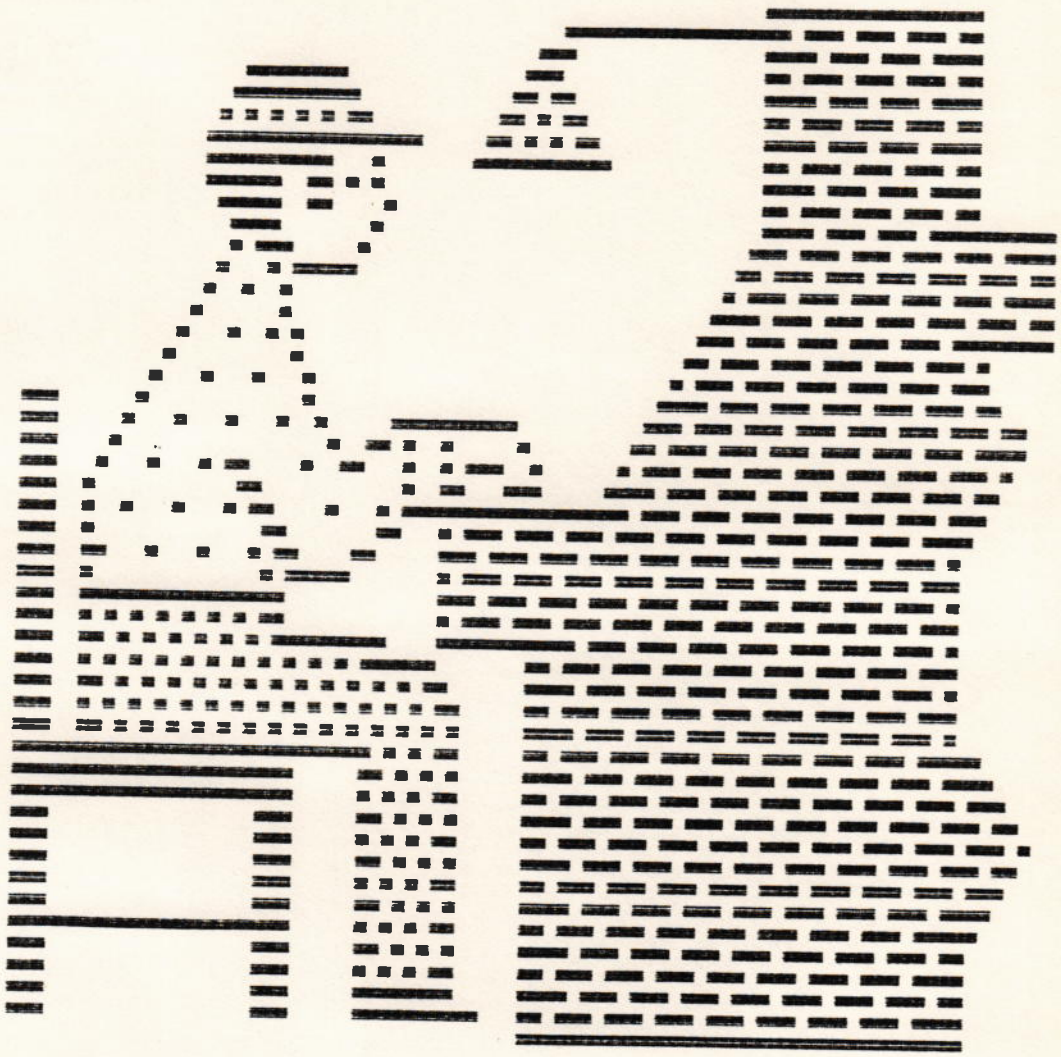
After diet counselling for a period of three months the fasting blood glucose levels and body weights were again recorded. The knowledge of the subjects were again assessed using the same questionnaire administered before diet counselling.

e. Evaluation of the selected methods of diet counselling

After the counselling period of three months, the improvements in the control of blood glucose, reduction in the body weights and gain in knowledge regarding the nutritional facts were evaluated using the same proceedure

used, initially. By comparing the data obtained through initial and final evaluation the benefits of diet kits were analysed.

The effectiveness of oral diet counselling and computer aided diet counselling were compared by analysing the improvement in the control of the blood glucose, body weight and knowledge of the subjects taught through the two methods. The results thus obtained are presented and discussed in Chapter IV.



RESULT & DISCUSSIONS

RESULTS AND DISCUSSION

The results and discussion pertaining to the study on "Developing diet kits for diet counselling of non-insulin dependent diabetics and its evaluation" are presented under the following headings.

A. General characteristics of the selected subjects.

B. Dietary pattern of the selected subjects.

C. Health condition of the selected subjects.

D. Nutrient intake of the sub-sample.

E. Impact of diet counselling on sub-sample.

A. GENERAL CHARACTERISTICS OF THE SELECTED SUBJETCS

The characteristics related to diabetes mellitus of the selected 250 diabetics studied through an interview schedule are presented and discussed in the following.

1. Type of diabetics prevalent among the selected subjects:

Table I gives the distribution of subjects according to the type of diabetes and sex.

TABLE - I

DISTRIBUTION OF SUBJECTS ACCORDING TO TYPE OF DIABETES AND SEX

SEX	NIDDM		IDDM		TOTAL
	Number	%	Number	%	
Male	129	58.4	23	79.3	152
Female	92	41.6	6	20.7	98
	221	88.4	29	11.6	

From Table I it is evident that 221 (88.4%) out of the total 250 samples, had non-insulin dependent diabetes mellitus whereas only 29 (11.6%) were insulin dependent diabetics. Non-insulin dependent diabetes is the most common form showing a prevalence rate of 88.4%. A study done by Raghuramalu (1990) also shows a similar rate (90-95%) of prevalence of NIDDM. Of the total of 221, 129(58.4%) were males and 92(41.6%) were females.

Insulin dependent diabetes mellitus was present at a rate of 11.6% among the 250 subjects, of this 29, (79.3%) were males and 20.7% were females.

2. Distribution of subejcts according to their age

Table II presents the distribution of the age of the selected subjects.

TABLE - II

DISTRIBUTION OF SELECTED SUBJECTS ACCORDING TO THE AGE

AGE IN YEARS	NIDDM		IDDM	
	Number	%	Number	%
0-20	5	2.3	1	3.4
20-40	40	18.1	19	65.4
40-60	167	75.5	3	10.3
60-80	9	4.1	6	20.9

Table II shows that the prevalence of non-insulin dependent diabetes was more in subjects between the age group of 40-60 years (75.5%). Brown (1987) has also reported a maximum prevalence of NIDDM in 50-60 years age group.

Eighteen per cent of the subjects were between 20-40 years, followed by 4.1% of subjects between 60-80 years and 2.3% between 0-20 years.

In the case of insulin dependent diabetes mellitus majority of the subjects were in the age group of 20-40 years (65.4%)

3. Educational Status

The educational status of the subjects showed that 61.6% of the subjects were literates and 38.4% were

illiterates. Among the literates male literacy rate (75.6) was greater than the female literacy rate (24.4%)

4. Occupational Status

Table II depicts the occupational status of the selected subjects.

TABLE - III

OCCUPATIONAL STATUS OF THE SELECTED SUBJECTS

OCCUPATION	MALE		FEMALE	
	Number	%	Number	%
Business	66	43.4	1	1.0
Officers	12	7.9	1	1.0
Agriculturists	51	33.6	3	3.1
Professionals	23	15.1	1	1.0
House Wives	-	-	92	93.9

From Table II it is evident that among the male diabetics majority (43.4%) were invoved in business followed by agriculturists (33.6%). 15% were professionals and only 7.9% were officers in government and private concern.

In the case of females majority (93.9%) of the subjects were housewives. Only 6 females were engaged in other kinds of occupations.

5. Duration of the disease

Table IV shows the duration for which the subjects were suffering from diabetes.

TABLE - IV

DURATION OF THE DISEASE

DURATION IN YEARS	NIDDIM		IDDM	
	Number	%	Number	%
0-5	100	45	3	10.3
5-10	58	26.1	11	37.9
10-15	19	8.6	8	27.5
15-20	28	12.6	6	20.8
20-25	16	7.2	1	3.4

Table IV indicates that about half of the subjects with non-insulin dependent diabetes have had diabetes for the past five years. The reason for a large number of diabetics having the disease for five years may be the improved screening procedure used in the recent past that has led to the finding of a number of new cases.26.1% of the cases had diabetes for a duration of 5-10 years. 8.6% of the subjects suffered from diabetes for 10-15 years, 12.6% for 15-20 years, 7.2% of the subjects mentioned that they had diabetes for the past 20-25 years.

In Insulin dependent diabetic subjects 37.9% were suffering for the past 5-10 years, 10.3% for the past five years, 27.6% for 10-15 years and the rest 24.2% for the past 15-25 years which is the longest duration. In the duration of the disease both NIDDM and IDDM show same trends.

B. DIETARY PATTERN OF THE SELECTED SUBJECTS

The dietary habits that have an effect on the disease are presented and discussed in the following.

1. Type of treatment followed by the selected subjects

Table V presents details regarding the type of treatment followed by the selected subjects.

TABLE V

TYPE OF TREATMENT FOLLOWED BY SELECTED

TREATMENT	NIDDM		IDDM	
	Number	%	Number	%
Diet alone	85	38.8	-	-
Diet + oralhypo glycemic drugs	90	40.5	-	-
Diet + insulin	46	20.7	29	100

Table V depicts that 38.8% of the subjects controlled their blood glucose by diet alone, 40.5% were treated by diet and oral hypoglycemic drugs, indicating that their blood glucose needs a slightly stronger control . About 20.7% of the NIDDM were taking occasional doses of insulin along with diet.

All the insulin dependent diabetics controlled their blood sugar by taking insulin injections and controlled their diet depending upon the type of insulin used.

2. Pattern of food consumption

Table VI presents details regarding the pattern of food consumption by selected subjects.

TABLE - VI

PATTERN OF FOOD CONSUMPTION

PATTERN	NIDDM		IDDM	
	Number	%	Number	%
3 meals a day	20	9.6	6	20.6
2 meals + a tiffin a day	71	31.9	3	10.3
2 tiffins + a meal day	124	55.8	7	24.4
3 tiffins and meal a day	6	2.7	13	44.7

Table VI points out that 55.8% of the non-insulin dependent diabetics consumed 2 tiffins and a meal a day. Two meals and a tiffin a day was consumed by the next majority (31.9%) of the NIDDM subjects. The other patterns like 3 meals a day and 3 tiffin + a meal a day were followed by a lesser number of subjects.

A majority (44.7%) of the insulin dependent diabetics consumed 3 tiffins and a meal a day. This pattern may be required to take care of the action of the insulin in IDDM.

The study also indicated that majority of the subjects were consuming more than one cereal a day. This is an acceptable pattern for a diabetic. A small percentage of NIDDM and IDDM subjects consumed only one cereal. These subjects need to be educated and convinced to consume a mixed cereal diet.

Green leafty vegetables were consumed by 54 per cent of the subjects twice a week and the rest (46%) consumed once in a week. Green leafy vegetables contain fibre which increase the bulk and help in reducing the blood glucose level. Hence the consumption of green leafy vegetables should be further increased.

Potatoes and carrots were consumed twice a week by all the subjects while yam and beet root were consumed once a week. Roots and tubers increase the carbohydrate content of the diet and thus increase the blood glucose level. Hence the consumption of roots and tubers should be avoided.

Cow's milk was consumed by 74.8% of the subjects followed by buffalo's milk by 21.6% and skimmed milk by 3.6%. People are not familiar with skimmed milk in our country. Among the subjects consuming cow's milk 41.2% consumed about 200 ml per day. Buffalo's milk was consumed in lesser a mounts than cow's milk. The reason given was its higher fat content. Subjects consuming skimmed milk, consumed only smaller amounts.

About 77.6% of the subjects were non-vegetarians and 22.4% vegetarians. Non-vegetarianism was most prevalent. This may be because of the fact that diabetes need more of high quality proteins. Realizing this need non-vegetarian foods were consumed by a greater number of subjects.

Chicken, fish and eggs were ccnsumed twice a week while mutton was consumed less frequently. The diabetics indicated that mutton consumption increases fat content.

All the diabetics used more than one type of oil in their diet. Refined oil and gingelly oil were consumed by all the subjects. Dalda, ghee and butter were used in limited amounts only by a few subjects.

3. Intake of special foods to control blood glucose

Table VIII gives information regarding the consumption of special foods by selected subjects to control blood glucose.

TABLE - VIII

SPECIAL FOODS CONSUMED TO CONTROL BLOOD GLUCOSE

SPECIAL FOODS	NIDDM		IDDM	
	Number	%	Number	%
Bitter gourd	27	12.2	6	20.6
Tulasi	9	4.1	1	3.4
Wheat	13	5.9	8	27.5
Neem Leaves	2	0.9	1	3.4
None	170	76.9	13	45.1

Table VIII indicates that 12.2% of the non-insulin dependent diabetics consumed bitter gourd to control blood glucose levels. Neem, tulasi, and wheat were also ccnsumed to control blood glucose levels. 76.4% did not consume any special food to control diabetes.

In the case of insulin dependent diabetic subjects wheat was consumed by 27.5% of the subjects. They indicated that consumption of wheat will cure the condition Tulasi and neem were consumed by only one subject each.

C. HEALTH CONDITION OF THE SELECTED SAMPLES

The condition of health was studied by finding out the fasting blood glucose levels and other disorders that were present along with diabetes mellitus.

1. Body mass index

The body mass index, calculated using the body weight and height of all the subjects are presented in Table IX.

TABLE - IX

BODY MASS INDEX OF THE SELECTED SUBJECTS

BODY MASS INDEX	NIDDM		IDDM	
	Number	%	Number	%
18.5 - 20.0 (under weight)	90	40.9	3	10.6
20 - 25 (normal weight)	128	57.6	26	89.4
25 - 30 (Over weight)	3	1.5	-	-

Table IX depicts that 57.6% of the non-insulin dependent diabetics were in the normal range of 20 to 25. This condition is essential for controlling diabetes. Among non-insulin dependent 40.9% of the subjects were under weight and 1.5% of the subjects were overweight. Reduction of body weight is a must to exercise a better blood glucose level.

In insulin dependent diabetics 89.4% of the subjects had a normal body weight and 10-6% were under weight. In general the non-insulin subjects had more body weight than the insulin dependent diabetic subjects.

2. Fasting blood glucose levels of the selecting subjects

Table X presents the fasting blood glucose levels of selected subjects.

TABLE - X

FASTING BLOOD GLUCOSE LEVELS OF SELECTED SUBJECTS

FASTING BLOOD GLUCOSE LEVELS IN Mg/dl	NIDDM		IDDM	
	Number	%	Number	%
100 - 150	29	13.1	6	20.6
150 - 200	48	21.6	10	34.4
200 - 250	73	32.9	7	24.1
250 - 300	51	23.0	6	20.6
300 - 350	11	5.0	1	3.3
350 - 400	9	4.4	0	-

Table X depicts the fasting blood glucose levels of 250 subjects. All the samples had fasting blood glucose levels more than 100 mg/dl. Only 13.9% of the samples had blood glucose between 100 - 150 mg/dl among non-insulin dependent diabetics. 32.9% of the subjects had 200 - 250 mg/dl. 23% had 250 - 300 mg/dl and 21.5% had 150 - 200 mg/dl. All the subjects had higher blood glucose levels than the normal level. In the case of insulin dependent diabetics also, all the subjects had higher fasting blood glucose levels.

3. Associated complications in selected subjects

Table XI depicts the complications associated with diabetes in the selected subjects.

TABLE XI - ASSOCIATED COMPLICATIONS

COMPLICATIONS	NIDDM		IDDM	
	Number	%	Number	%
Hypertension	21	9.5	10	34.4
Skin infection	18	8.1	9	31.0
Retinopathy	92	40.0	2	6.9
Nephropathy	9	4.1	-	-
Neuropathy	5	2.3	-	-
Obesity	8	3.6	2	6.9
None	69	31.4	6	20.8

Data on associated diseases of diabetes (Table XII) reveal that about 41% of the non-insulin dependent diabetics

had retionapathy which results due to uncontrolled blood glucose levels. Hypertension ranked next. Skin infection (8.1%) obesity (3.6%) nephropathy (4.1%) and neuropathy (2.3%) were also found. A large number of subjects were free from any of the complications indicating that they were controlling their blood glucose comparitively well.

Among the insulin dependent diabetics 34.4% suffered from hypertension and 31% had skin infections. Neuropathy and nephropathy were absent among them. This may be because of the control exercised by taking insulin. The number of subjects sufferring from retinal disorders was also very low (6.9%). About 20.8% of the insulin dependent diabetics did not have any complications.

D. FOOD AND NUTRIENT INTAKE

From the 250 samples a sub-sample of 30 non insulin dependent diabetics were selected and their food and nutrient intakes were studied using a 24 hour recall method.

1. Food intake of the sub-sample

Table XII presents the mean food intake of the sub sample. These samples were divided into two groups as group I for diet counselling trrough diet kit and group II for diet counselling through computer. The food intake data is presented for the two groups separately.

TABLE XII

MEAN FOOD INTAKE OF SUB SAMPLE

FOODS	GROUP I				GROUP II				RDA (ICMR 89)	
	MALE	% of + or -	FEMALE	% of + or -	MALE	% of + or -	FEMALE	% of + or -	MALE	FEMALE
Cereals	465	+1.08	420	2.4	470	+2.1	421	+2.6	460	410
Pulses	207	+417.5	173	+332.5	200	+400	137	+242.5	40	40
Green Leafy Vegetables	220	+450	200	+100	220	+450	206	106	40	100
Other Vegetables	105	+75	97	+62.6	107	+78.8	98	+63.3	60	60
Roots and tubers	204	+208	+97	+282	210	+320	153	+206	50	50
Fruits	62	+106	60	+100	60	+100	50	+66.6	30	30
Milk	633	+322	604	.504	699	300	535	435	150	100
Oil	51	+27.5	45	125	50	+25	43	+115	40	20
Fleshy foods	20	-44.4	20	-44.4	25	-16.6	20	-16.6	30	30
Sugar	45	+50	45	+125	25	+16.6	45	+125	30	20

Table XII indicates that the intake of all the foods were higher than the recommended dietary allowances for males and females of both groups. Consumption of fleshy food alone was low in the two groups of subjects. The subjects consumed higher quantities of cereals, roots and tubers, which is not a correct practice for a diabetic. These foods will increase the blood glucose and lipid levels. Hence education of these subjects on the ill effects of over eating of foods forms an essential part in counselling of these subjects.

With regard to the intake of sugar, as the patients are newly detected cases, their sugar intake is high. Their sugar intake needs to be stopped.

2. Nutrient intake of the sub-sample.

Table XIII presents the mean nutrient intake of subjects calculated from the mean food intake. The individual values are presented in Appendix IX & X.

TABLE XIII

MEAN NUTRIENT INTAKE OF SUB-SAMPLE

NUTRIENTS	NUTRIENT INTAKE BY GRP I				NUTRIENT INTAKE BY GRP II				RDA FOR NORMAL	
	Male	% of + or -	Female	% of + or -	Male	% of + or -	Female	% of + or -	Male	Female
Energy	3110	+28.2	2636	+14.05	2636	+8.7	2540	+35.4	2425	1875
Protein	100.8	+68	73.4	+47	106.2	+77	69.4	+38.8	60	50
Fat	75.3	+470	96.8	+384	102.5	+412.4	94.7	+373.5	20	20
Calcium	1658.8	+314.5	1530.1	+282.5	1808.7	+352.1	1431.7	+257.9	400	400
Iron	54.5	+94.2	45.5	+51.6	53.9	+92.5	39.9	+33.3	28	30
Vit. A	8247.8	+243.6	7474.8	+211.4	7543.1	+214.2	6017.1	+150.7	2400	2400
Thiamine	0.50	+109.3	2.31	+156.6	2.49	+107.5	2.1	+133.3	1.2	0.9
Riboflavin	1.913	+36.4	1.34	+21.8	2.28	+62.8	1.91	+72.7	1.4	1.1
Niacin	20.4	+27.5	20.1	+0.5	20.3	+26.8	19.1	+59.1	16	12
Vit C	181.9	+354.7	177.2	+787.7	203.5	+408.7	199	+399.2	40	40

Table XIII shows that the mean nutrient intake of all the subjects were higher than the recommened dietary allowances in female and males of both the groups. The subjects energy and fat intakes were in excess which will increase the blood glucose and lipid levels. The intake of calcium, iron, Vitamin A and other vitamins were also in higher quantities. So counselling is needed to reduce the intake of fat and energy, which are very much higher than the recommended dietary allowances.

E. IMPACT OF DIET COUNSELLING

An intensive diet counselling program was planned based on the food and nutrient intake and other practices of the subjects. The subjects were counselled through the two selected methods for a period of 3 months. The parameters studied before and after diet counselling are presented in the following and discussed.

1. Nutrition knowledge before and after diet counselling

The mean percentage scores obtained by the two groups before and after counselling are given in Table - XIV. The individual scores of all the subjects are presented in Appendix XI

TABLE-XIV

PERCENTAGE SCORES OBTAINED FOR

NUTRITION KNOWLEDGE BEFORE AND AFTER COUNSELLING

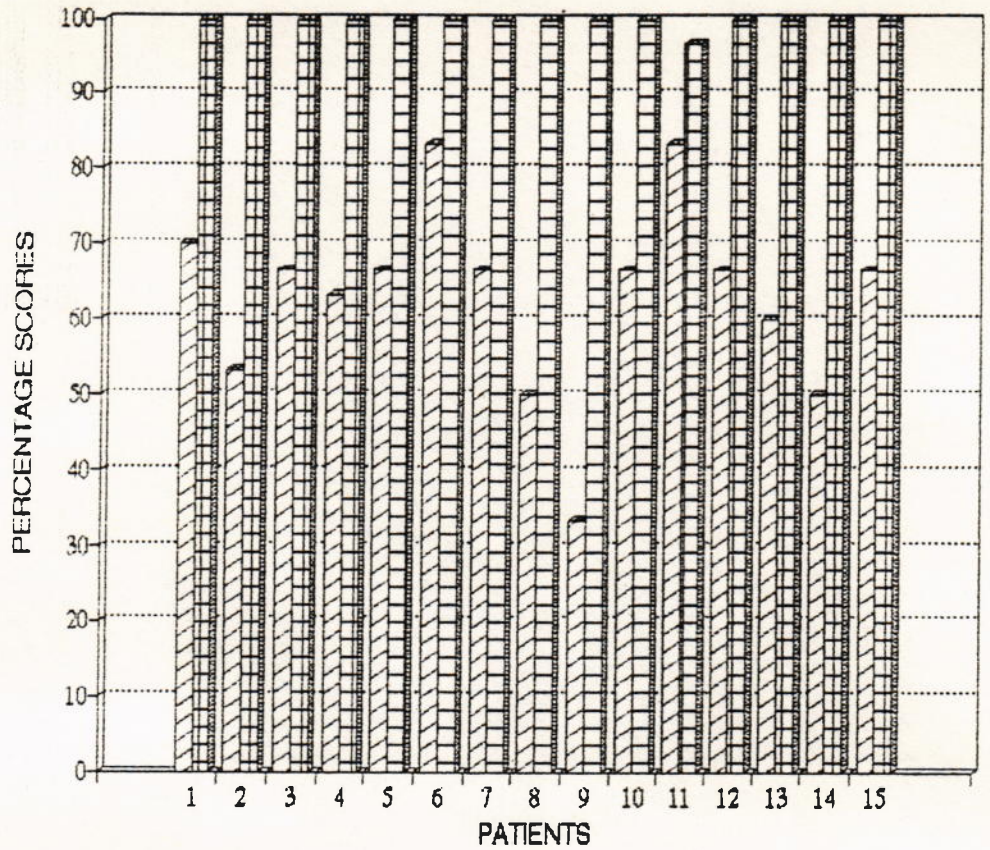
Type of counse-lling	Nutrition knowledge		't' value
	Before couselling in%	After counsellling in %	
Oral counseling with diet kit Group I	54.43±3.69	99.7±0.24	46.7**
Computer aided diet conselling Group II	68±3.95	93.3±1.49	9.9**

** Significant at 1% level

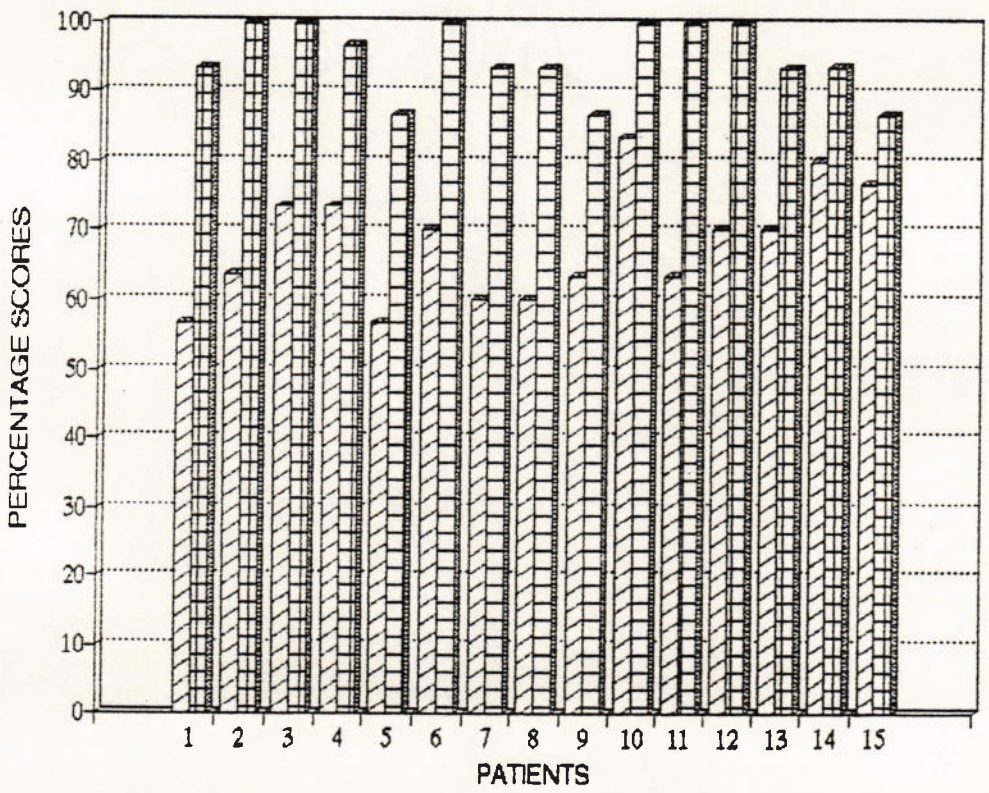
The intial percentage scores of subjects counselled through the diet kit was 54.4. After counselling the scores have increased to 99.7 showing a gain in the nutrition knowledge of the subjects. The subjects were able to answer all the questions. The statistical analysis indicated a highly significant difference between these two values.

Subjects counselled through computer had an initial score of 68%. After counselling for three months the mean scores were 93.3%. The increase in knowledge was statistically significant at 1% level. The two methods of counselling have produced significant impact on nutrition knowledge. But counselling through diet kit was more effective than computer counselling.

% SCORES OF SUBJECTS OBTAINED IN NUTRITION KNOWLEDGE (ORAL COUNSELLING)



(COMPUTER COUNSELLING)



2. Body weight before and after counselling

The mean body weights of the two groups of subjects before and after diet counselling are given in Table XV. The individual body weights of all the subjects are presented in Appendix XII.

TABLE XV

BODY WEIGHT BEFORE AND AFTER DIET COUNSELLING

Type of counselling	Body weight (Kgs) Before Counselling	After Counselling	't' value
Oral Counselling with diet kit Group - I	62.08±7.59	61.0±6.72	0.412^{NS}
Computer aided counselling Group - II	62.6±7.86	62.9±6.77	0.294^{NS}

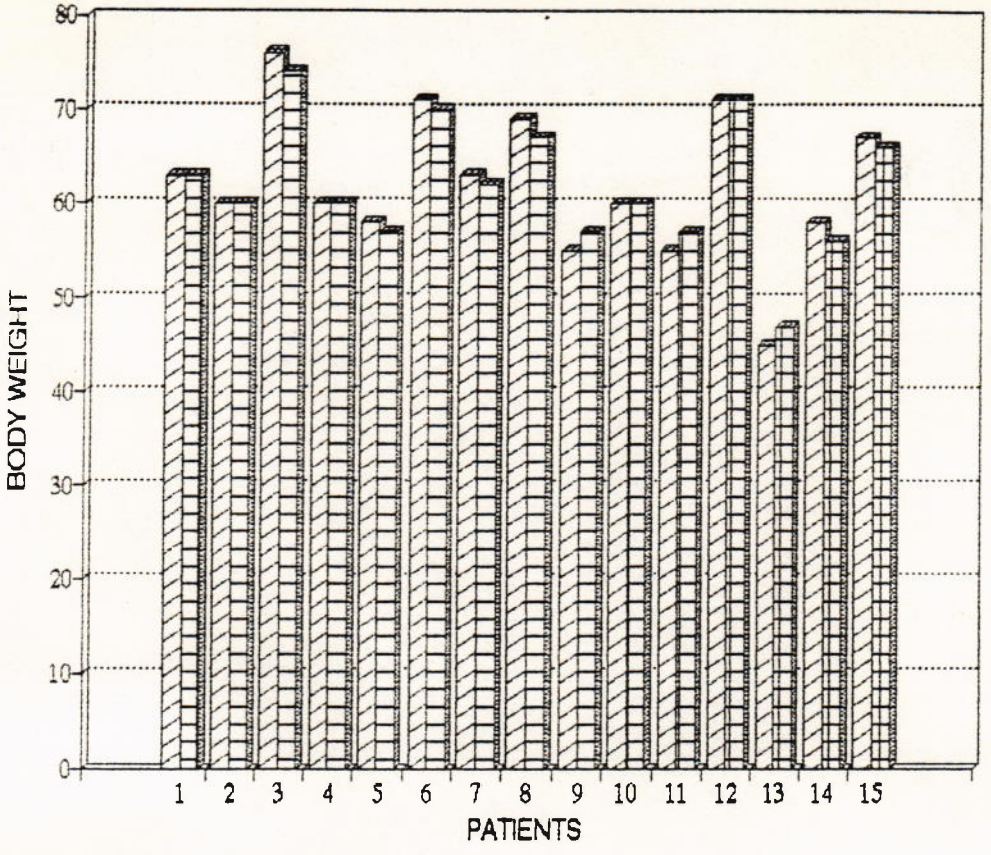
NS - Not significant

The mean body weight of the subjects before counselling orally through diet kit was 62 kgs. After counselling for three months the mean body weight was 61 kgs showing a slight decrease in body weight. But statistically the decrease was not significant.

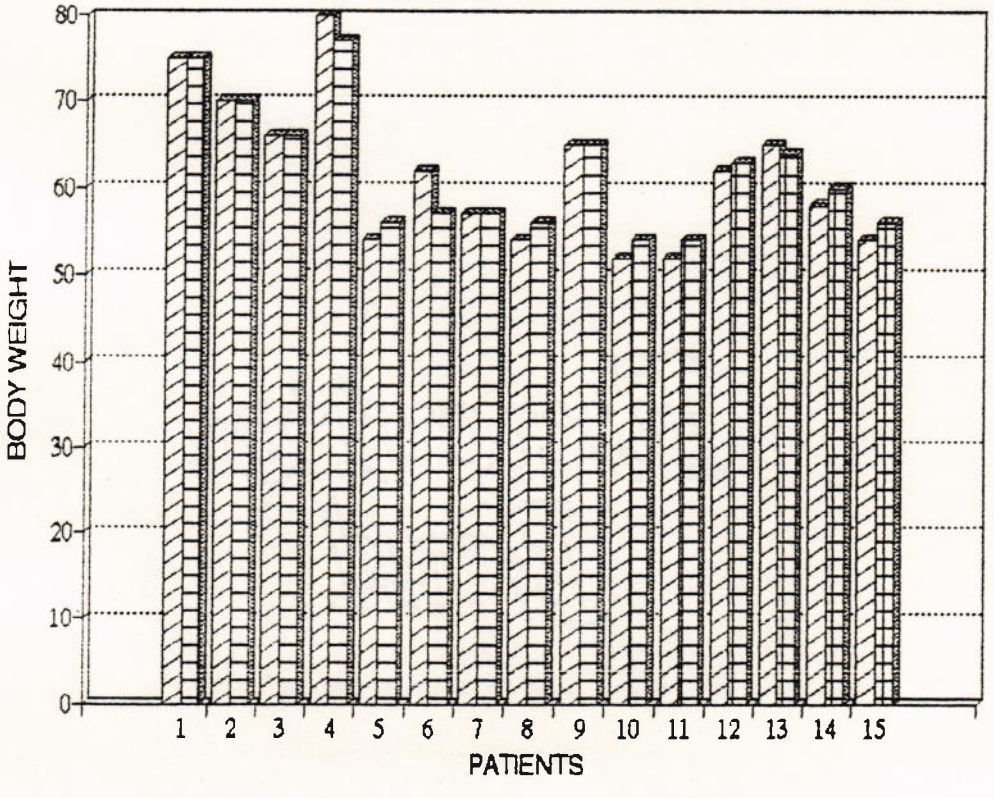
Subjects counselled through computer had an initial body weight of 62.6% kg. After counselling for 3 months the mean body weight was 62.9 kg. There was no difference in the body weight before and after counselling.

Counselling with oral diet kit and computer did not produce any significant impact on body weight. Oral diet

BODY WEIGHTS OF SUBJECTS AS RECORDED
(ORAL COUNSELLING)



(COMPUTER COUNSELLING)



kit had produced a slight decrease which was not statistically significant. Computer conuselling had no impact on body weight.

3. Fasting blood glucose before and after diet counselling

The mean fasting blood glucose of the two groups of subjects before and after diet counselling are presented in Table XVII. The individual fasting blood glucose levels of all subjects are presented in Appendix XIII.

TABLE - XVI

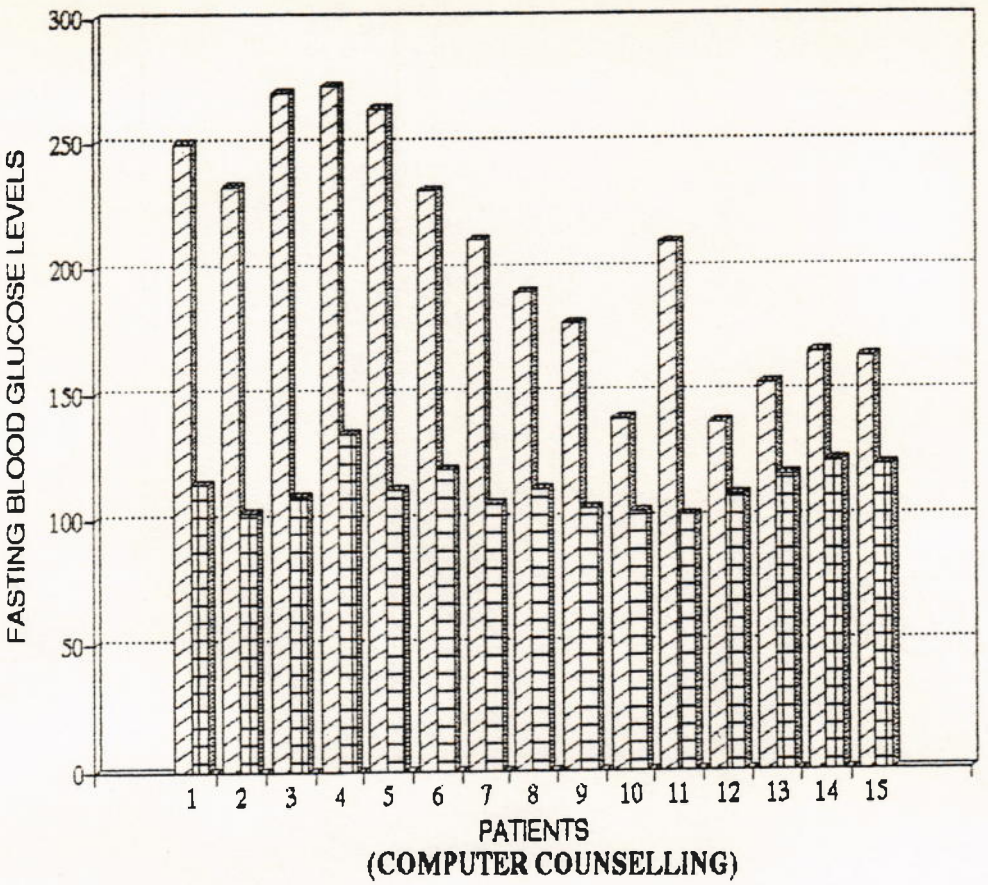
FASTING BLOOD GLUCOSE LEVELS BEFORE AND AFTER COUNSELLING

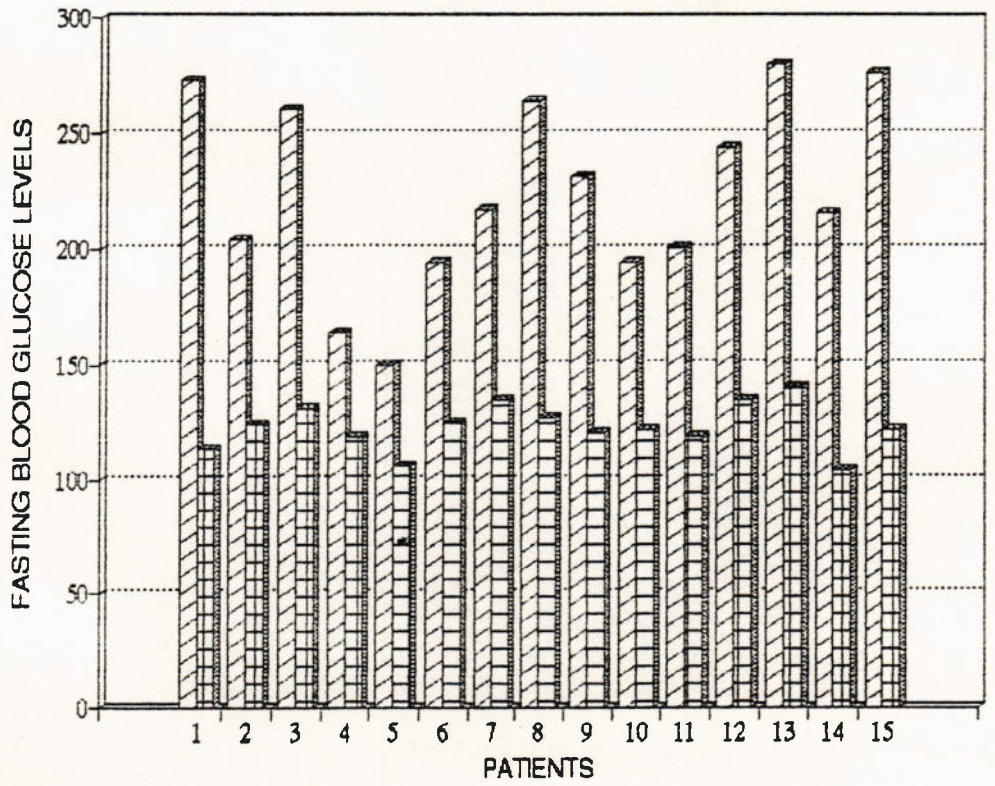
Type of counselling	Fasting blood glucose in mg/dl		't' value
	Before counselling	After counsel counselling	
Oral counseling with diet kit Group I	204.8 ± 45.71	112.5 ± 9.008	7.9673**
Computer aided diet conselling Group II	206.2 ± 39.64	114.4 ± 9.701	8.712 **

** Significant of 1% level

The mean fasting blood glucose of the subjects before counselling using diet kit was 204 mg/dl. After counselling for 3 months the level had decreased to 112.5 mg/dl. The statistical analysis indicate a highly significant difference between these two values.

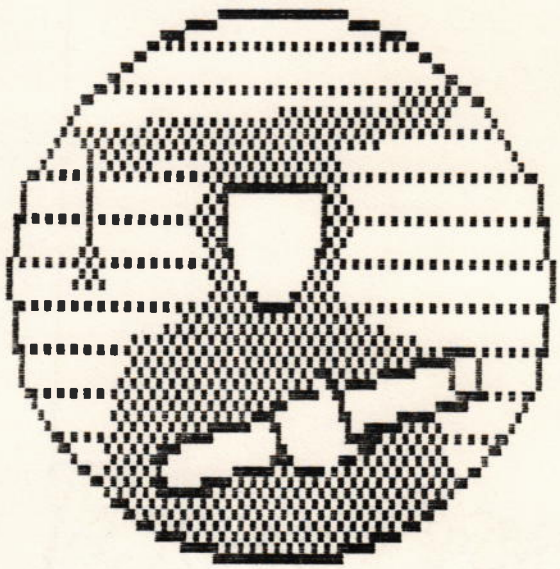
FASTING BLOOD GLUCOSE LEVELS OF SUBJECTS AS RECORDED (ORAL COUNSELLING)





Subjects counselled through computer had an initial fasting blood glucose level of 206.2 mg/dl. After counselling a decrease in blood glucose level which was significant at 1% level has been observed. The two methods of diet counselling have produced significant impact on the blood glucose levels. The blood glucose levels of both the groups of subjects have significantly decreased. The decrease in blood glucose level was more for the subjects counselled using oral diet kit than the subjects counselled using the computer.

The two diet kits developed for diet counselling of the non-insulin dependent diabetic subjects were found to be useful and effective in the counselling process. In general the results indicate that counselling through the oral diet kit had produced more impact in increasing the knowledge and decreasing the fasting blood glucose level of the subjects. Though computer counselling had also produced desirable changes, it was only secondary to oral diet kit.



SUMMARY &

Conclusion

SUMMARY AND CONCLUSION

The present study was undertaken to develop diet kits for oral and computer counselling of non-insulin dependent diabetics and to evaluate their effectiveness in the process of diet counselling. The oral diet counselling kit consisted of standard cups and spoons, exchange list, sample menu, pamphlets containing instructions on diabetes mellitus and restrictions in food, low fat recipes and diastix for testing urine. Computer counselling with a floppy was developed with informations regarding diabetes, instructions to be followed to plan a diet, exchange list, a program to plan a day's diet, list of foods to be avoided and restricted.

Two hundred and fifty diabetics attending Kovai Medical Centre and Hospitals were selected. An initial study was conducted to elicit information on the socio economic background, dietary habits and clinical data of the 250 samples. A specially designed questionnaire was used for this purpose.

A sub-sample of thirty non-insulin dependent diabetics between 40-60 years were selected for conducting diet conselling. All the 30 subjects were literates. These subjects were divided into two groups of 15 each with equal number of males and females. Questionnaire was

administrered before conselling to evaluate the nutrition knowledge of the 30 subjects. The fasting blood glucose and intital body weight of all the subjects were recorded before giving diet conselling.

Diet conselling was conducted individually through the diet kit for one group of 15 subjects and through computer for the second group of 15 subjects. After a period of 3 months, the nutrition knowledge, fasting blood glucose levels and body weights of all 30 subjects were evaluated. The results are statistically analysed and discussed.

The results of the study revealed that:

1. Out of the total 250 samples 88.4% were non-insulin dependent diabetics and 11.6% insulin dependent diabetes. Non-insulin dependent diabetes was the most prevalent form of diabetes. About 60% of the diabetics were males and 40% were females.
2. Prevalence of non-insulin dependent diabetes was more between 40 to 60 years of age, but insulin dependent diabetics predominated between 20 to 40 years of age. The number of diabetics between 60 to 80 years were very low.
3. The educational status of the subjects showed that 61.6% of the subjects were literates and 38.4% were illiterates. Male literacy rate was more than female literacy rate.

4. Majority of the subjects were doing business (43.4%). followed by agriculturists (33.6%) and professionals (23%), Among the females majority (94%) were house wives.
5. The number of subjects with diabetes for period of 0-5 years was more than subjects with the disease for a lower duration.
6. About 38.8% of the non-insulin dependent diabetic subjects controlled their disease with diet alone, whereas 40.5% took oral hypoglycemic drugs along with diet control. 20.7% needed occasional doses of insulin with diet. All the insulin dependent diabetics were on insulin.
7. Majority of the samples were consuming more than one cereal a day. Green leafy vegetables were consumed twice a week by 54% of the subjects and the rest consumed only once.
8. Root vegetables were consumed often. Skimmedmilk was consumed by a minority of 3.6% and the rest of the subjects consumed cows milk (74.8%) or buffalow's milk (21.6%). About 77.6% of the subjects were non-vegetarians and 22.4% were vegetarians. All the diabetics consumed more than one type of oil. Saturated fats were consumed only in limited quantities.
9. Bitter gourd, tulasi leaves, neem leaves and wheat were the special foods consumed by the diabetics for their

medicinal value. These were consumed in the belief that they would cure the disease.

10. Majority of the non-inslin dependent diabetics (57.6%) and insulin dependent diabetics (89.4%) had normal body weight. Subjects with under weight were more than subjects with over weight.
11. The fasting blood glucose levels of all the 250 samples were more than the normal values.
12. Only 34.4% of the non-insulin dependent diabetics and 20.8% of the insulin dependent diabetics subjects did not have any other complications with diabetics. The rest of the subjects suffered from only one of the complications such as retinopathy, neuropathy, nephropathy, hypertension, skin infection or obesity.
13. The food and nutrient intake of the subsample of 30 subjects indicated an increased consumption of all the foods except fleshy foods.
14. The nutrient intake were also more than recommened dietary allowances for all the nutrients, which indicated the need for diet conselling of the subjects.
15. The mean scores obtained by the subjects after diet conselling was significantly more than the scores obtained before diet conselling. The subjects taught orally using the diet kit had a better impact than the computer counselling.
16. The body weight of the subjects counselled orally with diet kit slightly decreased while there was a slight

increase in the body weight of sujects counselled through the computer.

17. There was a significant decrease in the fasting blood glucose level of both the groups of subjects. Oral diet counselling had produced greater decrease in blood glucose values than the computer counselling.

The study indicated that the two diet kits developed namely, the oral diet counselling kit and computer counselling were very much useful in the process of diet counselling. They brought about desirable changes in the attitudes and practices of the diebetics. Comparison of the two methods of counselling indicated that oral diet counselling brought about better results than counselling through a computer.

The study brought out the need for developing better diet kits with the help of computer, and their evaluation to find out a the best method which could make lasting impact on the minds of the patients and bring about desirable changes in attitudes and practices.

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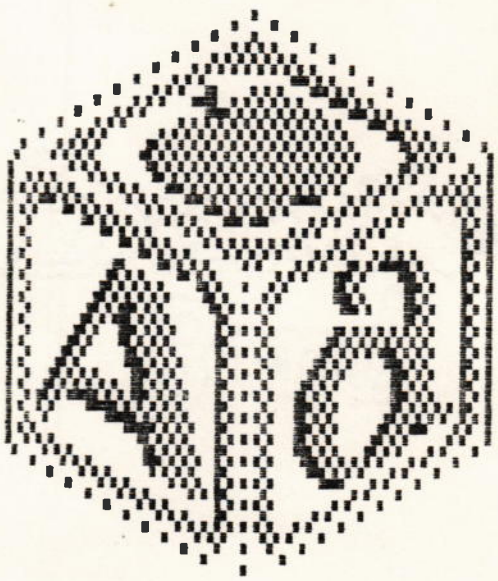

Appendix

APPENDIX - I

QUESTIONNAIRE TO ELICIT INFORMATION FROM THE DIABETIC PATIENTS

1. Name of the patient :
2. Occupation :
3. Marital Status :
4. Age :
5. Sex :
6. Educational status : Literate/ Illiterate
7. Height :
8. Weight :
9. Blood Pressure :
10. Fasting Blood Glucose :
11. Duration of the diesease :
12. Type of diabetes :
13. If IDDM what is the type of insulin used :
14. If NIDDM whether oral hypoglycemic drugs or insulin or diet alone or combination :
15. Complications if any with the dieases :
16. Vegetarian/Non-Vegetarian :
17. Meal Pattern :

    a. Number of times food is consumed per day

    b. Pattern in which food is consumed

        i. 3 meals a day
        ii. 2 meals and a tiffin a day
        iii. 2 tiffin and a meal a day
        iv. 3 tiffin and a meal a day

18a. Do you alternate cereals between meals in a day?

b. If yes, the number of times the number of times they are alternated

Rice Ragi Wheat Bajra

19. Consumption of roots and tubers in grams

Potato Yam Sweet Potato Carrot Tapioca

20. Consumption of green leafy vegetables.

21. Frequency of consumption of different fleshy foods

Mutton Fish Chicken Beef

22. Number of eggs consumed per week

23. Type of oil used at home

Oil	Amt/Day
Groundnut Oil	
Refined Oil	
Gingelly Oil	
Dalda	
Butter	
Ghee	

24a. Type of milk consumed

Cow's milk

Buffalo's milk

Skimmed milk

b. Amount of milk consumed per day (ml)

25a. Do you eat out often

b. If yes, how often

c. What do you eat out

d. Do you take sweets

26a. Do you consume any special food (apart from drugs) to control blood glucose.

b. How much

c. Its effects

APPENDIX - II

DIABETIC, LOW FAT, LOW CHOLESTEROL

I. **Free foods:**

1. Salad and boiled vegetables from the group of vegetables allowed (i.e) Tomato, cucumber, radish, greens cabbage, capsicum, gourds, salted pickles (no oil).

2. Beverage like rasam, vegetable soups (clear), lime juice with salt, diluted butter milk (skimmed), tomato juice, soda, mineral water, tender coconut water etc. without sugar, plain cofee or tea.

3. Skimmed milk and its products without sugar like cottage cheese and curds.

II. **Foods to be taken in limited quantities:**

1. Vegetables like carrots, peas, beans.
2. Cereals like wheat flour and rice and their products like refined flour bread, pulses and grains.
3. Oils like sanola and saffola are preferable to other oils as cooking media Allowance per day =
4. Fish and chicken in boiled steamed, grilled, or baked form not more than four times/week. Lean meat not more than one time a week.

5. Egg yolks including those used in cooking not more than two per week. Egg white may be taken more frequently.
6. Whole milk notmore than 300 ml/day including that used in curds, cofee, tea etc.
7. Fruits like orange, sweet lime, apple, pappaya, water melon, may be taken in pieces (100 gm/day).
8. Milk products like collag cheese may be taken in small quantities.
9. Property drinks like spurt, protinex.

III. Foods to be avoided:

1. Fats like vanaspathi, ghee, butter, coconut oil
2. Fried foods and food cooked in too much oil eg: chips, samosas, bajji, bonda etc.
3. Bakery products like cakes, pastries, cream biscuits.
4. Sweets like laddu, burfi etc. payasam, puddings, dessert ice creams.
5. Refined starch products like cornflour, commercial jelly products, custard powder, arrow root powder.
6. Root vegetables like potato, yam, colocasia, tapioca
7. High calorie fruits like banana, mango grapes, pomagranate, sapota, custard apple, apple, jack fruit etc.

8. Dried fruits and nuts like dates, raisins, cashew nuts, almonds, ground nuts etc.
9. Sweetened aerated drinks like Thump up, Campa cola, squashes, sherbats, milk shakes.
10. Proprietrydrinks like bournvita, horlicks, boost, complan.
11. Fatty meals like bacon, yolks of eggs, red meat, organ meat, crab, shrimps.
12. Pickles made in oil
13. Coconut.

Recommendations:

1. High fibre foods like green leafy vegetables and green salads should be an essential item on the menu for every meal.

2. Inclusion of whole wheat flour for at least one meal per day is advisable.

3. Whole grams and pulses are preferable to polished ones. They may be included in at least one meal can be sprouted.

4. Whole wheat bread is preferable to refined flour bread.

APPENDIX - III

EXCHANGE LIST

List 1 CEREAL EXCHANGE

30 gms. raw of the following foods give 100 calories

Particulars		Cooked amount
Bajra	:	2 chappathis
Bread (¼" thick)	:	2 slices
Cornflakes	:	2/3 cup
Iddli	:	2 No.
Macaroni	:	2/3 cup
Maize flour	:	1 cup (kali)
Oats	:	1½ cups (porridge)
Rice	:	1 cup(plain boiled)
Rice flour	:	1 cup (kali)
Rice puffed	:	2 cups (pori)
Sago	:	3 cups (porridge)
Semolina	:	1 cup (upma)
Vermicelli	:	1 cup (upma)
Wheat flour	:	1 puri (30 gms cooked)
Wheat flour	:	2 chappathi (40 gms cooked)
Wheat flour	:	½ paratha (30 gms. cooked)
Wheat Ravai (Dalia)	:	1 cup (upma)

List 2 LEGUMES AND PULSE EXCHANGE

30 gms. raw of any of the following gives 100 calories.

Bengal gram (Roasted)	:	1/3 cup
Bengal gram	:	¾ cup Boiled
Bengal gram dhal	:	¾ cup Boiled
Black gram dhal	:	1 cup Boiled
Dried peas	:	½ cup boiled
Green gram	:	1 cup boiled
Green gram dhal	:	¾ cup boiled
Mysore dhal	:	¾ cup boiled
Rajmah	:	½ cup boiled
Red gram dhal	:	1 cup boiled
Roasted Bengal gram dhal	:	1/3 cupboilded

List 3 MEAT/FISH/POULTRY

The following quantities give 100 calories.

Particulars		Boiled
Beef	:	100 gms.
Brain	:	100 gms.
Chicken	:	100 gms.
Crab	:	150 gms.
Egg	:	1 No
Liver	:	100 gms.
Mackreal	:	70 gms.
Mutton	:	50 gms
Pomfret	:	100 gms
Prawns	:	100 gms
Sardines	:	70 gms.
Sea fish	:	50 gms.

The caloric value will increase by 9 for every one gram of oil used in cooking

This group of food shows no appreciable change of weight on cooking.

List 4 VEGETABLE EXCHANGE 'A'

½ cub boiled gives 30 calories.

Amaranth
Bittergourd
Bringal
Broad beens
Cabbage
Cauliflower
Chow chow
Cucumber
Drumstick
Fenugreek leaves
French beans
Green papaya
Green Tomato
Knol khol
Lady's finger
Paruppu keerai
Pumpkin
Radish
Ridge gourd
Ripe Tomato
Siru Keerai
Snake gourd
Spinach

List 5 VEGETABLE EXCHANGE "B"

½ cub of the following cooked vegetables gives 50-60 calories.

Beetroot

Carrot

Colocasia

Cluster beans

Double beans

Peas

Plantain (green)

Potato

Yam

List 6 FRUIT EXCHANGE

One raw exchange of the following gives 40 calories

Particulars		Quantity
Amla	65 gms	4 - 5
Apple	65 gms	1 small
Banana (medium)	35 gms	½
Coconut		100 gms
Custard Apple	40 gms	1 small
Dates (fresh)	35 gms	3 nos.
Grapes (black)		20 nos
Guava	80 gms	1 average fruit
Jack fruit	45 gms	2 pieces
Jambu	55 gms	10 pieces
Lemon	100 gms	3 average fruit
Mango	55 gms	1 small
Melon	200 gms	1 slice
Orange	100 gms	1 slice
Papaya	100 gms	2" x 3" slice
Peach	80 gms	2 small
Pine Apple	100 gms	1 slice
Plums	80 gms	2 nos
Sapota	40 gms	1 small
Straw berry	100 gms	10 nos.
Sweet lime	100 gms	1 average
Water melon	200 gms	1 slice

- -

List 7 MILK EXCHANGE

Each exchange give 100 calories

Curds (buffalo's)	: ½ cup
Curds (cow's)	: 1 cup
Curds (skimmed)	: 2 cups
Cheese (commercial)	: 30 gms
Cheese (skimmed milk)	: 35 gms
Cheese (whole milk)	: 15 gms
Khoa (Buffalo's milk)	: 25 gms
Khoa (Cow's milk)	: 30 gms
Khoa (skimmed milk)	: 50 gms
Milk (buffalo's)	: ½ cup
Milk (condensed)	: 5 tea spoons
Milk (cow's)	: 1 cup
Milk (skimmed)	: 2 cups

List 8 NUTS AND OIL SEEDS EXCHANGE

The follwoing foods give 100 calories each

Particulars	quantity
Almond (10-12)	15 gms
Apricots	39 gms
Cashew nuts (10-12)	15 gms
Coconut dry	15 gms
Currants	30 gms
Dates	30 gms
Groundnuts	20 gms
Fig dried (small)	20 gms
Melon seeds	15 gms
Raisins	30 gms
Walnut (8-10 halves)	15 gms

List 9 FAT EXCHANGE

One exchange gives 90 calories

Butter	: 2½ tea spoons
Ghee	: 2 tea spoons
Oil (any variety)	: 2½ tea spoons
Vanaspathi	: 2 tea spoons

List 10 SWEETNERS

Each exchange gives 100 calories

Glucose (5 tsp)	: 25 gms
Honey (5 tsp)	: 35 gms
Jaggery	: 25 gms
Sugar (5 tsp)	: 25 gms

List 11 SOUPS

Each exchange gives 100 calories:

Brown meat soup	: ¾ cup
Chicken cream soup	: ¾ cup
Clear vegetable soup	: 9 cups
Tomato cream soap	: 1 cup
Vegetable cream soup	: 1 cup
Tea	: with 150 ml milk no sugar
Tomato juice	: 400 ml.
Tender coconut water	: 400 ml.
Rasam	: 9 cups.

List 12 OTHER BEVERAGES EXCHANGE

Each exchange gives 100 calories

a. Alcoholic drinks:

Beer	: ¼ - ½ bottle
Spirits:	
Brandy	:
Gin	:
Rum	: 1¼ - 1½ small pag
Whisky	:

b. Common beverages:

Apple juice	: 100ml.
Butter milk	: out of 150 ml curd
Coconut water	: 400 ml
Coffee	: with 150 ml milk, no sugar (each tea spoon sugar gives 20 calories)

c. Commercial Aerated waters

Campa cola	: 250 ml
Cola lite	: 350 ml
Limca	: 400 ml
Thumbs up	: 250 ml
Orange juice	: 400 ml

List 9 FAT EXCHANGE

One exchange gives 90 calories

Butter	: 2½ tea spoons
Ghee	: 2 tea spoons
Oil (any variety)	: 2½ tea spoons
Vanaspathi	: 2 tea spoons

List 13 MISCELLANEOUS:

Each exchange gives 100 calories

BISCUITS

Arrow root	: 4 nos.
Ginger	: 4 nos.
Glucose	: 3 nos.
MARIE	: 3½ nos.
Orange cream	: 2 nos.
Salt	: 6 nos.

a. supplement

Bournvitta	: 25 gms
Bomplan	: 22 gms
Horlicks	: 25 gms
Spert	: 30 gms

b. Sweets and savouries

Badam Halwa	: 20 gms	Namak para	: 20 gms
Balu shahi	: 20 gms	Nan katai	: 20 gms
Burfi	: 25 gms	Pakoda	: 50 gms
Dal vadai (1 no)	: 30 gms	Petha (1 pc) (sweet)	: 70 gms
Dhokla	: 30 gms	Potato chips	: 20 gms
Gulab Jamun (1 no)	: 25 gms	Potato kachori (1 no)	: 30 gms
Imarti	: 20 gms	Rasagulla (1 No)	: 30 gms
Jalebi (1 no)	: 25 gms	Samosa (1 no)	: 40 gms
Mathi (1 no)	: 25 gms	Sohan Halwa	: 25 gms
Meat puff	: 25 gms	Sooji Halwa	: 30 gms
Mixture (1 cup)	: 20 gms	Sweet Appam	: 40 gms
Muruku	: 20 gms	Sweet Kolkathai	: 50 gms
Mysore pak	: 30 gms	Tapioca chips	: 15 gms
		Yelea Adai	: 75 gms.

APPENDIX - IV

SAMPLE MENU

Date :

Name : _____ Sex : _____ Age:_____

Height : _____ Weight: _____

TIME	ITEM	QUANTITY
6.30 A.M	Tea/Cofee/Milk	
	_____ Sugar	_____ cup
8.30 A.M	Idli/Phulkas/Dosai/Uppuma	_____NO_____NO
		_____NO_____NO
	Chuntney	_____tsp
	Sambar	_____cup
	Tea/Coffee/Milk/Sugar	_____cup
	OR	
	Plain Bread/Toast	_____slices
	Butter /Jam	_____tsp
	Sprouted grams	_____cup
	OR	
	Vegetable sandwich	
	_____ butter	_____slices
	Egg _____	_____No
	Tea/Coffee/Milk Sugar	_____cup
10.30 A.M	Dilute Butter Milk/ Tomato soup/clear vegetable soup	_____ glass
	_____salt/sugar	
	Tomato juice/lime juice	_____ glass
	_____salt/sugar	

APPENDIX - IV

SAMPLE MENU

Date :

Name : _____ Sex : _____ Age:_____

Height : _____ Weight: _____

TIME	ITEM	QUANTITY
6.30 A.M	Tea/Cofee/Milk	
	_____ Sugar	_____ cup
8.30 A.M	Idli/Phulkas/Dosai/Uppuma	_____NO_____NO
		_____NO_____NO
	Chuntney	_____tsp
	Sambar	_____cup
	Tea/Coffee/Milk/Sugar	_____cup
	OR	
	Plain Bread/Toast	_____slices
	Butter /Jam	_____tsp
	Sprouted grams	_____cup
	OR	
	Vegetable sandwich	
	_____ butter	_____slices
	Egg _____	_____No
	Tea/Coffee/Milk Sugar	_____cup
10.30 A.M	Dilute Butter Milk/ Tomato soup/clear vegetable soup	_____ glass
	_____salt/sugar	
	Tomato juice/lime juice	_____ glass
	_____salt/sugar	

1.00 P.M	Clear vegetable soup	_____ cup
	chappathi/rice	_____no/cup
	Vegetable salad	_____cup
	Sambar/dhal	_____cup
	Rasam	_____cup
	green leafy vegetable	_____cup
	vegetable curries	_____ cup
	curds/butter milk	_____cup
	Fruits those permitted	_____slices
4.00 P.M	Tea/Coffee/Milk	_____cup
	_____sugar	
	Biscuits/vegetables sandwitches	_____No/slices
	_____butter	
	OR	
	Sprouted gram salad	_____cup
	OR	
	Roasted bengal gram	_____cup
8.00 P.M	Same as lunch or break fast	
8.30 P.M	Milk _____ sugar	_____cup

NOTE

1 Cup = 150 ml. capacity

1 glass = 200 ml. capacity

APPENDIX - V

LOW FAT RECIPES

CHANNA-MOONG CHAT

INGREDIENTS:

Bengal gram (whole)	:	20 gms
Green gram (whole)	:	20 gms
Salt & condiments	:	to taste
Fresh lemon juice	:	5 gms
Oil	:	3 gms

METHOD:

1. Clean, wash and soak Bengal gram and green gram overnight.
2. Drain the water, tie in a wet muslin cloth and hang. Keep the cloth moist by sprinkling water over it in between.
3. Keep for a day till 1/2 inch sprouts appear (Bengal gram takes longer to sprout than green gram).
4. Heat oil, Add cumin seeds, red chillies, sprouted grams and a little water.
5. Cook in a covered pan for five minutes (If a pressure cooker is availablte, cook for one minute only).
6. When cooked add lemon juice.

Nutritive Value:
Calories 170.

GRILLED FISH

INGREDIENTS:

Fish	: 1/4 Kg
Ginger	: 1 Piece
Lemon	: 1 Medium size
Salt	: to taste
Red chillies	: to taste
Food colour	: orange
Omum	: 1/4 tsp

METHOD:

1. Wash the fish pieces.

2. Grind ginger to paste and add lemon juice, salt, chilli powder, colour and omum to it.

3. Rub the masala into fish slices and leave it to marine for 1-2 hrs.

4. Grill the fish pieces or bake them in an oven at 375-F. It can be cooked in a non stick pan-with a lid. For this no oil is required to steam the fish tender.

5. Serve hot garnished with lemon slice onion rings, coriander, ketchup and mint chutney as desired.

Nutritive Value:
Fat Nil

CHICKEN ROAST

INGREDIENTS:

Chicken	: (800 g)
Curds (sour)	: 1 cup (200 g)
Mint	: few leaves
Coriander	: few leaves
Garam masala	: 1 tsp
Green chillies	: 1-2 to taste
Salt	:
Red Chillie pdr	: to taste
Orange food colour	:
Ginger	: 1" piece
Garlic	: 8 -10 cloves

METHOD:

1. Mix ground ginger, garlic, mint coriander, green chillies, salt, chilli powder, orange colour with beaten curds

2. Rub the curds and masala mixture on to whole chicken and leave to marinate for 4-5 hours

3. Keep the whole mixture (chicken & masala) in a broad pan & cook over slow flame with pan covered till chicken becomes tender and the masala dries up completely.

4. Cook the chicken directly over gas flame to dry masala completely.

5. Cut in pieces and serve hot garnished with onion rings, lemon peices etc.

Nutritive Value:
Calories 992.

GREEN MASIAL

INGREDIENTS:

Green	:	2 small bunches (200gm)
Urud dhal	:	1/2 tsp
Salt	:	to taste
Red Chilli	:	1
Oil	:	1 tsp
Asafoetida	:	a small piece

METHOD:

1. Boil and mash the greens.

2. Add salt to it and season with Urud dhal, red chilli, and asafoetida in oil.

Nutritive Value:
Calories 152

SPROUTED GREEN GRAM PACHADI

INGREDIENTS:

Sprouted green gram	: 1/2 cup (100 gm)
Onion (finely chopped)	: 1 tsp
Coriander leaves	: 1/4 bunch
Dry chillies (chopped)	: 4 nos.
Curds	: 1/2 cup (100 gm)
Mustard	: 1/2 tsp
Oil	: 1/2 tsp

METHOD:

1. Mix the gram with coriander leaves chopped onion and curds.

2. Heat oil, add the mustard and chillies.

3. Add the seasoning and salt to the gram mixture and serve chilled.

Nutritive Value
Calories 421

CAULIFLOWER KORMA

INGREDIENTS:

Cauliflower	:	100 gms
Onion	:	10 gms
Tomatoes	:	10 gms

Oil	:	5 gms
Salt & Chillies	:	to taste
Garam masala & turmeric	:	a pinch each

METHOD:

1. Wash and grate the cauliflower, steam a little.
2. Clean and chop onions and tomatoes finely.
3. Fry onions till brown. Add tomatoes and cook.
4. Add the cauliflower and condiments.
5. Fry on a low fire. Add water.
6. Cook till the gravy thickens.

Nutritive Value:
Calories 85

APPENDIX

CONTENTS OF THE FLOPPY

1. INTRODUCTION ABOUT DIABETES MELLITUS
2. INTRODUCTION TO PLAN A DAY'S MENU
3. A 1000-CALORIE DIET
4. EXCHANGE LIST
5. A PROGRAMME FOR THE PATIENT TO PLAN HIS OWN DIET ACCORDING TO HIS DIET PRESCRIBED
6. FOOD THAT ARE TO BE RESTRICTED, AVOIDED AND FREE FOODS
7. IMPORTANCE OF EXCERCISE

APPENDIX - VII

CHECKLIST TO KNOWN THE AWARENESS OF NIDDM PATIENTS ABOUT DIABETIC DIET

1. Diabetes is caused due to the deficiency of insulin

   Yes No

2. During diabetes sugar is excreted through urine

   Yes No

3. Overweight causes diabetes

   Yes No

4. Diabetes is a hereditary disorder

   Yes No

5. Insulin is produced by pancreas

   Yes No

6. The most important treatment for diabtes is diet

   Yes No

7. Wheat reduces blood sugar

   Yes No

8. The amount of food eaten should be constant daily

   Yes No

9. Exercise is essential to control blood sugar

   Yes No

10. Can egg be taken every week?

    Yes No

11. Vegetables increase blood sugar level

    Yes No

12. Can large amount of milk be consumed by a diabetic?

    Yes No

13. Does banana have an effect on blood sugar?

Yes No

14. The diabetic diet should contain twice the amount of protein consumed by a normal person

Yes No

15. Does mosambi juice affect blood sugar level?

Yes No

16. Does diabetes occur in persons about 45 years of age?

Yes No

17. Bottled drinks can be consumed by diabetes

Yes No

18. Can pastries be consumed by diabetic?

Yes No

19. The normal level of glucose in blood is 120 mg or below in 100 cc of blood

Yes No

20. Reduction of weight in obese diabetic individuals may bring sugar to normal level in blood

Yes No

21. Skimmed milk is preferable to whole milk

Yes No

22. More fat in the diet may have an effect on the increased glucose level in blood

Yes No

23. Sedentary life is a cause for diabetes mellitus

Yes No

24. Roots and tubers should be controlled in a diabetic diet

Yes No

25. Any amount of raw salads can be consumed by a diabetic

Yes No

26. More greens should be included in a diabetic diet

Yes No

27. Jam, Jelly should be completely avoided in the diet

Yes No

28. Uncontrolled diabetes affects the eye sight

Yes No

29. Frequent urination and increased thirst are present in hyperglycemia

Yes No

30. Insulin controls the level of sugar in blood

Yes No

APPENDIX - VIII

NUTRIENT INTAKE OF SELECTED SUB SAMPLE COUNCELLED ORALLY

SL NO.	Calories (Kcal)	CHO gms	Fat gms.	Protein gms.	Calcium mg	Fe mg	Vit-A ug	Thiamine mg	Riboflavin mg	Niacin mg	Vit-C mg
1.	4161	622.4	121.4	104.6	1662	55.1	6856.5	2.34	1.91	19.3	143.6
2.	2930	434.1	135.1	106.4	1733	56.6	12202.3	2.76	2.06	23.1	130.8
3.	3346	480	130.3	105.4	2524	59.5	11128.8	2.83	2.12	21.71	153.4
4.	3975	515.1	83.9	83.9	1163.4	60.1	9316.7	2.91	1.86	18.84	252.2
5.	3686	559.7	123.7	120.4	1999.1	52.3	7417.1	2.30	1.90	19.38	201.4
6.	2783	419.8	92.8	83.9	1600.1	48.6	6790.1	2.22	2.16	21.11	211.4
7.	1963	475.2	105.4	106.4	1341.9	56.2	8324.3	2.18	2.09	20.43	196.4
8.	2543	505.4	116.5	111.4	1201.7	50.1	7049.9	2.72	1.97	21.8	183.6
9.	2616	431.7	126.7	89.4	1662.1	51.1	7330.8	2.60	1.91	19.07	170.1
10.	3101	401.7	104.4	96.8	1701	54.8	6061.9	2.19	1.87	18.3	176.3
MEAN	3110	484.5	114	100.8	1658.9	54.9	2447.9	2.5	1.9	20.3	181.9

APPENDIX - IX

NUTRIENT INTAKE OF SUB SAMPLE COUNCELLED USING COMPUTER

SL NO.	Calories (Kcal)	CHO gms	Fat gms.	Protein gms.	Calcium mg	Fe mg	Vit-A ug	Thiamine mg	Riboflavin mg	Niacin mg	Vit-C mg
1.	2930	442.1	103.2	94.3	1413.2	51	5423.2	2.15	2.16	20.1	130.6
2.	1943	382.2	98.6	103.4	1822.8	49.6	1240.77	2.70	1.93	18.4	243.8
3.	3490	460	120.3	100.2	1999.1	56.2	2493.8	2.42	1.86	19.4	156.6
4.	2146	411.7	80.4	88.7	1231.2	49.8	6172.1	2.96	2.4	21.4	193.7
5.	1867	418.7	82.1	118.2	1896.5	56.6	8433.1	2.15	2.5	19.5	202.5
6.	2982	392.4	101.2	84.3	2330.6	53.1	4386.2	2.89	1.9	22.8	235.1
7.	3572	430.1	123.3	116.3	1742.8	55.1	7579.2	2.12	1.8	18.56	185.6
8.	1631	432.1	132.3	115.2	1403.6	48.2	3642.3	2.32	1.4	23.1	250.7
9.	1840	502.3	113.3	98.3	2341.6	59.1	2841.3	2.49	2.9	20.5	180.3
10.	3963	500.8	117.3	106.4	190.8	60.1	1536.2	2.80	2.7	20.7	256.7
MEAN	2636	437.3	106.3	102.5	1808.7	53.9	4374.8	2.5	2.3	20.5	203.6

APPENDIX - X

PERCENTAGE SCORES OF SUB SAMPLE OBTAINED IN NUTRITION KNOWLEDGE BY BOTH METHODS OF COUNSELLING

SL. NO.	GROUP I		GROUP II	
	BEFORE COUNSELLING	AFTER COUNSELLING	BEFORE COUNSELLING	AFTER COUNSELLING
1.	70	100	56.6	93.3
2.	53.3	100	63.6	100
3.	66.6	100	73.3	100
4.	63.3	100	73.3	96.6
5.	66.6	100	56.6	86.6
6.	83.3	100	70	100
7.	66.6	100	60	93.3
8.	50	100	60	93.3
9.	33.3	100	63.3	86.6
10.	66.6	100	83.5	100
11.	83.3	96.6	63.3	100
12.	66.6	100	70	100
13.	60	100	70	93.3
14	50	100	80	93.6
15	66.6	100	76.6	86.6

APPENDIX - XI

BODY WEIGHTS OF SUB SAMPLE RECORDED BEFORE AND AFTER DIET COUNSELLING BY BOTH METHODS

SL. NO.	GROUP I		GROUP II	
	BEFORE COUNSELLING	AFTER COUNSELLING	BEFORE COUNSELLING	AFTER COUNSELLING
1.	63	63	75	75
2.	60	60	70	70
3.	76	74	66	66
4.	60	60	80	77
5.	58	57	54	56
6.	71	70	62	57
7.	63	62	57	57
8.	69	67	54	56
9.	55	57	65	65
10.	60	60	52	54
11.	55	57	52	54
12.	71	71	62	63
13.	45	47	65	64
14.	58	56	58	60
15.	67	66	54	56

APPENDIX - XII

FASTING BLOOD GLUCOSE OF SUB SAMPLE RECORDED BEFORE AND AFTER DIET COUNSELLING BY BOTH METHODS

SL. NO.	GROUP I		GROUP II	
	BEFORE COUNSELLING	AFTER COUNSELLING	BEFORE COUNSELLING	AFTER COUNSELLING
1.	250	114	273	113
2.	233	103	204	124
3.	270	109	261	131
4.	273	134	164	119
5.	264	112	150	106
6.	231	120	194	125
7.	211	106	270	134
8.	190	112	264	172
9.	140	103	194	121
10.	210	101	201	119
11.	178	104	231	120
12.	138	109	244	134
13.	154	117	280	140
14.	166	223	216	104
15.	164	121	276	121

APPENDIX - XIII

BLOOD SUGAR ESTIMATION

GLUCOSE OXIDASE METHOD

PRINCIPLE: In this method glucose is oxidized by glucose oxidase to gluconic acid with the gluconolactone as intermediate. The overall reaction is

$$\text{Glucose} + H_2O + O_2 \text{ ------- gluconic acid} + H_2O_2$$

The hydrogen peroxide which is also formed is broken down to water and oxygen by a peroxidase in the presence of an oxygen acceptor which is converted to a coloured compound the amount of which can be read calorimetrically.

AUTO ANALYSER METHOD USING GLUCOSE OXIDASE (Mark and Lloyd-1963)

These authors describe both macro and micro methods in which proteins are precipitated with zinc sulphate and sodium hydroxide and a micromethod without removal of proteins. Here micromethod is used. The blood is placed directly into a sodium sulphate sodium iodoacetate solution. This mixes with a sodium sulphate dilute before entering the dialyzer and dialysis is into sodium sulphate. Then after receiving the enzyme dye reagent, in which O-tolidine is used, the stream passes through a 40-foot coil. Before entering the calorimeter it is mixed with sulphuric acid and

the yellow colour resulting has an extinction at 420 milli microns upto twice that of the blue colour at 660.

REAGENTS:

1. Sodium sulphate solution, 16.4 grams of the anhydrous salt per litre of aqueous solution Add 0.1 ml Triton X 100.

2. Stock sodium-iodoacetate, 0.4 gms in 100 ml of the 16.4 per cent sodium sulphate.

3. Sodium sulphate-iodoacetate diluent. Add 1ml of the stock idoacetate to 80 ml of 1.6 per cent sodium sulphate and make to 100 ml with the sulphate.

4. Sodium acetate - acetic acid buffer, 0.5 M, pH 5.0. Dissolve 475 gms of sodium acetate in water, add 91 gms (86 ml) of glacial acetic acid and make to 10 1 with water. Check the pH and adjust if necessary.

5. Peroxidase solution, 20 mg of horse radish peroxidase RZ (Hughes and Hughes) in 500 ml of buffer. Keep in a refrigerator.

6. O-Tolidine solution, 1 gm Analar reagent in 100 ml absolute ethanol.

7. Enzyme-dye reagent. To 800 ml of acetate buffer add 50 ml of the peroxidase, 10 ml of the O-tolidine and 10 ml of Fermcozme 653 A (750 units/ml - Hughes and Hughes) mixing after each addition. Make up a litre with buffer. Keep in the refrigerator in a dark bottle for up to 3 days.

8. Standard glucose solution prepare a stock standard in saturated benzoic acid solution containing 100 mg/100 ml. Dilute to obtain standards for use containing 5, 10, 15, 20, 30, 40, 60, 80 mg per 100ml. Put through in the same way as the test these correspond to 50, 100, 200, 300, 400, 600, 800 mg per 100 ml.

TECHNIQUE

For general use add 0.1 ml of blood to 0.9 ml of the sodium sulphate - iodoacetate. For blood sugar values and for glucose tolerance tests 0.2 ml to 0.8 ml is generally better. The standards will then range from 25-400. Run at 40-60 samples per hour and read at 420 mm.

Sensitivity with a dilution of 1-10 is 4 mg per 100 ml for each per cent. T between 50 and 100 mg per 100 ml 6 between 100 and 200, 8 between 200 and 400, 12 between 400 and 600.