3. METHODOLOGY

The methodology pertaining to the study entitiled, "**Efficacy of Software "*Nutra Glyx*" on Nutraceutical Recipes Incorporated with Selected Medicinal Plants for Diabetes Mellitus", is** presented under the following heads.

Phase I : Survey on Selected Female Type II Diabetic Subjects

Phase II : Selection of Medicinal Plants and Testing of Hypoglycemic Effect

Phase III : Standardization and Acceptability of Nutraceutical Recipes Incorporated with Selected Medicinal Plants

Phase IV : Development and Evaluation of a Software *"Nutra Glyx"* on Nutraceutical Recipes Incorporated with Selected Medicinal Plants

Phase I

3.1 Survey on Selected Female Type II Diabetic Subjects

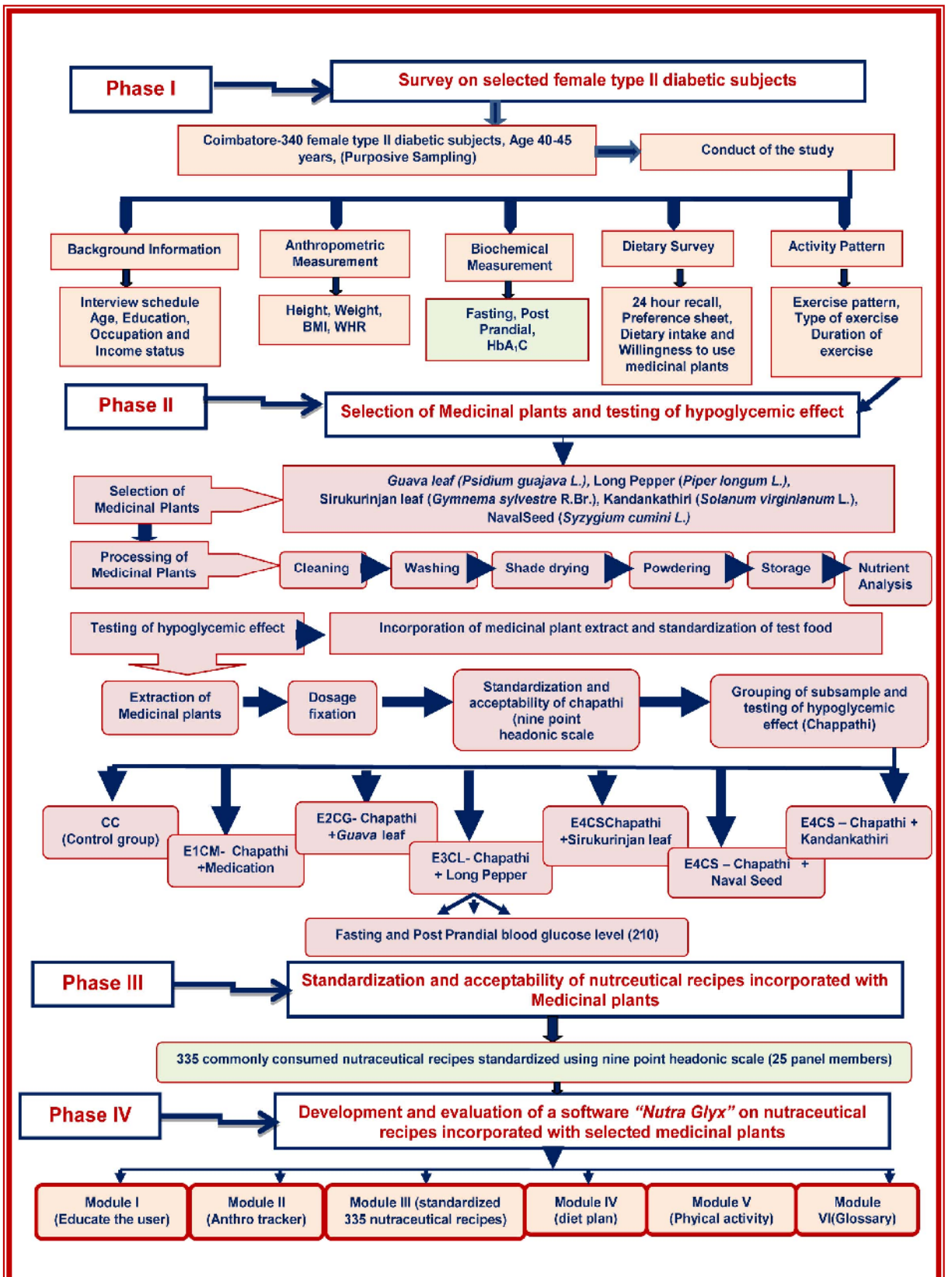
3.1.1. Selection of area

The prevalence of diabetes is swiftly increasing over the globe at an alarming rate. According to the International Federation of Diabetes (2017), 415 million adults around the world are suffering from diabetes mellitus,

As reported by ICMR's (INDIAB), one out of 10 people in Tamil Nadu is diabetic, and every two persons in a group of 25 are in the pre-diabetic stage. Also, the prevalence of Type II diabetes among urban women above 20 years of age is about 12.5 percent in Tamil Nadu. Thus, the recent statistics has come as warning signals to the public at large.

Coimbatore, the cotton city with equal number of urban and rural population is witnessing, dietary and lifestyle transition leading to the onset of lifestyle disorders such as obesity, cardiovascular diseases, and diabetes. Also surrounded by western ghats, Coimbatore serves as a house of many indigenous medicinal plants and since studies indicated the use medicinal plants to treat ailments at house hold level by population of Coimbatore (Karthiyayini, 2012) the investigator chose this region for the conduct of the study (Figure 1).

Figure 1 - Research Design a Overview



3.1.2. Selection of sample

According to Nadda (2016), women in urban Tamil Nadu have been among the most affected by Type II diabetes in India. The prevalence of Type II diabetes among urban women above 20 years of age is about 12.5 percent in Tamil Nadu and 3.2 lakhs in Coimbatore.

Though the onset and prevalence of diabetes among women is escalating continuously, coverage of dietary and health care interventions has not reached the entire women population as rightly pointed out by WHO (2009). Both sex and gender have a significant impact on the health of women and must be considered when developing appropriate strategies for health promotion. It is clear that women around the world face health challenges at every stage of their lives from early childhood to old age and also they are the direct care takers of the family and act as a fulcrum in establishing the dietary habits of the home and society by large.

Hence, with this rationale, a total of 340 female type II diabetic subjects between the age group of 40-45 years were purposively selected from two diabetic clinics in the city of Coimbatore for the conduct of the study.

Inclusion criteria

- Healthy female individuals
- Free from cold, fever, and cough
- Between the age group of 40-45 years
- Willingness to participate in study as taste panel members

Exclusion criteria

- Female with complications
- Above 45 years
- Who are not willing to participate

3.1.3. Selection of tools and conduct of study

The background information, anthropometric measurements, biochemical parameters, medical history, dietary habits, exercise pattern and Knowledge,

Attitude and Practice (KAP) of the selected subjects on medicinal plants were elicited using appropriate standardized tools.

3.1.4. Background information

The background information of all the 340 female type II diabetic subjects for age, marital status, educational status, occupational detail, total monthly income of the family and their medical history was elicited using a well-structured interview schedule (Annexure I).

3.1.5. Anthropometric measurements

Anthropometric measurements for height, weight, BMI, waist and hip circumference were measured for all the selected 340 female type II diabetic subjects using appropriate standard equipment to ascertain their body composition (Annexure II).

3.1.5.1. Height

The selected female type II diabetic subjects were made to stand on the surface of the stadiometer without foot wares and toes apart. The foot-long ruler was placed on the person's head and a mark was made on the scale, at the point of contact between the scale and the ruler, the distance from the floor to the mark on the scale was measured. Thus, the height was taken to the nearest ¼ inch or 0.5 centimeters.

3.1.5.2. Weight

Body weight was measured using a digital weighing scale for all the 340 female type II diabetic subjects. The subjects were asked to stand on the platform of weighing scale without foot wear and with minimal clothing. The individuals were asked not to lean against the wall or hold any support, while the weight was measured. The weighing scale was calibrated to 0.0 before the measurement and the weight was recorded as displayed on the weighing scale.

3.1.5.3. Body Mass Index

Based on the height and weight of the subject, the BMI was calculated and were classified as underweight (<18.5), normal (18 – 22.9), overweight (23–24.9), obese grade I (25-29.9), obese grade II (≥30), based on the cut off points recommended by ICMR (2016).

3.1.5.4. Waist circumference

The selected 340 female type II diabetic subjects were asked to stand erect with the body weight evenly distributed, with arms at the sides, foot positioned together and weight evenly distributed across the foot. Using a non-stretchable measuring tape, the waist was measured at the midpoint between the lower margin of the least palpable rib and top of the iliac crest.

3.1.5.5. Hip circumference

Similarly, for hip circumference the subjects were asked to stand erect with foot close together, arms at the side and body weight evenly distributed and was asked to wear light clothing. Using a non-stretchable measuring tape hip circumference was measured around the widest portion of the buttocks.

3.1.5.6. Waist-hip ratio

The Waist to Hip Ratio of all the female type II diabetic subjects was calculated to assess the prominent site of distribution of fat either on the upper part or lower part of the body and to determine the nature of obesity.

Based on the WHO, (2011) classification for Waist to Hip Ratio the selected female type II diabetic subjects were classified as low risk (0.9 for men, 0.85 for women), moderate risk (0.9-0.95 for men, 0.85-0.9 for women), and high risk (>1.0 for men, >0.9 for women) for obesity.

3.1.6. Biochemical parameters

As part of the biochemical analysis (Annexure III), the fasting and post prandial blood glucose levels of all the selected 340 female type II diabetics were analyzed using accu chek glucose meter. The HbA_1C test was also performed to find out the maintenance of blood glucose levels of the subjects for the past three months.

3.1.6.1. Blood pressure

Using a digital sphygmomanometer, the blood pressure of all the 340 female type II diabeticsubject was measured and recorded. Based on JNC7 classification of hypertension (2004) , the subjects were classified as, normal (<120-<80 mm/Hg), pre-hypertensives (120-139/80-89 mm/Hg), moderate

hypertensives (140-159/90-99 mm/Hg), severe hypertensives (≥160/≥100 mm/hg).

The approval for human ethics clearance was obtained from the Institutional Human Ethics Committee of Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore (Annexure IV).

3.1.7. Exercise pattern

The investigator collected information on the activity level (sedentary, moderate and sever worker) and exercise pattern (types of exercise, frequency and duration of exercise) of all the 340 selected female type II diabetic using a checklist (Annexure V).

3.1.8. Dietary assessment

Dietary assessment of the selected 340 female type II diabetic subjects was carried out, using 24 hour recall to evaluate their comprehensive nutritional status (Annexure VI). The subjects were asked to recall the food item consumed by them for the last 24 hours in household measures for three consecutive days. The cooked volume of the food consumed by the subject was converted into its raw equivalents. The nutrient intake for both macro and micronutrients of the subject was calculated using the nutritive value table of Indian foods (NIN, 2016).

Further, the mean nutrient intake of all the 340 female diabetic subjects was then calculated using the software “Asstranutrient” developed by Premala and Pallabika (2018). The mean nutrient intake of the selected subjects was compared with the Recommended Dietary Allowance (RDA) for Indians (NIN, 2016). The difference between actual mean nutrient intake and RDA was analyzed and interpreted statistically.

Apart from 24-hour recall, the activity level and exercise pattern of the selected subjects were also elicited. The usage of medicinal plants as a remedial measure to control diabetes mellitus and their incorporation in recipes were also obtained.

3.1.8.1. Dietary intake of food groups

The intake of food groups namely , cereals and millets, pulses, milk and milk products, roots and tubers, green leafy vegetable, other vegetable, fruits,

sugar, and fat comsumption (Annexure VII) was collected and compared with the number of portions recommended by the NIN, 2016.

3.1.9. Preference and frequency of commonly consumed recipes

Using an open-ended preference sheet (Annexure VIII), all the selected 340 female type II diabetic subjects were asked to tick their preference and frequency of commonly consumed recipes for different meals namely breakfast, lunch/dinner, snacks, soups, salad, etc. The recipes thus obtained were ranked and 67 most commonly and most frequently consumed recipes were identified**.**

3.1.10. The Knowledge, Attitude and Practice (KAP) of medicinal plants

The Knowledge, Attitude and Practice of medicinal plants (Annexure IX) by the selected type II diabetic subjects in the treatment of diabetes mellitus and their willingness to incorporate the medicinal plants in the commonly consumed recipes were elicited using a KAP sheet.

PHASE II: Selection of Medicinal Plants and Testing of Hypoglycemic Effect

A. Selection of medicinal plants

The dietary choice remains the basis for maintaining a healthy lifestyle and wellbeing especially relating to diabetes. Despite remarkable advances in pharmaceutical drug, medicinal plants are being explored recently for their nutraceutical properties as they are safe, free of side effects and cost-effective.

Scientific evidence suggests the usage of medicinal plants as an alternate to complement the management of various disease conditions including diabetes mellitus.

Dietary modification in unison with medicinal plants with potential therapeutic properties in the management of diabetes is therefore imperative. The state of Tamil Nadu, Coimbatore in particular houses 131 medicinal plants of 115 genera belonging to 64 families (Murugeswaran et al., 2014). From the entire list of 402 medicinal plants listed in the herbal Tamil directory, a total of ten medicinal plants namely Avaram (*Cassia auriculata),* kadukkai (*Terminalia Chebula),* Amla (*Emblica Officinalis*)*, Guava leaf (Psidium guajava L.), Syzygium cumin (*Naval seed)*, Andrographis Paniculata (Nilavembu),* Sirukurinjan leaf (*Gymnema Sylvestre* (Retz.) R.Br.)*,* Chittaratta *(Alpinia Galanga*)*,* Kandankathiri

(*Solanum virginianum* L.), Long Pepper (*Piper longum L.)* were identified with potential nutraceutical properties to treat diabetes mellitus.

Five out of ten medicinal plants namely Guava Leaf *(Psidium guajava L.)*, Long Pepper (*Piper longum L.)*, Sirukurinjan Leaf (*Gymnema Sylvestre* (Retz.) R.Br.), Naval Seed (*Syzygium cumini L.)* and Kandankathiri (*Solanum virginianum* L.) were selected for the conduct of the study based on their bioactive component, neutraceutical properties, palatability and feasibility of incorporation in recipes.

The above selected medicinal plants were subjected for the certificate of authentication by the department of Botanical Survey of India, Tamil Nadu Agricultural University (Annexure X).

3.2.1. Processing of Medicinal Plants

All the selected five medicinal plants were procured and processed individually using the standard procedure.

3.2.1.1. Processing of Guava leaf *(Psidium guajava L.)*

Fresh Guava leaf *(Psidium guajava L.)* **(Figure 2)** were washed in distilled water thoroughly till it is free from dust and dirt and were rinsed and dried. Using a clean white muslin cloth the moisture on the surface of the leaf was removed. The washed leaves were shade dried with adequate air, under dry conditions.

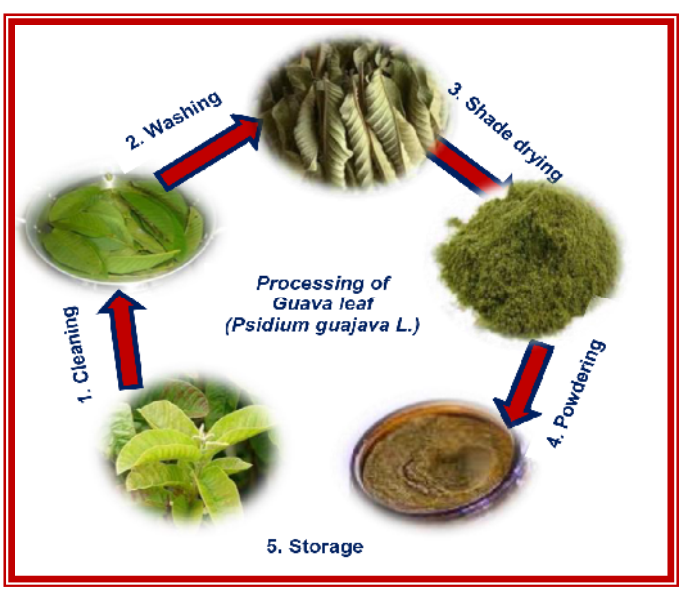


Figure 2: Processing of Guava Leaf *(Psidium guajava L.)*

The shade dried *Guava leaves (Psidium guajava L)* were then ground to a fine powder and were sieved using a 1.0 mm sieve. The powdered *Guava leaves (Psidium guajava L.)* were then stored in a clean dry and airtight container.

3.2.1.2. Processing of Long Pepper (*Piper longum L.)*

Dried Long Pepper (*Piper longum L.)* **(Figure 3)** were procured from Ayurvedic medical shops, washed in distilled water thoroughly till it is free from dust and dirt and were wiped, using a clean white muslin cloth and shade dried with adequate air, under dry conditions.

Figure 3: *Processing of* Long Pepper (*Piper longum L.)*

The shade dried Long Peppers (*Piper longum L.)* were then ground to a fine powder and were sieved using a 1.0 mm sieve. The powdered Long Pepper (*Piper longum L.)* was then stored in a clean, dry and airtight container.

3.2.1.3. Processing of Sirukurinjan leaf (*Gymnema Sylvestre* (Retz) R.Br.)

Fresh Sirukurinjan leaves (*Gymnema Sylvestre* (Retz.) R.Br.) **(Figure 4)** were plucked and washed in distilled water thoroughly till it is free from dust and dirt, using a clean white muslin cloth, the moisture on the surface of the leaves was removed and were shade dried with adequate air, under dry conditions.

Figure 4: Processing of Sirukurinjan leaf (*Gymnema Sylvestre* (Retz) R.Br.

The shade dried, Sirukurinjan leaves (*Gymnema Sylvestre* (Retz.) R.Br.) were then ground to a fine powder and were sieved using a 1.0 mm sieve. The powdered sirukurinjan leaves were then stored in a clean dry airtight container.

3.2.1.4. Processing of Naval Seed (*Syzygium cumini L.)*

The dried Naval Seeds (*Syzygium cumini L.)* **(Figure 5)** purchased Ayurveda shop were washed in distilled water thoroughly till it is free from dust and dirt and were shade dried with adequate air, under dry conditions. The shade dried Naval Seeds (*Syzygium cumini L.)* were then ground to a fine powder and were sieved using a 1.0 mm sieve.

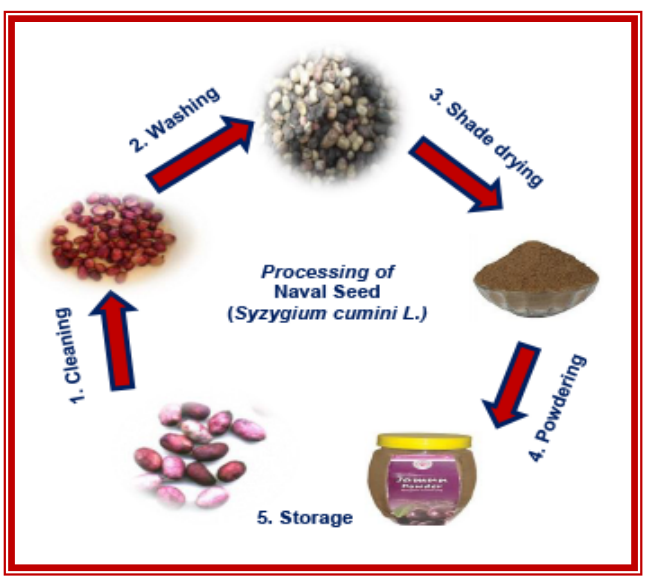


Figure 5: Processing of Naval Seed (*Syzygium cumini L.)*

The powdered Naval Seed (*Syzygium cumini L.)* were then stored in a clean, dry airtight container.

3.2.1.5. Processing of Kandankathiri (*Solanum virginianum* L.)

Kandankathiri fruits (*Solanum virginianum* L.) **(Figure 6)** were washed in distilled water thoroughly till it is free from dust and dirt and were shade dried with adequate air, under dry conditions. The shade dried Kandankathiri's (*Solanum virginianum* L.) were then ground to a fine powder and were sieved using a 1.0 mm sieve.

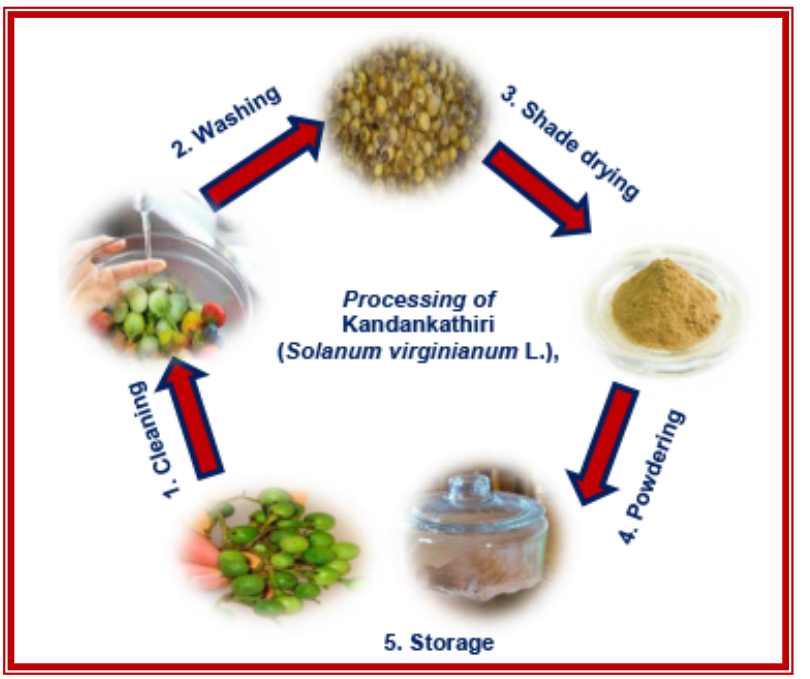


Figure 6: Processing of Kandankathiri (*Solanum virginianum* L.)

The powdered Kandankathiri powder (*Solanum virginianum* L.) was then stored in a clean, dry airtight container.

3.2.2. Nutrient analysis

The Nutrient analysis of the selected five medicinal plants was carried out, for both macro and micro nutrients namely energy, carbohydrate, protein, fat, calcium, iron, vitamin A, thiamine, riboflavin, nicotinic acid, pyridoxine, ascorbic acid, vitamin B12, dietary fiber, sodium, and potassium using standard procedures (AOAC method) (Annexure XI)

B. Testing of hypoglycemic effect of selected medicinal plants

3.2.3. Incorporation of medicinal plant extract and standardization of test food (Chapathi)

As nutraceutical recipes enhance the value of food that we consume by not only supplementing the diet with nutrient but also by contributing phytochemical that aids in prevention/treatment of disease, the investigator was interested in developing nutraceutical recipes incorporated with the selected medicinal plants tested for hypoglycemic effects to benefit the society and the diabetic patients in particular.

Due to the presence of bioactive components in medicinal plants namely Guava leaf *(Psidium guajava L.) (Alkaloids)*, Long Pepper (*Piper longum L.) (Flavonoids)*, Sirukurinjan leaf (*Gymnema Sylvestre* (Retz.) R.Br.) (gymnemic acid), Naval Seed (*Syzygium cumini L.) (Tannins)*, and Kandankathiri (*Solanum virginianum* L.) (Glucosides), researcher and nutritionist have recently started to explore their nutraceutical properties mainly their hypoglycemic effect. Hence, the investigator was also interested in investigating the hypoglycemic effect of the selected five medicinal plants.

3.2.4. Extraction of medicinal plant extracts

The hypoglycemic effect of the selected five medicinal plant extract was tested on ten female type II diabetic as a pilot study. Since, the pilot study revealed a significant decrease in blood glucose level, the investigator, tested the hypoglycemic effect of the selected five medicinal plants in a commonly consumed recipe. For this, the investigator had chosen chapathi, a standard recipe to test the hypoglycemic effect since the chapathis are commonly consumed by all age group particularly the person with diabetes for its low fat and high fiber content. Herbal extract has been widely used as medicinal agents throughout human history either in the form of Ayurveda and Homeopathy

As numerous scientific studies claim that medicinal plant powder has more indigestible fiber that may reduce the phyto chemical activity of the nutraceutical component present and also, numerous clinical studies have proved the efficacy of medicinal extract to be superior when compared to powders, the extraction of medicinal plants was carried out.

Thus, 100gm of the selected medicinal plant powder were dissolved in 1600ml of water and were boiled at 60ºC approximately for two hours till it reduced to 400ml (Thakkur, 2014). The extracts were then stored in clean dry and airtight container (Annexure XII).

3.2.5. Dosage fixation

As extensive literature survey showed fewer research investigation on the hypoglycemic effect of the selected medicinal plants in humans and revealed a considerable amount of scientific investigation carried out in animal studies, the investigator calculate the Human Milli Equivalent dosage for Dosage fixation based on rat studies using the formula (FDA, 2005).

Therefore, based on HMED extract of, 2.5g of *Guava leaf (Psidium guajava L.)*, 2g of Long Pepper (*Piper longum L.).*

Table I

Dosage Fixation of the Selected Medicinal Plants

S.No	Medicinal Plants	Calculated Human Dosage	Reference Study
1	*Guava leaf (Psidium guajava L.)*	2.5gm/serving	Mukhtar et al., 2004
2	Long Pepper (*Piper longum L.)*	2gm/serving	*Kitukale, 2014*
3	Sirukurinjan (*Gymnema Sylvestre* (Retz.) R.Br.)	1.5gm/serving	*Aziza, 2012*
4	Naval Seed (*Syzygium cumini L.)*	2gm/serving	*Bhavana, 2012*
5	Kandankathiri (*Solanum virginianum* L.)	2.5 gm/serving	*Poongothai, 2011*

1.5 g of Sirukurinjan leaf (*Gymnema Sylvestre* (Retz.) R.Br.), 2.5g of Naval Seed (*Syzygium cumini L.)*, and 2g of Kandankathiri (*Solanum virginianum* L.) were fixed as dosage (Table I).

3.2.6. Standardization and acceptability of test food (Chapathi)

Seventy-five grams of wheat flour (contributing 50gm of carbohydrate) was incorporated with the calculated dosage of five selected medicinal plants separately, as five different test food (2.5g of *Guava leaf (Psidium guajava L.)*, 2g of Long Pepper (*Piper longum L.),* 1.5g of Sirukurinjan leaf (*Gymnema Sylvestre* (Retz.) R.Br.)*,* 2.5g of Naval Seed (*Syzygium cumini L.)* and 2g of Kandankathiri (*Solanum virginianum* L.) and a portion of two chapathis were prepared for each medicinal plant.The chapathis were standardized, and their acceptability was rated using a nine-point hedonic scale by a panel of 20 semi-trained members (Annexure XIII).

3.2.7. Grouping of subsample and testing of hypoglycemic effects

The hypoglycemic effect of the selected medicinal plants namely *Guava leaf (Psidium guajava L.)*, Long Pepper (*Piper longum L.)*, Sirukurinjan leaf (*Gymnema Sylvestre* (Retz.) R.Br.)*,* Naval Seed (*Syzygium cumini L.)*, and Kandankathiri (*Solanum virginianum* L.) was tested on a subsample of 210 female diabetic of 40-45 years with a BMI ranging between 23 and 27, blood glucose level between126 mg/dl and 200mg/dl with $HbA1_c$ value between 5and 7, taking oral hypoglycemic drugs (glycomet, Glucophage).

Subsamples were then grouped into control and experimental groups as enlisted in Table II.

Table II

Grouping of Sub-samples

Grouping of Sample	N:210
CC - Control group	30
E1CM- Chapathi+Medication	30
E2CG- Chapathi+*Guava leaf (Psidium guajava L.)*	30
E3CL- Chapathi+Long Pepper (*Piper longum L.)*	30
E4CS- Chapathi+Sirukurinjan leaf (*Gymnema Sylvestre* (Retz.) R.Br.)	30
E5CN- Chapathi+Naval Seed (*Syzygium cumini L.)*	30
E6CK- Chapathi+Kandankathiri (*Solanum virginianum* L.)	30

A portion of two chapathi's incorporated with medicinal plant extract 15 g of onion chutney was given to the experimental for ten consecutive days. The control group received a portion of two standard chappathis without incorporation for ten consecutive days The fasting and postprandial blood glucose levels (30 min, 60 min, 90 min and 120min) were analyzed using Accu check glucose monitor for the control and experimental groups. The mean fasting and postprandial blood glucose level were calculated and statistically analyzed.

PHASE III

3.3 Standardization and Acceptability of Nutraceutical Recipes Incorporated with Selected Medicinal

3.3.1. Standardization and acceptability of nutraceutical recipes

Since the chapathis incorporated with the selected medicinal plants showed the significant reduction in the postprandial blood glucose level compared to the control group, at 5% level of significance, this gave an authenticated scientific reasonto the investigator to prepare nutraceutical recipes incorporated with selected medicinal plants. Also since the incorporation of medicinal plants in day to day recipes to enhance their nuetraceutical properties is yet attempted, standardization and acceptability of nutraceutical recipes incorporated with medicinal plants was carried out in Phase III.

Thus a total of 67 commonly consumed recipes comprising 14 breakfast/dinner dishes, five chutneys, nine kuzhambu recipes, 13 poriyal recipes, 17 lunch recipes and nine snack recipes were identified in **phase I** elicited using a preference sheet was considered for the incorporation of the extract of selected medicinal plants.

A total of 335 (67X5 selected medicinal plants) nutraceutical recipes were developed by incorporating the fixed dosage of medicinal plant extracts namely [*Guava leaf* **(2.5gm)** *(Psidium guajava L.)*, Long Pepper fruit **(2g)** (*Piper longum L.),* Sirukurinjan leaf **(2gm)** (*Gymnema Sylvestre* (Retz.) R.Br.), Naval Seed **(2.5gm)** (*Syzygium cumini L.)* and Kandankathiri **(2g)** (*Solanum virginianum* L.)*].* The developed nutraceutical recipes were further classified, standardized and tested for their acceptability using a nine-point hedonic scale by a panel of 25 semi-trained members in comparison to the original recipe. The recipes that obtained a score between 35 and 45 were rated as highly acceptable, 25-34 as

acceptable and score below 25 as not acceptable (Annexure XI). The recipes which optained an acceptability score of 25 and above were considered for the development of nutraceutical recipes.

3.3.2. Calculation of nutrient content

The nutritive value of the standardized recipe for one portion was calculated using the software developed by the investigatore for the present study.

PHASE IV

4.4 Development and Evaluation of a Software *"Nutra Glyx"* on Nutraceutical Recipes Incorporated with Selected Medicinal Plants

A. Development of a software *"Nutra Glyx"* on nutraceutical recipes incorporated with selected medicinal plants

Information technology is recently proving to be an effective supplementary health care tool in the prevention and management of diseases as it can be used to educate and motivate patients particularly the diabetic to self-manage activities like monitoring of blood glucose, healthy eating practices, exercise, medication and diet planning. Software and database are currently used as one of the efficient aid in the health management system.

As the whole globe moves towards digitalization, diet and health care services is also becoming challenging to meet out the health quest of individuals.

Integrating the information technology and dietary management of lifestyle disorders at the doorsteps of every household will pave the way for a healthy society. Thus, the investigator developed a software ***"Nutra Glyx"*** on nutraceutical recipes incorporated with selected medicinal plants for diabetes mellitus using My SQL (Structured Query Language) program for backend programming and PHP (Hypertext Preprocessor) for front end programming. The advantages of working with **MySQL** is that the programme is secured and uses solid data security layers to protect sensitive data from outside access. Individual rights can be set to provide multiple user levels, allowing several people access to stored data. Similarly, **PHP** (Hypertext Preprocessor) is an open source **programming** language which is implemented on the server side, easy to

develop, ease to manage, cost effective and has good database flexibility. Thus the software *"**Nutra Glyx"*** was developed with six modules.

Module I : **"*Dia Edu*"-**Educates the user on causes, symptoms, onset and management of diabetes mellitus.

Module II : **"*Health Tracker"-***Tracts the height, weight, BMI, blood glucose level, blood pressure of the individual user/family/patients records.

Module III : "***Herba Treat***"- Projects the formatted standardized 335 nutraceutical recipes incorporate with the selected five medicinal plants with their nutrient content, preparation time, portion size, etc.

Module IV : "***Diet Planner***"- Enable the user to plan their daily diets based on their activity pattern.

Module V : **"*Exercise Zone*"-** Teaches the user on simple therapeutic yoga exercises, meditation with instructional videos.

Module VI : "***Glossary***"- Glossary and video on preparation techniques.

B. Evaluation of the software *"Nutra Glyx*

A demonstration of the software was shown to 20 female type II diabetic subjects and 10 practising dietitians using a checklist developed by the investigator. The adequacy and accuracy of information presented in the software, ease of use, adaptability of the software with special reference to health tracker, feasibility of preparing nutraceutical recipes, benefits of exercise zone and diet planner were scored using three point rating scale (very good, good, fair) and the observation were tabulated (Annexure XII).