CHAPTER II

Review of literature

The purpose of review of literature is to discover what is already known and what others have attempted to find out. Therefore, an intensive review of literature has been done from published and unpublished thesis and journals. For the purpose of systematic compilation, review of literature has been presented as follow:

Table 2: Review of Literatures undertaken in the study

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Section A: Literature related to life style modification in management of diabetes mellitus

A study to assess type 2 diabetic patients with inadequate glycaemic control on oral hypoglycemic agents (OHA), or a lifestyle intervention programme based on exercise and diet counseling (a) was as effective as insulin treatment in controlling blood glucose, and (b) could prevent the weight gain usually accompanying the introduction of insulin treatment. Thirty eight type 2 diabetic subjects were treated with Oral hypoglycemic agents. Study results showed that, there was no significant difference between the groups in the change observed between start and 12 months of treatment (P = 0.74). There was a significant difference in weight changes between groups (P<0.01). Hence it is concluded that Lifestyle intervention was as effective as insulin treatment in improving glycaemic control during the intervention year.\textsuperscript{23}

A study was conducted on short term impact of a brief lifestyle intervention based on yoga on some of the biochemical indicators of risk for cardiovascular disease and diabetes mellitus. The variables of interest were measured at the beginning (day 1) and end (day 10) of the intervention, using a pre post design. 98 subjects were included in the study (67 males, 31 females), ages 20 – 74 years. The subjects were a heterogeneous group of patients with hypertension, coronary artery disease, diabetes mellitus and a variety of other illness. The intervention consisted of asanas pranayama (breathing exercises), relaxation techniques, group support, individualized advice, lectures and films on the philosophy of yoga and the place of yoga in daily life, meditation, stress management, nutrition and knowledge about the illness. The outcome measures were
fasting plasma glucose and serum lipoprotein profile. These variables were determined in
fasting blood samples, taken on the first and last day of the course. Observations
suggested that a short lifestyle modification and stress management education programme
leads to favorable metabolic effects within a period of 9 days.\textsuperscript{24}

A study reviewed evidence from literature on life style type 2 diabetes, pertinent
to physical activity and diet and life style modification, to determine the relevance of this
evidence to clinical practice. Study results showed that direct evidence supports
intervention for physical activity and diet modification for primary prevention and
management of type 2 diabetes. It is evident that supporting patients to make changes in
their physical activity and dietary habits can prevent onset of type 2 diabetes and its
management translating this findings into effective recommendations for clinical
practice.\textsuperscript{25}

A study under taken to assess the effectiveness of community based nutrition
counseling and education programme on behavioral risk factors, weight and serum
biochemical parameters for arresting secondary complications in diabetic subject. Result
of the study showed a significant reduction in fasting blood sugar, triglycerides, total
cholesterol. Thus community based health education programme, if effectively
conducted, will result in better control of diabetes and its complications. Life style related
risk factors play an important role. This is evident from increasing incidence of various
secondary complications in diabetes. Some of these risk factors like dietary choices,
smoking, alcohol consumption, over weight and sedentary life style are modifiable.
Studies have shown that these factors if effectively controlled, can lead to reduction in
the risk of developing further complications.\textsuperscript{22}
Life style modification can be a very effective way to keep diabetes in control. Improved blood glucose control can slow the progression of long term complications. Multiple small changes can lead improvements in diabetes control, including a decreased need for medication.  

A study was done to evaluate the efficacy of patient centered care on type 2 diabetes mellitus. Their fasting plasma glucose (FPG), hemoglobin Alc (HbAlc), eating and exercise behavior, compliance, symptoms of diabetes as well as satisfaction were compared before and after the intervention. The quasi experimental design (controlled before and after intervention) was conducted among 78 patients with type 2 diabetes mellitus, there were 53 females (67.9%) and 25 males (32.1%). Average age was 57.2 years. Diabetes duration was 6.75 ± 5.45 years. Mean FPG of overall subjects decreased 43.07 ± 76.32 mg/dL. About 16.44 per cent had FPG below 126 mg/dL. 55.13 per cent retained the same hypoglycemic medications, 10.5% had decreased dosage. Amongst 33 subjects (42.3%) who completed the programme, FPG decreased dosage. Amongst 33 subjects (42.3%) who completed the programme, FPG decreased 73.58 mg/dl (P<0.000) and exercise behavior (P<0.05) were better. Symptoms of diabetes were improved. Patients’ satisfaction indicated that they had a better understanding of the disease and illness. They were eager to share their experiences with others and able to develop a relationship with the health care team. Amongst 45 patients (57.7%) who partially followed the programme, FPG decreased 39.55 mg/dl (P=0.001). Glycemic control of type 2 diabetes subjects was improved by patient centered care. Eating and exercise behavior, compliance, symptoms of diabetes were better improved not only by the
biological indicators but also by behavior. The present study provides a beneficial impact on improving the health status of type 2 diabetes. 26

A study opinioned that life style modification aimed at reducing energy intake and increasing physical activity is the principal therapy for patients with type 2 diabetes even moderate weight loss in combination with increased activity can improve insulin sensitivity and glycemic control in patient with type 2 diabetes. The American diabetes association the North American association for the study of obesity, and the American society for clinical nutrition have joined together to issue this statement on the use of life style modification in the prevention and management of type 2 diabetes. 15

A research study reviewed the evidence from recent randomized clinical trials for benefit of life style modification in diabetes care. The Finnish diabetes prevention study and diabetes management programme in the USA, both demonstrated that life style change can significantly reduce the risk or life style changes can translate into significant risk reduction. Societies cannot afford to ignore the evidence of health benefit associated with physical activity and healthy weight in favor of medicating when morbidities develop. They come to the conclusion that, for a successful public health approach to chronic disease prevention, one cannot rely completely on pharmaceuticals, but must implement environmental change and a healthy lifestyle. 27

A Finnish study to prove the “Life style changes can reduce the risk of diabetes”, was undertaken. Researcher randomized 522 middle aged samples, overweight men and women with impaired glucose tolerance were randomly allocated to one of two groups. The intervention group received intensive diet and exercise training with the goal of reducing body weight by 5% reducing total fat to 30% and saturated fat to 10% of
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calorie intake, increasing fiber intake to 15 grams per 1000 Kcal, and exercising at least 30 minute each day. The control group received only printed information on diet and exercise, researcher assessed weight and blood glucose levels several times during the study. At the end of one year, those in intervention group lost average 4.2 kg weight, compared with an average weight loss of 0.8 kg of those in the control group. The intervention group also showed a significant reduction in waist circumference and fasting plasma glucose concentration. This study suggested that even small changes in the lifestyle can have a significant change on the health of diabetics. 28

Researchers studied to describe two lifestyle prevention strategies tested in first degree relatives of patient with type 2 diabetes and to present the short term effects of these strategies in nutrient intake, physical activity pattern and body weight in the 16 weeks controlled intervention trial. Subjects were assigned to one of three treatment condition, diet group (D) (n = 25), diet and exercise group (DE) (n= 30), and control group (c) (n=22). Men and women age 25 to 55 years, Non diabetic relatives of individuals with diabetes were recruited (n=77), Intervention groups received group counseling on two occasions and follow-up through unannounced telephone interviews every 10 days. Counseling regarding diet and physical activity was based on the Nordic nutrition recommendations. Compared with the control group both intervention groups decreased intake of saturated fatty acids (percent of energy), increased intake of dietary fiber and reduced average glycemic index of the diet. Study revealed that healthy individuals with heredity type 2 diabetes can achieve desired changes in lifestyle factors associated with increased risk for the disease. 29
Ecological and migration studies indicated that a western lifestyle is associated with a higher prevalence of type 2 diabetes was conducted. In recent years there has been a rapid accumulation of data on lifestyle on prevention of type 2 diabetes and risk for developing its complications. Studies also done on an individual level for the effect of different lifestyle factors and discussed various methodological approaches. Randomized intervention studies have shown that changes in diet and physical activity can protect against type 2 diabetes and its complications.

Effectiveness of a lifestyle intervention programme on glucose tolerance in Dutch subjects with impaired glucose tolerance (IGT) was undertaken. A total of 102 subjects were selected and randomized into two groups. Subjects in the intervention group received regular dietary advice and were stimulated to lose weight and to increase their physical activity. The control group received only brief information about the beneficial effects of a healthy diet and increased physical activity. Body weight loss after 1 year was higher in the intervention group. The 2h blood glucose concentration decreased 0.8 ± 0.3 mmol/l in the intervention group and increased 0.2 ± 0.3 mmol/l in the control group (P<0.05). Body weight loss and increased physical fitness were the most important determinants of improved glucose tolerance and insulin sensitivity. Study suggested that lifestyle intervention programme according to general recommendations is effective and induces beneficial changes in lifestyle, which improve glucose tolerance in subjects with IGT. Body weight loss and increased physical fitness were the most important determinants of improved glucose tolerance and insulin sensitivity.30

Researchers studied on exercise and improved diet is known to be beneficial in the management of type 2 diabetes mellitus. Study Hypothesized that a lifestyle
modification programme involving residential visits would result in beneficial effects on glycemic control and lipid profile. Three hundred and four individuals with type 2 diabetes participated in a lifestyle modification programme, involving three residential visits spaced over 31 weeks. The subjects were all referred for treatment following repeated failure to achieve metabolic control in primary care settings. Clinical parameters were determined at each visit. After completion of the programme, subjects showed significant improvements in glycemic control (P<0.0001). Oxygen uptake was significantly improved (P<0.0001) and blood pressure (P<0.0001), body mass index (P<0.0001) and serum cholesterol (P<0.001) was significantly reduced, while HDL cholesterol (P<0.05) was significantly increased. There were no changes in LDL cholesterol values. Subjects also reported increased well being and reduced stress. In conclusion a 31 week lifestyle modification programme resulted in marked improvements in glycemic control, blood pressure and well being in subjects with type 2 diabetes. Thus, this type of lifestyle modification programme is a powerful treatment option to reduce risk factors associated with diabetes and diabetic complications, even in patients who have not responded to conventional diabetic therapy.  

A study was conducted on life style modification reduces the incidence of diabetes. Study randomly assigned 522 (172 men, 350 women) middle aged (mean age 55 years), overweight (mean body mass index 31 kg/m(2)) subjects with impaired glucose tolerance either to the lifestyle intervention or control group. Each subject in the intervention group received individualized counseling aimed at reducing weight and intake of total and saturated fat, and increasing intake of fiber and physical activity. An oral glucose tolerance test was performed annually to detect incident cases of diabetes
and to measure changes in metabolic parameters. The risk of diabetes was reduced by 58 per cent (P<0.001) in the intervention group compared with the control group. The study concluded that reduction in the incidence of diabetes was directly associated with number and magnitude of lifestyle changes made. 32

Life style changes effective in protecting type 2 diabetes risks, changing to a healthier life style appears to be at least as effective as taking prescription drugs in reducing the risk of developing type 2 diabetes complications. Type 2 diabetes is a growing problem in England. Researchers from Leicester reviewed studies which measured the effect of different intervention life style changes, diabetes drugs on people with diabetes type 2 (people with diabetes type 2 have a high risk of developing complications). They found that life style changes e.g. switching to a healthier diet and increasing exercise to be at least as effective as taking prescription drugs. However, the researchers say that both life style changes and prescription drug taking must be sustained in order to prevent the development of type 2 diabetes related complications. 17

A multi year study on Lifestyle modifications that may affect the development of diabetes and prevent complications was done. The ultimate goal is to determine whether long term lifestyle intervention can improve glycemic control and prevent complications in patients with type 2 diabetes. This initial report on this multi year study describes protocols and the analysis of baseline data and three year interim results. The study enrolled 2205 patients with previously diagnosed type 2 diabetes. The lifestyle modification programme included intensive lifestyle management at each outpatient clinic. The intervention group received educational materials concerning the importance of lifestyle and behavioral changes. Small but significant differences in HbA1c levels
between the intervention (INT) and conventional (Con) therapy groups appeared as early as two years after the start of intervention and were maintained in the third year. The effect of lifestyle modification on improving the glycemic control of patients with established type 2 diabetes mellitus was significant in these three years after initiation of the intervention.33

A study done in impaired glucose tolerance of males by intensive lifestyle intervention designed to achieve and maintain ideal body weight and was assessed from health screening; examinees were randomly assigned in 4:1 ratio to standard intervention group (control group) and intensive intervention group (intervention group). Total of 356 respectively the subject in both group were advised to maintain ideal body weight, by diet and exercise. In intervention group detailed instruction on lifestyle were repeated every 3-4 months during hospital visit. The cumulative 4 years incidence of diabetes was 9.3% in control group versus 3.0% in intervention group. In conclusion life style intervention can be effectively conducted in an out patient clinic setting.28

A study demonstrated the advantages of behavior modifying education in the metabolic profile of the type 2 diabetes mellitus patient. A quasi experimental study was performed with a control group. The experimental group was made up of 25 type 2 diabetic patients and the control group consisted of 24. The type of education carried out was a behavior modification. Baseline measurement and subsequent monthly measurements of serum glucose, total cholesterol and triglycerides were carried out during 9 months after the intervention. The groups were controlled according to age and sex. The statistical analysis was performed to determine the difference. The experimental group in comparison with the control group in the measurement after the intervention
Achieved a mean difference in serum glucose of 64.2 mg/dl (P=0.001), in the cholesterol of 31.6 (P=0.008), and in the triglycerides of 50.8 (P=0.006). The study concluded stating that behavior modifying education is a better option than traditional intervention for metabolic control in type 2 diabetes mellitus.  

SECTION B: Literature related to diabetes life style educational programme

A study to evaluate the efficacy of lifestyle education for preventing type 2 diabetes and its complications in individuals at high risk by meta analysis of randomized controlled trials was undertaken by YamaokaK & Tango Through an electronic search, 123 studies were identified. A literature search identified eight studies that met strict inclusion criterion of Meta analysis for 2 – h plasma glucose and five studies for the incidence of diabetes. Subjects were adults diagnosed as being at high risk for type 2 diabetes. The difference in mean reduction of 2 hour plasma glucose from baseline to the 1 year follow up and relative risk (RR) of the incidence of diabetes in the lifestyle education group versus the control group were assessed. Overall estimates were calculated using a random effects model. Lifestyle education intervention reduced 2h plasma glucose by 0.84 mmol/l compared with the control group. The 1 year incidence of diabetes was reduced by approximately 50 per cent compared with the control group. Results were stable and little changed. Data were analyzed by subgroups or other statistical models. Funnel plots revealed no selection bias. Lifestyle education was effective for reducing both 2h plasma glucose and RR in high risk individuals and a useful tool in preventing diabetes.  

A study to evaluate the effect of a structured teaching programme on metabolic control of non insulin dependent type 2 diabetic patients was done. The programme was
aimed at improving over all treatment quality through measures involving self care, diet, exercise and weight reductions. Theoretical practical teaching was given to 5-8 groups to previously train by general practitioners. The result strongly suggested that education through health personnel constitute efficient tools to improve compliance and metabolic control of type 2 patients.36

Herpertz et al reported that Diabetes constitutes a global public health problem. Today about 135 million people are affected and it is estimated that the number in 2025 will be 300 million. The aim is to raise awareness among nurses, nurse educators and nursing students of the global epidemic of diabetes mellitus, its multiple underlying causes, especially social ones. A further aim is to discuss the implications for future curriculum content in nurse education programmes in lifestyle from a traditional healthy and active life to a modern, sedentary, stressful life and over consumption of energy dense foods. This process, labeled coca colonization, is evident all over the world, although more so in developing countries. Diabetes mellitus needs to be treated with a holistic approach through dietary adjustment, exercise, medication (if needed), education and self care measures. Type 2 diabetes mellitus is a preventable disease. The main implication for nurses and nursing curricula is to change the focus from the individual with diabetes mellitus and management to prevent deterioration of health to population based community intervention programmes. These need to focus on health promoting activities to raise awareness among healthy people of the risk factors for diabetes mellitus. Nurses all over the world have an important role in fighting the diabetic pandemic by health promotion aimed to keep people healthy as long as possible.37
The efficiency of an educational programme based on behavior modification to enhance weight loss and changes of other cardiovascular risk factors. In this study followed prospectively, 46 obese, type 2 diabetic patients for a 55 week period, in order no patient received pharmacological treatment during the study. At the end of the follow up the patients obtained an average weight loss of 9.250 kg; the BMI was reduced from 34.2 to 30.6 (P<0.01) fasting serum glucose descended from 7.9 to 6.1 mm (P<0.05); SBP (systolic blood pressure) decreased from 145.7 to 126.4 mmHg (PM0.01); DBP (diastolic blood pressure) decreased from 83.5 to 65 mmHg (P<0.01); triglyceride levels were lowered from 164.5 to 109.7 mg/dl (P<0.01); HDL – cholesterol levels increased from 1.27 to 1.53 mm (P<0.01), serum glucose 2 h after a 75g glucose oral load decreased from 14.9 to 12.7 mm (P<0.05) on week 35 of follow up.38

A study to compare traditional individual diabetes care with a model in which routine follow up is managed by interactive group visits while individual consultations are reserved for emerging medical problems and yearly checks for complications was undertaken. A randomized controlled clinical trial of 56 patients with non-insulin treated type 2 diabetes managed by systemic group education and 56 control patients managed by individual consultations and education. Observation times were 51.2 ± 2.1 months for group care and 51.2±1.8 for control subjects. Glycated hemoglobin increased in the control group but not in the group of patients. Over the study period, group care required 196 min and 756.54 US dollars per patient, compared with 150 min and 665.77 US dollars for the control patients, resulting in an additional 2.12. US dollars spent per point gained in the quality of life score. Study revealed that Group care by systemic education is feasible in an ordinary diabetes clinic and cost effective in preventing the deterioration
of metabolic control and quality of life in type 2 diabetes without increasing pharmacological treatment.  

An educational programme in 10 Latin American countries to evaluate its effect on the clinical, biochemical and therapeutic aspects as well as the economic cost of diabetes was studied. Educators from each participating country were previously trained to implement the educational model. The patient population included 446 individuals with type 2 diabetes; all patients were <65 years of age, did not require insulin for metabolic control, did not have severe complications of diabetes or life limiting illnesses, and had not previously participated in diabetes education courses. Clinical and therapeutic data and the cost of their pharmacological treatment were collected 6 months before participating in the educational programme. On entry into the programme all parameters measured had improved significantly (P<0.001) by 1 year: fasting blood glucose (mean ± SD) 10.6±3.5 vs. 8.7±3.0 mmol/l; HbA1c 9.0±2.0 vs. 7.8 ± 1.6 per cent; body weight 84.6 ± 14.7 vs. 81.2 ± 15.2 kg; systolic blood pressure 149.6 ± 33.6 vs. 142.9 ± 18.8 mmHg; total cholesterol 6.1± 1.1 vs. 5.4 ± 1.0 mmol/l; and triglycerides 2.7 ± 1.8 vs. 2.1±1.2 mmol/l. At 12 months the decrease in pharmacotherapy required for control of diabetes, hypertension and hyperlipidemia represented a 62 per cent decrease in the annual cost of treatment ($ 107,939.99 vs. $ 41,106.30 (US)). After deducting the additional cost of glycosuria monitoring ($30,604), there was still a 34 per cent annual savings. The beneficial results of this educational model, implemented in 10 Latin American countries, reinforced the value of patient education as an essential part of diabetes care. They also suggested that an educational approach promoting healthy lifestyle habits and patient education as an essential part of diabetes care and an
educational approach promoting healthy lifestyle habits and patient empowerment is an effective strategy with the potential to decrease the development of complications.\textsuperscript{40}

The efficacy and ease of administration of education/behavior modification classes, provided by a nurse and a dietitian in a primary care clinic for improving control of type 2 diabetes mellitus was determined. Patients were divided randomly into two groups. Eighteen patients completed 6 months of structured, office based classes and 20 similar patients served as control subjects. All were patients of the same group practice and had their usual office visits. Glycemic control, lipid levels, body weight, knowledge about diabetes, medication requirements and symptoms were monitored during the 6 months, with follow up at 12 months. At the end of 6 months, the intervention group had significant reductions in mean fasting blood glucose, glycosylated hemoglobin, total cholesterol, and low density lipoprotein cholesterol (LDL-C) values. Their mean body weight was significantly reduced at 12 months and their knowledge of diabetes had improved. Control patients had significant improvement only in glycosylated hemoglobin and body weight at 6 months. Minimal physician time was required. The study suggested that the education/behavior modification programme was clinically worthwhile and it was easy to administer.\textsuperscript{41}

SECTION C: Literature related to diabetes and its knowledge

Knowledge and practice of a semi urban Omani population regarding diabetes was conducted. A total of 563 adult residents were interviewed using questionnaires for study. The percentages of correct responses to questions on diabetes meaning, classical symptoms and complications were 46.5\%, 57.0\% and 55.1\% respectively. Only
29.5%, 20.8% and 16.9% identified, obesity, physical inactivity and positive family history, respectively, as risk factors for diabetes. A higher level of education, a higher household income, and presence of family history of diabetes found to be positively associated with more knowledge. This study demonstrated that there is lack of awareness of major risk factors for diabetes mellitus. Study suggested that the level of education is the most significant predictor of knowledge regarding risk factors, complications and prevention of diabetes.42

A descriptive study conducted on 100, type 2 diabetes patients to assess the knowledge and attitude on self care activities by using interview schedule and Likert’s scale. The results showed that 48% of the patients had inadequate knowledge, 35% of the patients had moderately adequate knowledge and 17% of the patients had adequate knowledge. Regarding attitude 72% of the patients had undesirable attitude, 16% of the patients had desirable attitude and 12% of the patients had most desirable attitude on self care activities. The researcher concluded that most of the patients were having inadequate knowledge and attitude about diabetes mellitus. So it is suggested that proper health education can improve the patient’s knowledge and attitude on self care activities.43

A study administered structured questionnaire on knowledge, belief and practices regarding diabetes to 199 subjects with diabetes (92.5% type 2 DM), attending the Aga Khan University Hospital, Karachi. Mean age was 53, Mean duration of diabetes was 7 years in men and 6 years in women. Men had a significantly better knowledge score than women (p= 0.02), there was no significant difference in the beliefs and practices scores.44
A cross sectional study on the relationship between diabetes knowledge and compliance among women diabetes patients was undertaken. The data was collected through structured self report interviews based on validated scales, assessing diabetes knowledge, compliance behavior and demographic data. The diabetes knowledge scale was used to sample knowledge of the basic physiology and general principles of diabetes care. The findings indicated that there was no association between knowledge and compliance. There was a difference between what the subjects were taught and what they were actually doing. Strategies were suggested to bridge the gap between knowledge and practice and increase patient’s motivation ability to comply with health regimen. 

A study to determine and compare the knowledge, beliefs and practice of diabetics receiving free medical care and those paid for medical care in Tamil Nadu, India was undertaken. A questionnaire was administered to elicit diabetic patients
knowledge regarding diet, exercise, adverse effects, habits and other matters. Their beliefs about diabetes and their practices regarding diet, medication and self monitoring of blood glucose results showed a large gap between knowledge and action in both groups. Study suggested a need for increased efforts towards patient’s education regarding diabetes mellitus.  

Research reported poor metabolic control in type 2 diabetic patients attending a primary care clinic in Trinidad. In an attempt to explain the poor metabolic control, they studied the primary care patient’s theoretical knowledge of diabetes control and risk factors. 254 Diabetic patients are recruited consecutively. Although the majority of the patients (81%) were unaware that cigarette smoking is a diabetes risk factor, a majority were aware that obesity (66%), physical inactivity (74 %) and being a relative of a diabetes patient (79 %), constitute diabetes risk factors. Again, the majority of the patients were aware that healthy diet (95%), exercise (95%) and weight loss (87%) are beneficial in diabetes control. While media (49%) was the commonest source of diabetes information, doctors and nurses were consulted by (40%) and 11 % of patients respectively. Study suggested the need for immense health education in the community regarding the risk factors of diabetes. 

A literature review of community based intervention intended to prevent or delay type 2diabetes, based on recently published findings about the potential to prevent or delay type 2diabetes with intensive life style interventions was conducted. The search revealed 16 published interventions, 8 of which were conducted in the U.S. and involved populations disproportionately burdened by diabetes (e.g., American Indians, Native
Hawaiians, Mexican Americans, and Africa Americans). Of the studies reporting results among youth there were post-test improvement in intervention groups in knowledge, preventive behaviour and self esteem. Among studies reporting results among adults, most reported improvements in intervention groups in knowledge or adoption of regular physical activity. Conclusion of the study stated that, there is a critical need to conduct and publish reports on well designed community based diabetes prevention research and share information on the process, result and lessons learned, armed with recent positive findings about diabetes prevention and literature documenting community based efforts, advocates at Local, State and National levels can collaborate to stem the rising tide of diabetes in community.\textsuperscript{49}

A survey to determine the demand for health education among patients by means of evaluating the level of their knowledge was done. The survey showed that 54\% of the subjects not able to explain the mechanism of diabetes, while 39.2\% of the patients do not know the nature of type 2 diabetes. The survey results indicated the need for the increasing accessibility and intensity of the educational activities in diabetes health care.\textsuperscript{50}

**SECTION D: Literature related to monitoring blood glucose level**

A study to evaluate the efficacy of monitoring blood glucose levels among patients with diabetes was undertaken. By Ezaki O. by five trials of blood glucose monitoring of 6 months duration yielded a polled effect estimate of a decrease in blood glucose level. Study concluded stating that
most blood glucose monitoring produces a statistical significant but clinically modest effect in controlling blood glucose level, in patients with diabetes mellitus.\textsuperscript{51}

A study was conducted with the aim of clarifying and redefining the concept of monitoring of blood glucose level in type 2 diabetes mellitus patients, which includes consideration of patients subjective experience and cultural context. Rodgers Evolutionary method was used. The Pub Med, CINAHL, Psyc INFO, and Cochrane data base of systematic reviews were searched for the years 2002-2000. Results revealed that monitoring blood glucose level in type 2 diabetes mellitus was composed of three attributes. 1. Awareness. 2. Interpretation 3. Responses, this attributes contributes to the patient’s particulars manifestations of type2 diabetes mellitus. The findings indicated that considering a patients subjective life experiences and individual cultural contexts may be important while monitoring blood glucose level. This concept analysis will be useful for researchers and health care providers seeking to understand the role, while monitoring blood glucose level.\textsuperscript{51}

A study to explore the pros and cons of glucose monitoring from the patients perspective was undertaken. 40 patients with type 2 diabetes were selected for the study. The study revealed that glucose monitoring can lighten patients awareness of the impact of life style. Glucose monitoring amplifies a sense of success, or failure about self management and often results in anxiety and self blame if glucose reading remains consistently high. Their analysis highlighted the importance of understanding and monitoring of blood glucose level.\textsuperscript{52}
A study was undertaken to investigate effectiveness and safety of real time blood glucose monitoring in patients with type 2 diabetes mellitus. Open label cross over, randomized study was used among 31 type 2 diabetes patients. Primary outcome was time in euglycemia; secondary outcomes included time in other glucose ranges, incidence of adverse events and patients satisfaction. Glucose monitoring was assessed. Results revealed that there were no serious adverse events. Patient satisfaction was good, median, relative, absolute difference of blood glucose level. Conclusion of the study stated that short term use of glucose monitoring was safe with good care of diabetics. Study suggested conducting the perceptions of patients and educators match in further studies.  

A cross sectional study Danish- British multi-center survey of 1076 patients with diabetes mellitus was undertaken. The variables were test frequency and motive. Glucose monitoring was performed daily by 39% of the patients and less than weekly by 24% and 67% reported to perform routine testing while the remaining 33 % only tested when hypo or hyperglycemia was suspected. Age, gender and level of diabetes related concern were associated with test pattern. Reported frequencies of mild and severe hypoglycemia and awareness of hypoglycemia were independently associated with testing behavior. Conclusion of the study was patient’s compliance regarding continuous blood glucose monitoring is thus limited. Almost two thirds of the patients do not perform daily blood glucose monitoring and one third do not perform routine tests. 

A study was undertaken to investigate patients perception of diabetes status related to glucose monitoring. Cross sectional method was used for the study. Among 1561 patients 30 years or older who filled at least two prescriptions for any glucose lowering drug between 2003- 2004, In Netherland. Using 30 items self administered
questionnaire, data on self monitoring behavior, perceived diabetes status and disease severity were gathered. Study result shown that practicing glucose monitoring was more common among patients who rated their diabetes status as poorly or moderately controlled, compared to those who rated it very well controlled. A better perceived diabetes status was more likely in those who performed blood sugar tests frequently. Researcher concluded the study stating that, among type 2 diabetes mellitus patients blood glucose monitoring behavior is associated with patients perception of diabetes status, irrespective of the self reported disease severity. 55

A study conducted in Italy recommended that monitoring of blood glucose before, during and after physical exercise can reduce the incidence of mortality rates in the general population as well as subjects with diabetes. In diabetes subjects who were treated with insulin/oral hypoglycemic drugs, exercise may result in complications leading to hypoglycemia, hyperglycemia and possible ketoacidosis. Both complications may also occur several hours after exercise. Thus, supervised exercise training associated with blood glucose monitoring is an effective and safe intervention to decrease blood glucose levels in type 2 diabetic subjects. 56

SECTION E: Literature related to diabetes diet.

A study investigated to know whether glycemic and lipid control in patients with type 2 diabetes can be significantly improved using a low-fat, vegetarian diet in the absence of recommendations regarding exercise or other lifestyle changes. Eleven subjects with type 2 diabetes were recruited from the Georgetown University Medical
Centre and the local community was randomly assigned a low fat vegetarian diet or a conventional low fat diet (four subjects). Although the sample was intentionally small in accordance with pilot study design, the 28 per cent mean reduction in fasting serum glucose of the experimental group, from 10.7 to 7.75 mmol/L (195 to 141 mg/dl), was significantly greater than the 12 per cent decrease, from 9.86 to 8.64 mmol/L (179 to 157 mg/dl), for the control group (P<0.05). The mean weight loss was 7.2 kg in the experimental group, compared to 3.8 kg for the control group (P<0.005). Differences between the diet groups in the reductions of serum cholesterol and 24 h microalbuminuria did not reach statistical significance. However, high density lipoprotein concentration fell more sharply (0.20 mmol/L) in the experimental group than in the control group (0.02 mmol/L) (P<0.05). Study concluded stating that the use of a low fat, vegetarian diet in patients with type 2 was associated with significant reductions in fasting serum glucose concentration and body weight in the absence of recommendations for exercise. 57

A study on diabetes education programme, have been designed specifically for older adults. This study evaluated the impact of nutrition intervention on blood glucose and lipoprotein levels of adult > 65 years of age without functional limitations. 98 people were randomized to the experimental group and for control group. A pre-test-post-test control group design was used to evaluate the intervention. 92 people (94%) completed the study. Participants exceeded the guidelines for optimal glycemic control at the pre-test. The experimental group had greater improvement in fasting plasma glucose (p=0.05) and glycated hemoglobin (p<0.01) than the control group. Study concluded stating that older adults with diabetes need additional education to achieve metabolic control.
Study suggested that nutrition education can improve metabolic control. Improved metabolic outcomes reduce the morbidity and mortality associated with diabetes.\(^{58}\)

A study to identify factors that contribute to the barrier to dietary adherence in individuals with diabetes, and strategies to overcome this barrier. A ten item open ended telephone questionnaire was used to obtain information. The sample included 75 registered dietitians who participated in a previous survey to identify barriers and agreed to follow up telephone interview of the 75 participants. At the conclusion factors identified as the greatest contributors to the barriers being evaluated included lack of time, lack of symptoms, lack of education, poor self esteem, lack of empowerment and misinformation from family, peer group and others with diabetes. The primary recommendation made for overcoming each of these barriers included individualizing meal plans and planning ahead, teaching about complications and setting obtainable goals. The registered dietitians who were surveyed emphasized the importance of individualizing dietary counseling.\(^{59}\)

A study in lifestyle laboratory and metabolic measures at the general clinical center on reduction in risk factors for type 2 diabetes mellitus in response to a low sugar and high fiber intake among 54 overweight Latino adults (25-35 years). Results show that those who decreased added sugar intake had an improvement in glucose level, those who increased fiber intake had an improvement in body mass index and visceral adipose tissue. The study concluded that individuals who reduced added sugar, increased fiber intake by the equivalent of a cup of beans showed decrease in glucose level and body weight.\(^{60}\)
A study to assess the effectiveness of weight loss more quickly with low carbohydrate diets with usual dieting obese patients with type 2 diabetes was undertaken. Ten volunteers with type 2 diabetes, who were very obese were taken for study purpose. For the first 7 days, patients were at their usual diet, for next 14 days, they followed a low carbohydrate diet. The study results showed that patients lost 1.65 kg after 14 days. Blood sugar and cholesterol level improved during the low carbohydrate diet. The researcher suggests that, reduced calorie intake seems to account for weight loss associated during the first 2 weeks of low carbohydrate diet.  

Researcher had the opinion that in spite of the importance of diet in the management of diabetes mellitus (DM), diabetics are often unaware of its place in ensuring good glycaemic control. Consequently, compliance and adherence with dietary advice remain poor among diabetics. The standard of practice of dietary therapy for DM among physicians is also low. To justify this they conducted the study to assess the dietary knowledge, practices and control of type 2 DM in Obafemi Awolowo University teaching hospital complex Nigeria. All selected 33 subjects had trunkal obesity and needed to lose weight. This was moderately severe in 60 per cent of subjects. About 52 percent who received significant higher mean knowledge scores, seemed to be associated with better dietary practices and better glycaemic control. Study found that overall, dietary practices improved significantly following diagnosis and counseling. A significant proportion of subjects increased their use of food with low glycaemic index following diagnosis. The findings further emphasize the importance of structured dietary advice and dietary control in type 2 diabetes. Study recommended that in settings where
dieticians are scarce, physicians managing diabetic patients must be skilled in the dietary management of the condition and show commitment to it.  

A study found from the North Karelia Project, Finland study and Stanford five city project communities based intervention trials, emphasized the role of nutrition, counseling and health education programme in reducing or modifying the risk factors. As risk reduction requires changes in a given individual’s lifestyle, community action and ready access to support services, can lead to significant changes in behavior. Similarly, family support can greatly enhance patient compliance with life style changes and/or pharmacological therapy leading to greater changes in targeted risk factors.  

A study to assess the effects of type and frequency of different types of dietary advice. 1467 participants were included, dietary approaches assessed were low fat/high carbohydrate diet, high fat, low carbohydrate diets, low calorie (1000 Kcal per day) and very low calories (500Kcal per day) diets and modified fat diets, dietary advice plus exercise. The studies all measured weight and glycemic control. Other outcomes which were measured in these studies included mortality, blood pressure, serum cholesterol, serum triglycerides. The result suggested that adoption of dietary advice is a good way to promote better glycemic control.  

Prospective cohort studies and randomized clinical trials to demonstrate that, type 2 diabetes can be prevented largely through moderate diet and lifestyle modifications was studied. Excess adiposity is the most important risk factor for diabetes. Increasing physical activity and reducing sedentary behaviors such as, prolonged TV watching are important both for maintaining body weight and improving insulin sensitivity. There is increasing evidence that the quality of fat and carbohydrate plays a more important role
than does the quantity. Recent studies have also suggested a potential role for coffee, dairy, nuts, magnesium and calcium in preventing diabetes. Overall, a healthy diet, together with regular physical activity, maintenance of a healthy weight, moderate alcohol consumption and avoidance of sedentary behavior and smoking, could nearly eliminate type 2 diabetes.  

Life style changes that promote weight loss are the primary life style treatment for people with type 2 diabetes who are over weight was undertaken. Improving caloric balance, eating fewer calories than are used by the body, should be considered the primary goal of life style modification. Timing of the food intake consistent timing: people using anti hypoglycemic agents may find it easier to control their blood sugar levels when they eat approximately the same amount of carbohydrate at the same time each day.  

Above study by close E.J and Wills emphasized the improving caloric balance eating fewer calories should be considered to control their blood sugar level, eat same amount of carbohydrate at same time each day. Another study by Fritz T.7 Wondel assesses the effect of type and frequency of different types of dietary advice. The result suggested that adoption of dietary advice is a good way to promote better glycemic control. This study related to diabetes diet is effective

**SECTION F: Literature related to diabetes and exercise**

A study to assess the effect of exercise in type 2 diabetes mellitus was researched. Trials were identified through the Central Register of Controlled Trials. Fourteen randomized controlled trials comparing exercise, against no exercise in type 2 diabetes were identified involving 377 participants. Trials ranged from eight weeks to twelve months duration compared with the control. The exercise intervention significantly improved glycemic control as indicated by a decrease in glycated hemoglobin levels of 0.6 percent. This resulted in both statistically and clinically
significant changes. There was no significant difference between groups in whole body mass, probably due to an increase in fat free mass, with exercise intervention significantly increased insulin response and decreased plasma triglycerides. No significant difference was found between groups in quality of life. The analysis shows that exercise significantly improves glycemic control and reduces visceral adipose tissue and plasma triglycerides.66

A study was conducted on moderate aerobic exercise in type 2 diabetic patients. The purpose of the study was to determine long term cardiovascular autonomic adaptation to moderate endurance aerobic exercise, in people with type 2 diabetes. Testing was performed before and after 6 months with supervised progressive, aerobic training programme, twice weekly. Heart rate variability was assessed by autoregressive power spectral analysis. Study concluded stating that, a twice weekly, 6 month, moderate, aerobic exercise programme without a concommitant weight loss, is associated with significant improvement in cardiovascular autonomic function in type 2 diabetic individuals.67

A study investigated the effects of an 8 weeks programme of supervised exercise on glycemic control and cardio respiratory fitness in adolescents with NIDDM. The experimental group participated in supervised exercise programme in the hospital exercise area for 30 -45 minutes for 3 days a week, for 8 weeks. The control group received instructions regarding the importance of regular exercise including frequency, duration and recommended activities. But glucose and cholesterol were not supervised, and weight was checked before and after the exercise programme. There was a significant improvement in the experimental group though no statistical significant changes were seen in the control group. It implies that regular, supervised exercise programme helps to maintain the glycemic control.68
A study to prove that lifestyle interventions can prevent the deterioration of impaired glucose tolerance to manifest type 2 diabetes was undertaken. In the extended follow up of the Finnish diabetes prevention study assessed the extent to which the originally achieved lifestyle changes and risk reduction remain, after discontinuation of active counseling. Overweight, middle aged men (n=172) and women (n=350) with impaired glucose tolerance were randomly assigned to intensive lifestyle intervention or control group. During the total follow up the incidence of type 2 diabetes was 4.3 and 7.4 per 100 person years in the intervention and control group, respectively (long rank test \( P=0.0001 \)), indicating 43 per cent reduction in relative risk. The risk reduction was related to the success in achieving the intervention goals of weight loss, reduced intake of total saturated fat and increased intake of dietary fiber as well as increased physical activity. Beneficial lifestyle changes achieved by participants in the intervention group were maintained. Lifestyle intervention in people at high risk for type 2 diabetes resulted in sustained lifestyle changes and a reduction in diabetes incidence, which remained even after the individual lifestyle counseling, was stopped. Study suggested that physical activity and exercise are important components in the prevention of diabetes, in addition to lowering blood glucose; exercise improves insulin action, contributes to weight loss, and reduces several risk factors for cardiovascular disease. Physical activity reduces occurrence of diabetes long term complications. This suggests that regular physical activity has a protective role. This association has been shown in the diabetes prevention programme, in which physical activity in the form of walking for 30 minutes/ day on most days of the week was encouraged.\(^{32}\)
A study was designed to assess the effects of exercise training on patients with type 2 diabetes. Subjects (50 men, mean age 53.3 years) with type 2 diabetes were randomized into either a control group, in which they received conventional treatment only, or an exercise group, in which they received conventional treatment together with heart rate controlled endurance training twice a week, and supervised muscle strength training twice a week for 12 months. Study concluded that exercise training improves glucose control sensitivity in type 2 diabetes subjects in addition to increasing the exercise capacity and muscle strength and improving glucose control. Study suggested that these beneficial effects in reflector autonomic regulation and glucose control caused by exercise, may be associated with improved prognosis of type 2 diabetes patients.69

A research undertaken suggested that gentle aerobic exercise, which increases the heart rate for a sustained period of time, is often the best choice for diabetics. Aerobic exercise includes walking, cycling, swimming or rowing. Diabetics with well controlled blood glucose levels and no complications can usually participate in most any type of exercise.70

A study to evaluate the weight loss and exercise programme designed to improve diabetes management in older African – Americans was undertaken. Overweight African-Americans (n=64) ages 55 – 79 years with NIDDM were randomized to either an intervention or usual care at 0, 3 and 6 months of treatment. Significant net differences in the intervention versus usual care were observed for weight (-2.0 kg, P=0.006), physical activity and dietary intake of fat, saturated fat, cholesterol and nutrition knowledge at 3 months (all P<0.05), and for weight at 6 months (-2.4 kg; P=0.006) and mean HbAlc values at 3 and 6 months respectively, (-1.6 and -2.4%, both P<0.01). After the
adjustment for changes in weight and activity, the intervention participants were approximately twice as likely to have a one unit decrease in HbAlc value as those in usual care. Study resulted that the intervention programme was effective in improving glycemic and blood pressure control. The decrease in HbAlc values was generally independent of the relatively modest changes in dietary intake, weight and activity and may reflect indirect programme effects on other aspects of self care.  

After referring the studies world wide, researchers had the opinion that regular physical activity and exercise are important components in the prevention of diabetes. The association between increased levels of physical activity and a reduced occurrence of diabetes long term complications suggests that regular physical activity has a protective role. Sedentary lifestyles have been linked to 23 per cent of deaths from leading chronic diseases, including heart disease and diabetes. Given the epidemic nature of diabetes in the world during the 21st century, diabetes management through physical activity and structured exercise should be considered an adjunct to diabetes management. Understanding the beneficial effects of exercise, as well as the mechanism for adopting a physically active lifestyle, is important for the management of diabetes mellitus. Despite the well known benefits of exercise, patient education, paired with the implementation and promotion of safe and sustainable habits of physical activity for individuals with diabetes, is still inadequate. Although traditionally seen in middle aged and older people type 2 diabetes which is associated with obesity, poor diet and lack of exercise, it is now increasingly being diagnosed in children and young people who are overweight. Studies from around the world point to the usefulness of diet and exercise regimens in preventing onset of this illness.
Researchers expressed that during the past 50 years several studies have underlined the central role of physical exercise in the management of patients with both type 1 and type 2 diabetes mellitus. The numerous benefits described in normal individuals who practice regular exercise have also been demonstrated in patients with diabetes who obtained significant physical and psychological advantages for the care of the underlying disease. Even though adverse events may occur, exercise is still judged one of the most important components in the treatment of patients with diabetes. Thus, children, adolescents and young adults with diabetes, must be educated on the metabolic changes occurring during physical activity in order to be able to acquire the ability to individually modulate their diet and insulin therapy before and after exercise. Appropriate education may allow a proper and correct approach to physical exercise. 73

Researchers examined the various studies, with the objective of systematically evaluating the evidence for an association between physical activity of moderate intensity and risk of type 2 diabetes. The researchers searched EMBASE and Medline through March 2006 and examined reference lists of retrieved articles. He excluded the studies that did not assess physical activity of moderate intensity, had no information on study design, participant characteristics, or any assessment of physical activity. Outcomes and estimates of associations were extracted independently by two investigators who identified 10 prospective cohort studies of physical activity of moderate intensity and type 2 diabetes, including a total of 301,221 participants and 9,367 incident cases. Five of these studies specifically investigated the role of walking. The summary RR of type 2 diabetes was 0.69 for regular participation in physical activity of moderate intensity as compared with being sedentary. Similarly, the RR was 0.70 for regular walking as
compared with almost no walking. The associations remained significant after adjustment for BMI. Similar associations were observed in men and women in the US and Europe. These findings indicate that adherence to recommendations to participate in physical activities of moderate intensity such as brisk walking can substantially reduce the risk of type 2 diabetes. Although traditionally seen in middle aged and older people type 2 diabetes which is associated with obesity, poor diet and lack of exercise, is increasingly being diagnosed in children and young people who are overweight. Studies from around the world point to the usefulness of diet and exercise regimens in preventing onset of this illness. 74

SECTION G: Literature related to diabetes and foot care practice

A cross sectional study on knowledge and practice of foot care in Iranian people with type 2 diabetes, to determine the knowledge and practice of foot care in people with type 2 diabetes was undertaken. A questionnaire was completed by 148 patients with type 2 diabetes in Tehran, Iran. Knowledge score was calculated and current practice was determined. The knowledge score was 6.6 out of possible 16 illiterate patients who were the least knowledgeable. Lack of adequate knowledge includes the following 56% not aware of the effect of smoking on circulation to the feet, 60% failed to inspect their feet and 42 % did not know to trim their toenails and high risk practice including walking bare foot. The results of this study highlighted the patients inadequate knowledge of self care about their foot and lack of optimal foot care services. 75
Researchers had expressed that management of the diabetic foot ulcers are likely to occur in up to 25% of people with diabetes mellitus at some time in their life without adequate management. There is a high risk of infection, gangrene, amputation and death. Over 50% of major amputation in the UK happens to people with diabetes, and within three years of amputation 50% patients die. Diabetic foot ulcer need specific management and some of the principles of moist wound healing do not apply. Diabetic patients with foot ulcers benefit from accurate and prompt assessment, diagnosis, treatment, and long term follow up. In order to conserve the foot ensure that these complex wounds are treated.

Researcher reviewed 72 patients with new foot problems over a 14 months period. 66% had a previous ulcer and 44% required hospital admission for a mean duration of 1 month. Diabetic foot ulcer in Sweden accounts for 25% of all diabetic patients. Foot care is very important to reduce amputation and to reduce this menace knowledge on foot care has to be disseminated.

A study states that approximately 60,000 major lower extremity amputations are annually performed on diabetic clients in the United stated. Diabetic foot ulcer forms a major factor in 84% of these amputations and delay in treatment of ulcers leads to gangrene and amputations. To prevent foot ulcers the patients need repeated education on foot care.

A cross sectional study was conducted in an institute of endocrinology, Iran on 148 type 2 diabetes subjects. The aim of the study was to determine the knowledge and practice of foot care in people with type 2 diabetes. A questionnaire was administered to subjects to collect the data, and the results showed inadequate knowledge of self care
about their foot and lack of optimal podiatry services. Management of patient’s care regarding foot care services in diabetes patients is recommended. 79

Researchers have opined that foot ulceration and lower limb amputation are still common complications of diabetes. Diabetic peripheral neuropathy and peripheral vascular disease are the most important etiological factors, but there is a complex interplay between these abnormalities and a number of other contributory factors, such as altered foot pressures, limited joint mobility, glycemic control, ethnic background, and cardiovascular parameters. Identification of patients at high risk of ulceration is nevertheless simple, and education of such patients can achieve a major reduction in amputation and ulceration rates. 80

A study stated that diabetic foot ulcers are common. If treatment is delayed or is inappropriate, the lesions can become infected, resulting in gangrene and amputation. Physicians and clinics that perform aggressive therapy for these ulcers, provide revascularization when indicated, practice a team approach, suggest the use of therapeutic shoes, and repeatedly educate patients. Foot care has reduced their amputation rate by 50% or more. Goals of the United States department of health for the year 2000 include a 40% reduction in the amputation rate in patients with diabetes. This should be the goal of every one providing care for patients with diabetes. 77

Researchers after reviewing the copious literature had the opinion that diabetic ulcers are the most common foot injuries leading to lower extremity amputation. Family physicians have a pivotal role in the prevention or early diagnosis of diabetic foot complications. Management of the diabetic foot requires a thorough knowledge of the major risk factors for amputation, frequent routine evaluation and meticulous preventive
maintenance. The most common risk factors for ulcer formation include diabetic neuropathy, structural foot deformity and peripheral arterial occlusive disease. Patient education regarding foot hygiene, nail care and proper footwear is crucial to reducing the risk of an injury that can lead to ulcer formation. Adherence to a systematic regimen of diagnosis and classification can improve communication between family physicians and diabetes sub specialists, and facilitate appropriate treatment of complications.  

A study was conducted to investigate the prevalence and characteristics of foot problems in non-diabetic individuals compared with those in a diabetic population, in order to develop recommendations for preventive foot care in older people. A total of 308 patients aged 33 to 95 years with 183 had diabetes mellitus (DM) and 125 were without DM. Forty three per cent of subjects with diabetes had PN, 32 per cent had PVD, and 19 percent had both conditions. Eighteen per cent of subjects without diabetes had PN, 21 per cent had PVD and 6 per cent had both. The risk of foot abnormalities in those without DM increased with age (r=0.99, p=0.0002). Thirty eight percent of non-diabetic patients older than age 60 had one or more of these major risk factors. Ninety per cent of the subjects reported inappropriate foot care practices. Older individuals without DM are at high risk for foot related disease and should receive the same foot care screening, education and follow up as those with DM. Study revealed that older people who have PN, PVD or physical and psychosocial limitations may require referral to foot care specialists. 

Researchers reviewed the studies related to foot care and expressed that foot ulcers are a significant complication of diabetes mellitus and often precede lower extremity amputation. Mechanical stress resulting from joint deformity, limited joint
mobility, and poor foot care/footwear are important. It was shown that the recurrence of foot infection was common among Indian diabetic patients (52%). A lesser prevalence of peripheral vascular disease (13%) among Indians was noted when compared with those in Western countries (48%). Smoking increases the risk by reducing blood circulation in the legs and reducing sensation in the feet. Prompt and aggressive treatment of diabetic foot ulcers can often prevent exacerbation of the problem. Various Studies suggested that multidisciplinary management programmes that focus on prevention, education, regular foot examinations, aggressive intervention and optimal use of therapeutic footwear have demonstrated significant reductions in the history of lower extremity amputations.\textsuperscript{83}

Researchers expressed that among persons diagnosed as having diabetes mellitus, the prevalence of foot ulcers is 4 to 10 per cent, the annual population based incidence is 1.0 to 4.1 percent, and the lifetime incidence may be as high as 25 per cent. Prevention of diabetic foot ulcers begins with screening for loss of protective sensation, which is best accomplished in the primary care setting with a brief history and the Semmes–Weinstein monofilament. Studies all over proved that educating patients about proper foot care and periodic foot examination are effective interventions to prevent ulceration. Substantial evidence supports screening all patients with diabetes to identify those at risk for foot ulceration. These patients might benefit from certain prophylactic interventions, including patient education, prescription foot wear, intensive podiatric care and evaluation for surgical interventions.\textsuperscript{82}

A study was conducted on daily foot care and concluded that inspection can prevent the development of foot ulcers. This descriptive study of foot care practices involved a convenience sample of 61 adult men and women with type 1 or type 2
diabetes, 24 with existing foot ulcers and 37 without foot ulcers who resided in a rural areas of a southeastern state. Out of a possible score of 20, those with foot ulcers scored an average of 13.88 and those without ulcers averaged 13.57. These results reveal that those without foot ulcers have similar foot care practices to those with foot ulcers. This instrument is useful in assessing current foot care practices on a point-in-time basis. Study suggested that preventive practices must be stressed and reinforced so those without foot ulcers do not develop ulcers.  

A study suggested that a number of effective, low cost strategies are available to identify and treat the person at risk for diabetic foot ulcers and lower extremity amputation. These strategies must be more widely adopted by all diabetic care providers to maintain the integrity and function of the lower limb and thus improve the quality of life for people with diabetes.  

A study was conducted by a telephone survey of a random sample from this cohort was conducted to assess their foot care practices, barriers and perceptions of risk. Eight per cent of subjects reported a history of foot ulcers and 7 per cent a history of lower extremity amputation. Based on claims data, 30 per cent of subjects were at high risk for future foot complications. However, 50 per cent of those with claims indicating a high risk perceived themselves to be at low risk for future foot complications. Overall 20 per cent of subjects seldom checked their feet daily for sores or irritations. Among this group, 60 per cent felt that it was unimportant and 9 per cent reported they were limited by poor vision or physical problems. Findings suggested that strategies are needed to improve the delivery of preventive foot care services to older persons with diabetes.
A study explained that the objectives of diabetic foot screening are to identify foot problem, determine a foot risk category and management category for patients, and to instruct patients with diabetes and their families in proper foot care. The screening technique is simple and can be used in clinic settings or at the bedside. Incorporating foot care education into the foot screening process increases or reinforces patient’s knowledge of self care. Such knowledge empowers patients to join their healthcare teams to decrease the incidence of ulceration and amputation. 87

SECTION H: Literature related to diabetes and medication practice

A study suggested that, as type 2 diabetes mellitus affects 16 million people in the United States. To effectively monitor such clients in the home, a thorough knowledge of the medications used to control hyperglycemia is needed. Primary failure with monotherapy has been studied and found to occur within 6 years. Combinations of two drug classes now are used to control blood glucose levels. The home health care provider must be aware of the mechanism of action of the different classes of hypoglycemic agents to monitor treatment. 88

A study was conducted on effect of diabetes drug counseling by the pharmacist, and diabetic education. Randomized controlled trial was selected for the study. A total of 360 volunteers with type 2 DM patients were selected. Subjects were categorized into simple randomized 180 to control group and 180 to intervention group. Intervention categorized to 2 groups. One group received diabetes drug counseling, the other group received plus diabetic education. Both the groups were monitored for fasting plasma glucose and Hb A1c at 3-6 months. Glycemic levels in both groups were compared. After
6 months, mean fasting glucose and HbA1c decreased with the intervention group vs. Control group. The most favorable glycemic outcome was the group that received drug counseling and diabetes education. In conclusion, results showed that drug counseling has little beneficial effect on diabetes management outcome compared to the diabetes management education and drug counseling. Study recommended that, to improve glycemic control of type 2 diabetes mellitus diabetics must integrate self management in daily life, with wide a variety of education, drug taken behaviours and health care provider. Available communication produces improvement in patient management and is some what better when used in combination.89

A study suggested that dietary advice from health professionals can play a significant part in preventing and managing type 2 diabetes. Overweight and obesity are strongly associated with this condition and individually tailored advice on weight loss and maintaining an appropriate weight are useful, together with encouragement to take appropriate exercise. Current thinking about advantages of a healthy diet and lifestyle apply to people with type 2 diabetes.25

**SECTION I: Literature related to diabetes and recognizing complication**

A study explained the Type 2 diabetes mellitus and prevention of macro vascular complications. Most patients with type 2 diabetes will develop vascular complications. This may be micro vascular disease, such as nephropathy, retinopathy or poly neuropathy and also macro vascular disease, such as coronary heart disease, stroke or peripheral artery disease. Optimal control of elevated blood glucose levels will reduce the symptoms of hyperglycemia levels and help to prevent the development of complications. In
addition, treatment of hypertension and lipid disturbances has been shown to reduce the incidence and severity of vascular complications significantly. 90

A study explained that preventing vision loss due to diabetes relies on an intensive metabolic control of diabetes and elimination of coexisting risk factors for development of diabetic retinopathy and, on the other hand on carrying out a programme for early detection and treatment of diabetic retinopathy. Proper treatment of diabetes, expressed by good glycemic control, proper arterial pressure parameter and lipid concentration in blood, reduce the risk of heavy complications and extend life span and improve its quality. An ideal model of screening studies diabetic retinopathy is based on an annual examination of vision acuity in all diabetic patients, by an experienced ophthalmologist using precise methods for imaging eye fundus. The incidence of vision loss due to diabetes is significantly lower in the countries which introduced programs preventing retinopathy, than in those which do not have them. 91

A study expressed that the management of type 2 diabetes has been revolutionized over the last 3 to 5 years as a result of dramatic changes in our health care system, new clinical trial data, novel pharmacologic agents and a better understanding of appropriate methods for patient education regarding lifestyle issues. As a result, diabetes management has become much more heterogeneous, with dramatic differences in style and approach. Diabetes care has also become much more rewarding: The vast majority of patients can now achieve excellent glycemic control while leading full and unrestricted lives. The overall goal of diabetes management should be to provide an opportunity for patients to live out their normal life expectancies with minimal complications. 92

A study was conducted to assess the clinical features of coronary heart disease with concommitment diabetes mellitus. 243 type 2 diabetic patients were assessed and examined by coronagraph. Clinical and ECG observations were supplemented by measurement of total cholesterol and selective coronagraph. Patients of the study group more frequently consumed tobacco, alcohol, and had obesity. However after trials patients had a history of class II angina, circulatory insufficiency, and high
cholestrolemia and hypertension further deteriorating to coronary heart disease. Hence it is concluded that patients with diabetes are at higher risk of coronary heart disease.  

A study explained that the diabetes prevention programme (DPP) randomized trial has shown that a combined programme of weight loss, improvement of diet and increased physical exercise, lowers the risk of development of type 2 diabetes by 58%. Benefits have been found for metaphoric acarbose and troglitazone. Treatment with metaphoric was less effective than lifestyle modification resulting in an average reduction of risk for development of type 2 diabetes by 31 percent compared with placebo. Similarly, acarbose in the stop NIDDM trial reduced the risk of developing type 2 diabetes in patients with IGT by 25 percent. Remarkably, cardiovascular event rates, in particular myocardial infarction, were significantly reduced.

Above studies reveals that the management of type 2 diabetes has been revolutionized over the last 5 years as a result of dramatic changes in our health care system, new clinical trial data, oval pharmacological agents and better understanding of appropriate methods for patients education regarding life style issues as a result of many studies like Bijalani R. & Vempathi comprehensive life style education programme, improved blood glucose control can slow the progression of long term complication. Another study by Pruksariritonond study provides a beneficial impact in improving the health status of type 2 diabetics. Similar study by Ryan D H. Pharmacological agents versus life style intervention, evidence says that one can not rely completely on pharmacological agents but must implement environmental change and healthy life style. Another study by Finish researcher to prove the life style changes can reduce the risk of diabetes complication, study suggest even small changes in the life style can have a significant change of health of diabetes.

Another multi year study by Sone H. Katergiri on life style modification that may affect the development of diabetes and prevent complications. The intervention of life style modification response on improving the glycemic control of patients with established type 2 diabetes mellitus was significant thus above studies have been conducted in western countries, similar studies though have been conducted in Indian setting on life style modification not been focused on all the components by the nursing researcher. Thus the present study focusing on life style modification with related domains is vital and significant.