Chapter II
Review of Literature
Search Strategy used for review of literature:

The search strategy used for review of literature was designed and planned to retrieve published original articles, review articles, questionnaires etc. pertaining to quality of life (QoL) in DM, development and validation of health related QoL or any other related instruments used in diabetes, studies to evaluate knowledge of foot care, barriers to foot care. MEDLINE which is an electronic repository of biomedical literatures was looked for via PUBMED by using the medical subject heading (MeSH) terminologies namely “quality of life”, “diabetes mellitus”, “barriers”, “knowledge”, “diabetic foot”, “self-foot care”, “functional foot care”. We have also searched other electronic repositories like Scopus & Proqolid. A manual search was also made for few specific journals by browsing individual issues in the archives section. The journals are Diabetes Care (all issues since 1990 onwards), Diabetes, Diabetes Spectrum, Clinical Diabetes, DRCP (from 1985 to January 2007), New England Journal of Medicine (issues from 1990 onwards), Lancet Diabetes and Endocrinology (all issues since 1990 onwards), Diabetologia (from 1965 to January 2007) and the Diabetes Educator journal (from 1980 to January 2007). We have also used the names of the questionnaires which came up during the initial search as keywords for literature review.

Diabetes mellitus and its consequences:

Diabetes mellitus is a major and rapidly increasing health problem worldwide. Some 62.5 crores of individuals are projected to be affected by this deadly disease by the year 2040. India has the second highest number of diabetics aged between 20-79 years in the world. The diabetic population in India is presently estimated around 69.2 million and is anticipated to go up to 123.5 million by the year 2040, unless and until preventive actions are taken immediately.

Quality of life (QoL) in DM:

The awareness of assessing QoL as an outcome measure for diabetes care are becoming more and more popular amongst the medical fraternity. QoL is a dynamic concept having many aspects and assesses the psychological aspect of the individual. As stressed by Gujrati et al., QoL is highly subjective in nature and is primarily defined by “what the patient says it is”. In simple words, QoL is how an individual perceives their life to be, either good or bad. This aspect emphasizes the most important component of measuring QoL, which is to capture the person’s immanent valuation of their QoL and not what anyone else perceives it to be. Healthcare professionals including physicians and nurses may believe that because of the persistent relation
they share with patients, they know their patient very well and have a good understanding of the patient’s QoL. Nevertheless, such perceptions might be often misleading. Walker et al. had demonstrated that the QoL rated by diabetic nurses for a group of teenage patients were highly correlated with the patient’s glycemic status (measured in HBA1c) rather than the QoL rating of the patients. On the contrary, the QoL rating of the patients was somewhat weakly correlated with the patients’ HbA1c level. This shows that although good glycemic control with worse QoL, the nurses conversely associated good glycemic control with better QoL. This contradicting perception regarding QoL proves the fact that healthcare professionals are particularly more focused with clinical outcomes measured by biomedical tests, which are not at all a good indicator or substitute for the patients’ own perception on how DM affects their life.

While reviewing the literature, it was found to be over populated with questionnaires making claims to measure QoL which in fact are only measures of status of health and measures in reality the quality of health rather than QoL. It is quite believable that quality of health will hold some correlation with “how good or bad the individual feels their life to be” but QoL and quality of health cannot be considered as same entity.

Considering the facts mentioned vide-supra, we can thereby infer that efforts intended to achieve better health may have an adverse effect on QoL. Thereby, results could be highly misleading if health status and QoL are used interchangeably. The United Kingdom Diabetes Prospective Study (UKPDS) looked into the effects of intensive blood glucose control on macrovascular and microvascular complications in patients with T2DM. Investigators involved in this study desired to measure QoL, however due to unavailability of diabetes specific QoL in the late 1970s, the investigators used Euro QoL, which is basically a health measure. Consequently, when the UKPDS researchers published their results in 1990s, the health measure was misinterpreted as a measure of QoL. The researchers erroneously and over optimistically exacted that treatment intensification in patients with T2DM had no effect on the QoL, however the matter of the fact is that, the researchers had found no impact of treatment intensification on the perceived health of the patients.

Thereby, it is highly warranted that results of such particular studies conducted in the era when QoL measures were not available are to be deciphered with utmost care. A checklist to distinguish between health-related measure and QoL may be useful in such scenarios.
Presently, we have a plethora of validated measures of QoL and it becomes quite confusing for a research scholar to choose between different QoL measures. Moreover, QoL measures are available with condition specific items, instruments individualized to allow for the respondents to answer only those facets of life which are relevant to the individual, allowing them to rate the impact of disease on various aspects of their life as well as rate the importance of each facet for their QoL.

**Criteria and Parameters for Selection of a Questionnaire:**

There are certain pre-defined criteria which are believed to be very important in the evaluating quality of life instruments namely validity and reliability as mentioned below.

The reliability of an instrument is pertained with the secular stability for the instrument scores and, refers to internal consistency for multi-item instruments. The process of assessing reliability is a repeated measure of testing and retesting after deleting the particular item which has very poor correlation with the other items of the questionnaire. The reliability also evaluates the consistency of score across two different time points, with an assumption that there is no alteration happening in the underlying state of health.

The reliability of internal consistency is evaluated by adopting only one application program and assesses the inter item relationship or relation between all items and their power as well as utility to measure a single inherent domain of a function. A reliability estimates which is commonly used in applied science is known as Cronbach’s alpha method. The Cronbach’s alpha value should fall in the range 0.70 and 0.90 are usually recommended for instruments proposed for measuring a particular domain amongst groups and individuals respectively.

Validity measures whether an instrument appraises what it proposes to measure. Validity can be assessed by *qualitative means via testing of instrument subject matter* and by *quantitative means via a statistical method called factor analysis* in combination with principal component analysis and making comparisons with other inter-related variables. These two ways of measuring validity are qualitative weighs of adjudicating whether a particular instrument is worthy for the intended application.

Factor analysis and principal component analysis are statistical methods that provide empiric confirmation for the dimensionality as well as for the internal construct validity of an instrument. By this method we can find out how many dimensions the single instrument can measure or in other word how many constructs can be build-up from the instrument.
On the other hand, external construct validation method includes a comparative profile with the other instruments and relates the instrument scores with various clinical and socio-demographic variables. The results are then compared to select the most suitable instrument for our use.

Responsiveness is believed to be the measure of longitudinal construct validation process. Appraisal of responsiveness includes estimate of an effect size by proper statistical methods. Responsiveness usually concerns to an instrument’s inherent ability to find out change over a period of time. For evaluating the relative size of alteration; an absolute value of 0.1 is considered as small to middling and finally a change of 0.8 or more is considered as large.

**Bradley C (1999):** The audit of diabetes dependent QoL is one of the available questionnaires to assess QoL in DM patients. This questionnaire broadly covers two dimensions, one is current overall QoL and other is the QoL specific to diabetes. There are 19 domain specific items which are articulated to gauge the effect of DM on particular facets of life such as “freedom to eat”, “work life”, “family life” and self-confidence. This questionnaire is quite sensitive to treatment alterations impact on QoL quite dissimilar to the instruments designed to measure the health status rather than QoL. Another advantage of ADDQoL is that it is not influenced by co-morbid conditions which are not related to DM. It is based on the same philosophy as that of SEIQoL.

**Singh H and Bradley C (2006):** The ADDQoL-19 was evaluated in 210 Indian patients in Hindi and Punjabi language. The questionnaire found that self-confidence and family life to be severely affected in Indian DM patients. Both of these parameters were found to be more severely affected when compared with the UK population where the questionnaire was originally devised, validated and subsequently administered to the patients with DM for assessing their QoL.

**Polonsky WH et al (1995):** The Joslin Diabetes Center in collaboration with the Harvard Medical School has developed a 20-item questionnaire namely problem area in diabetes scale (PAID) scale. The PAID primarily measures only one factor that is diabetes related distress. The 20 items are designed to capture an array of emotional problems. These items were developed after a round of interviews with patients with diabetes as well as inputs from specialist HCPs practicing Diabetes. It takes less than five minutes to fill up the questionnaire. It is now available in nine languages.

**Hirsch A et al (2000):** The questionnaire namely quality of life with diabetes (LQD) is a seventeen- item scale developed from the questionnaire namely DQOL. It is developed from the
feedback of the patients. The LQD primarily covers the patients’ perception of satisfaction with their life as well as the burden of diabetes and its treatment. All the 17 items are answered on a five-point scale.

**Herschbach P et al (1997):** The QSD-R is a unique questionnaire in its own that is actually a revised version of the original QSD. Q stands for questionnaire, S stands for stress, D stands for diabetes and R stands for revised. Thus, we can infer that the questionnaire is designed primarily to evaluate the stresses due to psychological burden which are associated to problems faced by T2DM patients in their day to day living. The T2DM questionnaire has a total of 45 items. All of these items determine a total of 8 stress scale in patients with diabetes namely leisure period, depression/insecurity/fear with regards to their future, hypoglycemia, diet and treatment regimen, complaints associated to physical parameters, work-related, partner-related and finally relationship of patient with doctor.

**Duran G et al. (1995):** The original version of the (Questionnaire for stress in diabetes) QSD questionnaire has a total of ninety items which is double of the items included in the revised version namely, QSD-R. The ninety items were actually selected after extensive review of literature and interviews with patients and diabetes specialists Responders were inquired to point out if a particular circumstance had resulted stress in them, and if it is so, to grade the severity of stress on a Likert scale of five-point grading. The questionnaire takes somewhere from 15 to 20 minutes to complete.

**Carey MP et al (1991):** The appraisal of diabetes instrument was developed based on researches conducted previously and theoretical aspect of QoL. This instrument has a total of seven items. It was formulated to evaluate the patient’s assessment of his or her diabetes. All of the seven items make use of a five-point scale and assess parameters like control, doubtfulness, coping with various situations, effect of diabetes on goals of life, predictive opinion of diabetes and the extent of distress that is caused by diabetes. The ADS had also been used to measure the influence of different environments like family related environment and work-related environment on blood glucose control. Furthermore, it also aimed to evaluate how far the adult patients with diabetes has the element of psychosocial adaptability. It takes not more than 5 minutes of time to complete this questionnaire.

**Bradley C et al. (1999):** There is a similar instrument to measure QoL namely “audit of diabetes-dependent quality of life” which is also called as “ADDQoL” in abbreviated form. This
questionnaire has a total of 19 items. All the items are in Likert scale. All of the items were developed after examination of instruments that were in place. The items were further refined after thorough discussions with expert health professionals as well as interviews with patients with diabetes. The instrument was planned to assess patients’ individual perceptions with regards to the impingement of diabetes disease on their QoL. There was a total of nineteen QoL domains specific to diabetes that was primarily aimed to address physical, projected social and emotional functioning. Each of the items has a scoring option on a seven-point scale. To answer the items, the respondent had to indicate whether the particular item is very important, important, quite important, or not at all important. The instrument has been translated into more than 20 languages till date, even in Indian languages like Hindi and Punjabi.

Boyer JG et al. (1997): The questionnaire namely “diabetes-39” which also known as (D-39) in short is a 39-item scale. It was basically designed to evaluate the QoL of patients with diabetes. This questionnaire encompasses a total of five dimensions pertaining to health with regard to glycemic control of the diabetes subjects, energy and mobility of the patient, psychological parameters like anxiety and worry, social burden, and lastly sexual functioning. The questions were selected depending on the review of literature and after conducting thorough interactions with healthcare professionals in the field of diabetes mellitus. This questionnaire makes use of a visual analogue scale. This questionnaire had also been rewritten into more than two languages.

Fitzgerald JT et al. (1996): The diabetes care profile (DCP) questionnaire was developed with an aim to fulfill the deficiency of an instrument that can comprehensively appraise social and psychological factors related to the diabetes and its management. The questionnaire is one of its kinds in being a very comprehensive one and administers 234 items to the respondents. Thereby it is a challenging task in real life scenarios to administer this particular time-consuming questionnaire which needs approximately 30 to 40 minutes to complete. This questionnaire was deduced basically from the educational profile of diabetes and the models with regards to health belief, and so to a considerable degree bears on issues pertaining to knowledge regarding diabetes, beliefs regarding diabetes, and treatment of diabetes. However, there are six sub-questions in the DCP that evaluate diabetes-explicit QoL spaces including perceptual experience of individual working, social working as well as emotional functioning.

Polonsky WH et al. (2005): The diabetes distress (DDS) scale was developed by Polonsky and colleagues in the year 2005. It is basically a 17-item scale which was built on the merits and
advantages of the instruments developed previously. The questionnaires on which the DDS was based are ATT39, QSD-R, and PAID. The DDS has been successful in addressing at least few of the short comings of the previous questionnaires. This DDS instrument was formulated to evaluate the emotional suffering due to diabetes primarily for utilization in research as well as clinical practice. Initially a 28-item scale was built up in consultation with both the patients as well as healthcare professional from various disciplines. The initial questionnaire had a total of four subscales which were aimed at four domains related to diabetes suffering namely emotional load, physician related stress, therapy regimen related stress and inter-personal stress with regards to diabetes.

**Meadows K et al. (1999):** The questionnaire namely “Diabetes Health Profile (DHP)” was developed by Meadows and associates has an inbuilt capacity to study mental well-being linked with bearing diabetes, with particular accent on psychological suffering, deterrents to the patients’ behavior, activity level and dietary perceptual experiences. The questionnaire cognitive content was derived after a review of different literatures, review of instruments that were available at point of time, consultations with diabetic subjects and words with various health care professionals dealing with diabetes. The validation study carried out on the original version had resulted in a total of 32 items scale. Thereby, initially the questionnaire had three domains to cover, formulated for utilization among adult diabetic patients who were dependent on insulin and also patients requiring insulin in ambulatory care settings. However, the final version was reduced to 18-item scale based on a cross-culture study with the three factors mentioned above, but it was modified for utilization in patients with type 2 diabetes. Till date, the questionnaire is translated to 14 different languages.

**Hammond GS et. al (1999):** The “Diabetes impact measurement scales (DIMS)” is one of the lengthiest questionnaires with a total of 40- item scale that has been formulated to assess the changes in health status occurring over a period in patients with diabetes. This questionnaire has a very good utility in clinical trials. It was developed after review of literature of the instruments which were already in place as well as after dealing with diabetes. The five domains of this instrument DIMS cover general well-being, physical signs or symptoms, morale & social functioning related to diabetes. All of the items employ a scale between four to six-point grading. It takes approximately 15 to 20 minutes to completely fill the questionnaire. It has been translated into languages like Chinese, Italian and French.
**Shen W et. al (1992):** The questionnaire namely “Diabetes Quality of Life Clinical Trial Questionnaire Revised” (DQLCTQ-R) has been formulated on the basis of DQLCTQ. The revised version comprises only 57 items with eight generics as well as domains specific to the disease: physical functioning, energy/fatigue, health related distress, psychological health, level of satisfaction, satisfaction with regards to treatment, flexibility in treatment, and absolute frequency of symptoms. The developers who were involved in the initial draft questionnaire had included measures like SF-36 and DQOL that were previously validated and developed new items accordingly. The DQLCTQ questionnaire was earlier framed of a mammoth 142 items and was planned for use in the human clinical trials to assess the QoL changes particularly in patients who were on treatment with insulin Lispro. All these items were on Likert scale and usually take not more 10 minutes to complete. This QoL instrument had also been translated into languages like French and German.

**Jacobson AM et. al (1997):** The “Diabetes Quality of Life Measure (DQOL) and Quality of life in patients with diabetes mellitus” questionnaire is a 46-item questionnaire which has been developed for application in the diabetes control and complications trial (DCCT) for comparison of two treatment regimens used for only chronic but not acute complications in Type 1 diabetes patients. Nevertheless, the framing and content of the questionnaire allows for application in patients with Type 2 diabetes as well. The instrument’s cognitive content is derived from standard process via review of literature as well as consultations with diabetes patients and diabetes physicians. The scoring of the item is on a five-point Likert scale. The instrument has been translated into different languages like Chinese, French, Spanish and Turkish.

**Bott U et. al (2003):** This “Diabetes-Specific Quality of Life Scale (DSQOLS)” is one of the diabetes specific QoL instrument comprised of a total of 64-Items in scale variable based on review of the pre-existing questionnaires specific to diabetes. The authors also held bunch dialogs with some diabetes mellitus patients and master survey by medicinal services experts dealing with diabetes. The instrument is prepared to assess the quality of life in type 1 diabetes patients. There was a total of 39 quality of life items in this instrument and it covers 6 different dimensions with regards to social relationship, leisure tile flexibility, complaints of physical nature, concerns about the future aspects, restrictions related to diet and hassles of day to day life. All the items uniformly use a six-point Likert scale. Filling up the questionnaire takes not more than half an hour. In a research conducted afterwards, five more sub-questions were
increased the questionnaire. It has also been back-translated from Germany language to English for use in United Kingdom.

**Araki A et. al (1999):** The questionnaire namely “elderly diabetes burden scale (EDBS)” is a brief version of the previously elaborated “elderly diabetes impact scale (EDIS)” which is comprised of total 37 items. The authors had selected only 23 out of 37 items that were all rated on a Likert scale with four-point multiple-options and prepared the EDBS accordingly. The EDBS altogether comprised of six sub-scales namely burden of symptoms, burden due to social factors, restrictions due to dietary constraints in diabetes, worry regarding diabetes, dissatisfaction due to treatment, and burden due to administration of tablets or insulin. It usually takes even fewer than five minutes of time to complete this questionnaire.

**Peyrot M et. al (2005):** The “Insulin delivery system rating questionnaire (IDSRQ)” is a 67-item formulated by adapting a three-step process because of literature review, interviews with patients with diabetes and considering experience of the individual authors. The “IDSRQ” is comprised of seven multi-item sub-scales, one dedicated for to each section of the questionnaire. Three subscales are investigated for questions which are specific to the patients’ insulin delivery arrangement method and other three subscales are general in their nature. One subscale is evaluated for the overall predisposition for the specific preferred insulin delivery method. The score for each of the items is in a metric scale which ranges from 0 for the minimum response option to 100 for the maximum response option, maintaining equal distance between each of the response categories. Scale scores are calculated as well as the average value of the items that has been completed by the respondent.

**Hirsch A et. al (2000):** This questionnaire namely “Quality of Life with Diabetes (LQD)” has a total of 17-item in scale measurement that evolved from DQOL and gathered from the feedbacks with diabetic patients. The LQD basically deals with several dimensions with regards to the overall satisfaction with life and the encumbrances of diabetes and its management. The 17 items, which are answered on a five-point scale, refer to the month before the test.

**Polonsky WH et. al (1995):** This questionnaire namely “Problem Areas in Diabetes” (PAID) Scale has altogether 20-items in scale measurement. It basically aims to measure a single-factor with regards to diabetes related distress. It was formulated by researchers who were associated with the reputed Institute namely Joslin Diabetes Center in collaboration with Harvard Medical School. There are 20-items which intends to cover an array of emotional problems. The items
were prepared after conducting several rounds of patient interviews, inputs from health care professionals dealing with diabetes after a proper pilot testing. It takes even less than five minutes to fill in the questionnaire. Till date, it has been translated into nine languages.

**Duran G et. al (1997):** This questionnaire “Questionnaire on Stress in Patients with Diabetes Revised (QSD-R)” which is aimed to measure stress in patients with diabetes has altogether 45-items in quantitative scale. It is contrived to evaluate psychological stress factors that are linked with problems in day to day life in patients with diabetes. The items determine eight stress scales for diabetic patients with regards to leisure related time, depression and apprehension of future, occurrence of hypoglycemia, treatment and diet regimen, complaints related to physical endurance, work related, partner related, and relationship between doctor & patient. The original version of the QSD is consisted of a total of ninety items which were selected after review of literature and conducting interviews with healthcare professionals dealing with diabetes as well as after interacting with patients. The responders were inquired to point out whether having diabetes results in stress among the patients and if it really so, to grade the extent of stress on a Likert scale on five-point. It takes not more than 15 to 20 minutes to complete this questionnaire.

**Mannucci E et. al (1999):** This questionnaire namely “Well-being Enquiry Questionnaire for Diabetics (WED)” has a total of 60-item all in scale measure. All the questions measure quality of life related to the disease. All of the things giving an assessment of four parts of personal satisfaction specifically manifestations, distress, tranquility, and the illness' effect. The instrument's subject was defined from a writing audit of the current explicit QoL measures explicit to diabetes and comment got from patients and human services experts treating diabetes. All of the items are measured in Likert scale.

**Boyer JG et al. (1999):** A research by Boyer et al. demonstrated all the dominant patients’ characteristics that have been found to positively impact enhanced basic foot care habits were young age, African-American ethnicity, greater education, severe forms of foot neuropathy, and having a previous exposure of foot ulcer. The authors have divided the study into two phases by conducting a detailed literature review from the available instruments. They first arrived at a questionnaire with 92 items addressing all the important aspects of a patients’ life. The authors have followed a very exhaustive process where the investigators mailed questionnaires to 1000 patients’ out of which 516 responses were obtained. Based on the responses obtained, 42 items were deleted leaving behind only 50 items. After final analysis of the data only 39 items were
retained in the final instrument encompassing five dimensions namely energy, mobility, control of diabetes, anxiety and worry, sexual functioning and social burden. Furthermore, the results from the diabetes were correlated with the other QoL instrument namely SF-36 (brief form of the physical assessment consisting of 36 items).

**Araki A et al. (2003):** Another original research study conducted by Araki et al. demonstrated a difference in the self-foot care behaviors and the authors also found their interpretation also varied significantly between the inhabitants of American Indian and Pacific Islanders as compared to the Asians as well as the African Americans. The primary endpoint was to assess and devise a questionnaire to properly measure the diabetes burden in the elderly population. The researchers distributed questionnaires specific to diabetes as well as few non-specific QoL questions not specific to diabetes in 455 elderly diabetic patients aged greater than 65 years. As a rule of thumb, the authors measured both the internal consistency and test-retest reliability of the items in the question. The validity was assessed by measuring its association with the Philadelphia Geriatric Center morale scale, mini-mental state examination scale (MMSE), hemoglobinA1c and diabetic complications, diabetes treatment, hypoglycemic episodes, and socio-demographic parameters. The factor analysis of all the 23 items revealed six components to be reliable namely restrictions in diet (Cronbach's α=0.89), burden of symptoms (Cronbach's α=0.55), worries related to the diabetes disease (Cronbach's α=0.85), social burden, dissatisfaction with regards to treatment and burden reported by the patients’ associated with side-effects of oral anti-diabetic agents and usage of insulin (Cronbach's α=0.77). The patients who scored highest marks revealing poor quality of life seemed to have poor glycemic control, on treatment with insulin and also frightened of hypoglycemic events. The authors thus concluded it to be a useful instrument in the elderly patients of diabetes and hints at avoiding hypoglycemia and intensive therapy with insulin in these sub-set of patients.

**Bott U et al. (1998):** One of the major barriers when it comes to the performance of proper foot care in daily practice is the patients’ inadequate knowledge regarding self-foot care. Based on this previous observation, the authors Bott and colleagues attempted to appraise the extent of diabetes care in a epidemiological study comprising 684 type 1 diabetes subjects, out of which 657 patients completed the initial questionnaire namely diabetes-specific quality-of-life scale (DSQOLS). This particular questionnaire is having 64 items from different dimensions covering various aspects of treatment goals along with satisfaction associated with success of
treatment, distress associated with diabetes. The factor analysis of the 44 items in the initial version of the questionnaire demonstrated six components to be reliable as social relationship; complaints of physical elements, worries related to future, diet related restrictions, flexibility related to leisure timings and hassles related to daily life activities. The authors concluded the DSQOLS as a valid and reliable measurement instrument for diabetes specific quality of life. They have found the scale to have a distinguishing capacity between various dietary and treatment regimens and also to consider the lack of social equality. The questionnaire has also the capacity to find out motivational shortfalls, if any and tailor treatment modalities.

**Peyrot M et al. (2005):** The underlying factors constituting this particular barrier are generated from the mounting evidences mostly indicating that the educational programs may play a pivotal role in improving patients’ knowledge and foot behaviors. Therefore, the authors intended to allow for a prelude appraisal of the validity and reliability of a new measure of health-related quality of life (HRQOL) and the patients’ preferences for treatment pertaining to the insulin delivery systems. The authors enrolled 197 type 1 and type 2 diabetic patients to appraise the patients’ perception with regards to treatment satisfaction, effect of treatment on day-to-day activities, worries related to diabetes, psychological well-being of the patients and the preferences to different regimens of insulin treatment particularly with regards to insulin pump usage and various day by day infusions. The numerous relapse investigation modifying for age, gender, and sort of diabetes showed that treatment related fulfillment, fathomed clinical viability, and mental prosperity were severally associated with by and large treatment introduction and clarified half of the distinction of assessment in preference among insulin pump users and sub-cutaneous injection patients.

**Hirsch A & C. Bartholomae (2000):** The authors wanted to ascertain which questionnaires are authentic and dependable for evaluating the QoL in type 2 diabetic patients residing in Germany, since the hidden variables comprising this specific behavior are created from the guidelines generally recommending that the instructive projects may assume a vital job in improving patients' learning and foot practices. Accordingly, the authors evaluated five questionnaires as mentioned vide-supra. A representative sample of around 150 participants who were going to one of nine diabetes specialty hospitals during the time of the study period were applied the questionnaires two times. All of the items in the sub-scales of the questionnaires were found to demonstrate inherent consistency of more than 80% for the validation of the questionnaire.
Nevertheless, on retesting the reliabilities were found to be lower, particularly for the scales which were measuring gratification with regards to the levels of plasma glucose levels and general health related treatment. On conducting a factor investigation of all the scale, the general scores yielded many predictors to be specific for general health, prosperity and delight, diabetes-specific depression, and finally treatment related fulfillment. By constructing the validity, it was established that absolute frequency of hypoglycemia, nerve related disorder, treatment with different kinds of short acting and long acting insulin and count of late onset microvascular and macrovascular complications posed a detrimental effect on QoL. Not a single instrument could encompass all pertinent facets of the QoL in type 2 diabetics. Hence, it is recommended that QoL in patients with diabetes must be assessed with the scales constituting the intellectual related inputs and insights so that the clinician do not miss out any significant views of the patients with regards to quality of life.

J.G. Boyer & J.A.L. Earp (2007): The primary aim of this two-year project was to formulate an instrument particularly designed to evaluate the quality of life of people with type 2 diabetes. The research project was divided up into two phases. In the initial phase, selective information from an elaborate literature review, from existent QoL questionnaire instruments, and derived by conducting interviews with the health care professionals and patients with diabetes was initially used to formulate a preliminary instrument which consisted of 92 items that were considered to cover all the important facets of patients' lives. The researchers mailed the initial questionnaire to 1,000 people with diabetes, and data obtained from the 516 patients who responded were further used to pick out the most significant and crucial items. Fifty items were at first excluded, leaving behind 42 items that established the pilot instrument. During the second phase, the pilot instrument was then utilized to evaluate the QoL of the 427 respondents, who filled in the revised questionnaire. The ultimately developed questionnaire consisted of 39 items that covered five dimensions of patients' lives: namely energy of the patient and their mobility, diabetes related control, anxiety and worry with regards to the disease, social burden, and sexual functioning. The authors also concluded that by giving a patient to rehashed presentation to the instructive program had gone far concerning improved patients' adherence empowering them to perform self-foot care appropriately. Diabetic patients who had recently partook in excess of three instructive projects had shown fundamentally improved self-foot care rehearses when contrasted with the patients who had not visited or had gone to just a single preparing program.
Consequently, the proof firmly exhibits the need of rehashed and constant instructive activities for a superior and manageable foot care rehearses in patients with diabetes. Simply going to a solitary program is likewise not going to help concerning improved foot care habits.

**Boulton AJ et al. (2005):** Foot related problems are very usual across the world, resulting in major economic crisis for the diabetic patients, their families, and the entire society on whole. The major burden is attributed to foot ulcers which are more likely to be of neuropathic beginning, and hence eminently preventable, in the developing third world countries, mainly India and China as well as type 1 diabetes to some extent in the next few years. Diabetes patients who are at largest risk of ulceration can well be distinguished by carefully conducting clinical examination of the feet. In this subset of patients, proper self-foot care education and frequent follow-up is indicated. When evaluating the consequences of economic aftermaths of diabetic foot disease, it is extremely crucial to recall that rates of recrudescence as well as recurrence of foot ulcers are enormously high, being higher than 50% after three years. Hence the costing should therefore constitute not only the straightaway ulcer episode, but also welfare work, home based care, and consequent ulcer episodes. An integrated and holistic care-based approach with screening on regular basis and self-foot care education of the diabetic patients at high risk necessitates low spending and has the potentiality to minimize cost of treatment.

**Calle-Pascual AL et al (2002):** The primary aim of the present study was to measure the efficiency of a prophylactic self-foot care curriculum, employed in a general out-patient setting aimed to reduce the new incidental cases of foot ulcers in type 1 and type 2 diabetics diagnosed to have neuropathy assessed by the neuropathy disability score (NDS), with respect to the seriousness of neuropathy based framework by the vibration discernment limit technique. An incorporated and continuous deterrent self-foot care program was additionally structured so as to guarantee great footwear, strolling related foot cleanliness, legitimate consideration of callus, appropriate nail cutting strategy, locally established water temperature checks, legitimate use of warming gadgets to avoid consuming in sensation misfortune because of neuropathy, bathroom related medical procedure, self-foot care items and self-inspectional techniques. Persistent foot-care training and treatment, including evaluation of podiatry, were additionally made accessible by the creators. Assessment of foot was directed something like at regular intervals. They selected diabetic patients (n=308) with neuropathy score greater than or =6), without a previous history of foot lesions were recruited over a period of three years and followed-up for almost five
years. The authors identified that the low risk group comprised of 124 individuals who had a VPT score less than 25 V while the high-risk group comprised of the 184 patients’ who had a VPT > or =25 V. In all the 220 patients who were found to be compliant with the programme, most contributed to the low risk rather than the high-risk groups. The low risk group was found to develop nine ulcers in nine patients, whereas the high-risk group was found to develop altogether 24 ulcers in 19 patients. Out of these ulcers, more of it were in the rebellious patient gathering, offering ascend to a general danger of 22 and eight contrasted with individuals running with the programme respectively. The authors thereby suggest that the proper and meticulous adherence with a protection self-foot program diminishes the new cases or frequency of foot ulcer development in individuals enduring with diabetes with attendant neuropathy. This reduction was demonstrated to be relatively greater in the sub-group of patients with less severity of neuropathy. The simple method has a wide applicability in a resource constraint setting.

**Cosway R et al. (2001):** The authors wanted to determine if non-complicated Type 2 diabetes bears any correlation with damage of cognitive functionality and informatics power of the brain. The authors recruited patients with uncomplicated Type 2 diabetes and also non-diabetic controls. The two groups were alike for confounders like age and the patients’ intellectual ability. The authors employed an extensive battery of tests to assess the different degrees and areas of cognitive functions letting in important factors like verbal as well as pictorial capacity, official capacity, and general capacity of the brain and relative efficiency of information processing. They didn’t find any differences amongst the diabetes and control groups on any parameter of cognitive function or ability and relative effectiveness of data preparing of the brain. The execution of these different test parameters was not correlated with any recent glucose control (as ascertained by HbA1c). However, the duration of diabetes significantly correlated with poor performance on different measures of communicative memory.

**Formosa C et al. (2012):** - The authors describe core components of diabetes care is the promotion of diabetes education to improve self-management, which would decrease the economic and personal burden imposed by diabetes. Nevertheless, as education and knowledge alone cannot constantly interpret into bettered metabolic consequences, a better understanding of the components that bestow to suboptimal self-management is important. The authors thereby indicate a drift away from conventional and traditional, didactical, diabetes-associated education, which has flunked in a variety of settings. The accordingly advocate towards an innovative
approach that are patient-centric and concentrated to better metabolic consequences and quality of life for patients with diabetes.

Hasnain S & Sheikh H (2009): - In this cross-sectional design study, Hasnain et al. aimed to evaluate the level of attitude and self-foot care practices in diabetics. The authors resorted to a non-probability-based convenience sampling method, as it is more feasible in a real-world scenario. They had recruited 150 patients with diabetes whereby the respondents who had fulfilled the inclusion criteria and exclusion criteria were admitted in the study. The diabetic patients’ knowledge level and self-oriented practices with regards to foot care were appraised by a pre-validated instrument and the overall response from each participant were sorted as, satisfactory, good and poor based upon the score. Altogether 15 questions each pertaining to knowledge level and self-practices with regards to foot care were inquired. Each of the questions was assigned with one mark. In the event that the all-out score was above 70%, it was considered as great, if score was 50-70% it was considered as medium and if score under half it was considered as poor both for the dimension of learning and self-situated practice for the foot care. The authors reported that around 29% of the respondent’s demonstrated good knowledge, 40% of respondents had satisfactory knowledge and the remaining ones had poor knowledge about self-foot care. However, the knowledge didn’t translate into practice as revealed by the fact that only 14% of the diabetic patients had demonstrated good level of practices for foot care, 54% had exhibited satisfactory practices and the remaining 32% had exhibited poor practices. Interestingly, the dimension of training of the diabetic respondents had measurably noteworthy relationship with learning level and furthermore rehearse concerning foot care. In any case, sexual orientation and pay of the respondents had shown no noteworthy relationship with respect to information and works on in regard to foot care. The creators reasoned that around 33% of diabetic patients exhibited poor dimension of learning with respect to foot care and without a doubt, not many diabetic patients had great practices for foot care.

Ikpeme IA et al (2010): - Amongst the highest and difficult to treat diabetic foot complications are the diabetic foot ulcers and foot related gangrene as the primary cause of diabetic foot related morbidity and mortality which are of great importance. This study conducted by Ikpeme et al. attempted to examine the possible preventive self-foot-care practices in a group of diabetic patients who had presented with gangrene in the foot. The authors’ selected one hundred and two (102) cases diabetic emergencies by non-probability convenience sampling method who had
presented during the study period. Amongst all, diabetic foot gangrene accounted for around 26% of these cases. Only 33% of the patients had been given any form of foot-care education. A majority of 55% of the patients had treated their ulcers by unorthodox means, and 63% of the diabetic patients practiced no significant self-foot care practices. The authors concluded that more concentrated foot-care education as well as awareness is needed in order to prevent the emerging and serious problem of diabetic foot related gangrene and subsequent lower limb amputation.

**Jabbar A et al. (2001):** The researchers attempted to determine the level of knowledge among people with diabetes. They had recruited two hundred and thirty patients by random selection method as selected from out-patient department clinics. The authors had administered a 34-item Likert scale multiple choice questionnaire to all the study patients. The questionnaire was previously validated and structured to evaluate the knowledge about the state of diabetes, diagnostic tests for diabetes as well as complications and management. The authors’ found that the mean score of correct responses for the entire group was 40%. A ly higher score was associated with younger age (16-30 years), educational status of the patients and regularity in the follow-up of the patients with a diabetes clinic. However, the study demonstrated no difference with regards to the knowledge score between males and female diabetic patients or between the subgroup of patients who are on oral anti-diabetic agents (OADs) or insulin. Around fifty percent of the diabetic patients could properly answer questions with regards to food as well as nutrition and a substantial 60% of the diabetic patients were aware of their target plasma glucose levels required for optimal control. In a nutshell, the present study underscores the need for a more widespread diabetes education at all the levels namely primary, secondary as well as tertiary, both aimed for the patients and the health care professionals to restrain the ever-growing pandemic of diabetes-related microvascular and macrovascular complications across the globe.

**Knight KM, et al. (2005):** Most of the available present guidelines state that diabetes related education is cardinal to aid patients with diabetes to alter their life-style and foreclose morbidity and early mortality. Nonetheless, majority of the patients with diabetes are not meeting enough education. There is a common and widespread presumption that channelizing knowledge will better health related outcomes but there is minuscule empirical back up for affirmation of the claim. In reality, know-how and behavior are badly correlated. Knowledge may be a requisite consideration but is seldom an adequate condition to impact or influence change in the behavior.
Solitary intercessions, either cognitive or behavioral were found to have very disappointing results, not surprisingly if we consider the complexity of human behavior. The most efficacious interventions were found to be multifaceted and constitute not only education but also behavioral and psychosocial components. They are meant to target changes in lifestyle and elements such as efficacy in self-care and empowerment. The authors had recommended that educational intercessions must have multiple constituents and should aim to better the diabetic patients' sense of wellbeing with regards to self-efficacy as well as empowerment. It should also build a positive attitude towards diabetes that will further corroborate the lifestyle changes which are needed for productive self-care and management.

Kurniawan T et al. (2011): Bettering diabetic patients’ self-foot care knowledge and behaviors is the cornerstone of all the effective schemes available at disposal of a clinician in minimizing diabetic foot problems like ulceration and its advance damaging impacts, either in hospitalized patients or outpatients. In this paper, the authors wanted to depict the self-foot care knowledge and behaviors among few of the selected hospitalized diabetic patients, to enforce picked out foot care know-how and behaviors betterment evidence, and to appraise its effectuality. Hence, the author recruited four diabetic patients who were hospitalized and closely monitored for at least three days in the surgical ward of the university hospital. The authors employed educational program on the basis of the patients’ learning needs, catered diabetic foot care leaflet, and helped patients to set their goal and action mechanism to achieve the goal. On day 3 of treatment, the authors’ evaluated patients’ self-foot care knowledge level as well as their goal and activity plans required in improving foot care behaviors. On the basis of the data gathered from these four hospitalized patients with diabetes, it was demonstrated that all patients required multifaceted foot care behaviors improvement program as well as the educational program that aggregated with goal setting and action plans to improve the hospitalized patients’ foot care knowledge level and their comprehended foot care conducts. This multifaceted method was found to be easy, safe, and appeared to be practicably relevant for hospitalized patients suffering with diabetes. Hence the present study provided worthful information for betterment of hospitalized diabetic patients with regards to foot care level of knowledge and behaviors. The authors thereby advocated nurses to apply this evidence-based practice in order to bestow in ameliorating the quality of life as well as diabetic care.
Lincoln NB et al. (2007): - There were no instruments available till the present study to document self-foot care practice among patients with diabetes and such measurements were the need of the hour as a surrogate marker in all of the studies which were intended to ascertain the effectuality of self-foot-care education. The creators have in this way grown such a measure, the Nottingham Assessment of Functional Foot care (NAFF) and have evaluated its unwavering quality just as legitimacy. The authors have administered a pilot questionnaire to the patients with diabetes as well as healthy controls, after which it has been revised and shortened version was formulated. The new version’s internal consistency was found to be around half in people with diabetes and a much lower value of less than forty percent in the healthy volunteers. Twenty-eight things have exhibited noteworthy contrasts between the patient's with and without diabetes. The instrument was again tweaked to a 29-thing adaptation, which had a higher interior consistency of 0.53. Besides, a noteworthy relationship and no huge contrast was exhibited. The subgroup of participants, particularly with high scores which was altogether higher than those without neuropathy (p<0.01). Subsequently, the author concluded that NAFF as an instrument could serve as a resultant measure in the future trials which are then necessitated to demonstrate the role of educational programme in the evidence based clinical practice. The authors also pointed out the utility of the instrument in routine practice care to distinguish that subset of patients in whom the common foot care have a propensity their feet at risk of future ulceration.

McInnes A et al. (2011): - The authors attempted for defining and arriving at a conclusion to provide a pragmatic educational model for delivering healthcare properly at all the levels in patients with diabetes specifically focusing on the patients who are not at high risk for foot complications. The methodology they followed is that they have arranged for a consensus meeting involving experts from all the related specialties to arrive at a guideline based on rich clinical experience and judgment of the specialists. The experts have identified four primary health related behaviors identified as the one responsible for developing foot complications viz. glycemic control, attending an annual foot screening programme, observing any changes in the foot health and practicing a foot care routine on daily basis. Hence, the experts concluded that the subset of patients should be recommended to set about a basic foot care daily regimen in order to decrease the likeliness of developing foot complications.
**Nusbaum L et al. (2001):** The intent of the authors in the present study was to develop a translated version of the Roland-Morris (RM) instrument questionnaire into two different languages Brazilian as well as Portuguese and further examine the adaptability of the questionnaire and to validate it. In the first step, three English teachers front translated the original version RM questionnaire independently into the Brazilian and Portuguese language version and subsequently a consensus version was brought forth. In the next step, another set of three different translators, who were blinded to the original version of the questionnaire, executed a back translation. Both of the versions were then equated with the original version of the English questionnaire. Any sort of divergences or variances were then talked about and further worked out by a panel of eminent three rheumatologists and the final RM questionnaire’s Brazilian version was then established (Brazil-RM). This version was then subjected to pretesting on a set of 30 patients with chronic low back pain who were sequentially selected from the reputed spine disorders out-patient clinic. In addition to measuring the traditional clinical outcome measurements, the Brazil-RM questionnaire is a 6-point pain analogue scale (ranging from no pain to the most unbearable pain), and the questionnaire’s numerical pain rating scale (PS) extends from 0 to 5 and a visual analog scale (VAS) ranges from 0 to 10. Both of these were further dispensed twice by one interviewer (1 week apart) and once by another independent interviewer. The author’s measured Spearman’s correlation coefficient (SCC) as well as the intra-class correlation coefficient (ICC) in order to compute and accordingly assess and test-retest the inter-observer reliability. The authors also evaluated the cross-sectional construct validity by the SCC. Subsequently in the pre-testing session, all questions were found to be very well understood by the diabetic patients. The mean time of questionnaire administration was very less just under 5 minutes. The authors’ concluded that the Brazil-RM version have been successfully translated and validated for practical application in the Brazilian patients, with acceptable reliability and satisfactory cross-sectional construct validity.

**Perrin BM et al. (2009):** Patients with diabetes and coexisting peripheral neuropathy frequently don’t carry out the recommended self-foot-care behavioral schemes which are advised by healthcare professionals. The conception of self-efficacy has been demonstrated as an efficacious prognosticator of behavioral measures in lots of areas related to health. The present study looked into the relation between foot-care notions, self-accounted behavior and past medical history of diabetes-associated foot pathophysiology in subjects with diabetes and departure of defensive
aesthesis in their feet. Accordingly, the authors have recruited ninety-six subjects in the present cross-sectional study. All participants had a diagnosis of diabetes and clinically diagnosed exit of protective sensation in one of both of their feet. All of the participants had accomplished a self-accounted report questionnaire with regards to their foot-care self-efficacy beliefs (as per the "Foot Care Confidence Scale") and also completed a minimum of two aspects of existent foot-care behavior-preventative behavior as well as potentially detrimental behavior. The authors’ computed Pearson’s correlation coefficients to ascertain the connection amongst foot-care self-efficaciousness notions and actual reported foot-care behaviour. Subsequently, a weak positive correlation (r = 0.2, p = 0.05) was detected between self-efficacy notions and preventative behavior whereas no correlation was found between self-efficacy beliefs and potentially damaging behavior. No difference was also found in self-efficacy notions in the patients who had a history of foot pathology compared to the control group. Hence, the authors concluded that a little connection amongst self-foot-care self-efficacy beliefs and actual self-foot-care behaviour. The utility of measuring self-foot-care self-efficacy notions to evaluate and determine the actual self-foot-care behavior by using presently available questionnaires is confined in patients with diabetes along with loss of protective aesthesis.

**Sloan HL. (2002):** In this study the authors attempted to develop and test the instrument namely “Foot Care Confidence Scale (FCCS)”, which was contrived to appraise the self-confidence (or self-efficacy) of the diabetics when it comes in performing their self-foot care behavior. The validity of the content was evaluated with the help of Lynn's (1986) Content Validity Index (CVI) with an aggregate of cent percent content validity (Sloan, 1993). The authors administered the instrument to four persons with diabetes (Sloan, 1994) and conducted a pilot testing in 41 healthy older adults (Wills & Sloan, 1995). On the basis of feedback obtained from the pilot study and CVI results, as well as extra review of literature, the instrument was subjected to revision. The instrument had a very high Cronbach's alpha score of 0.92. Factor analysis disclosed that all 12 items are loaded on to one factor and all of the 12 items are necessitated to assess self-confidence to care for one's feet. The authors concluded FCCS as a pragmatic instrument for utilization in many settings, particularly where time constraints exist. It may also have a role in assisting the nurses for measuring and bettering outcomes of self-foot care of the feet in patients with diabetes mellitus.
**Pollock RD et al. (2004):** In this study, Pollock et al. attempted to ascertain the knowledge and functional foot care practice in patients with diabetes. The authors have developed an instrument by calculating score based on the patients’ knowledge to evaluate the current practice that may pre-dispose the patients to the risk of developing foot ulcer. The patients who were at the high risk of foot ulcer were then compared with the patients at low risk of ulceration. The average knowledge score of both the groups was found to be 6.5 ± 2.1 out of a maximum possible score of 11. The authors found a positive correlation between the knowledge score and chance of receiving an advice on foot care by the healthcare professional. Inadequacies in knowledge score mainly comprised of the unfitness to feel trivial foot injury, disposition to ulceration and consequence of smoking status on the circulation. Approximately one-fourth of the patients never visited a foot doctor, around one-fifth flunked to scrutinize their feet and a substantial of 83% of the patients did not have their feet evaluated when they last bought shoes. Common habits which assign participants for ulceration comprised of exposure to direct exposure of heat. The major limitations to the practice of foot care were primarily attributed to co-existing diseases. The subset of patients’ who were at the high-risk feet demonstrated a higher knowledge score but not as compared to the patients at low risk of ulceration. Overall, their functional foot care practice was found to be better in all aspects. Accordingly, the present study results foreground aspects where attempts to better skills and foot care attitude may substantially impart to the prevention of development foot ulcers and subsequent amputation.

**Rocchiccioli JT et al. (2005):** In this article, the author attempted to evaluate the diabetic health care system in Malta by conducting a strategic analytic thinking of diabetic care practices across the country. They came up with recommendations for ensuring an economical standard of care and by providing legislative support for implementing comprehensive diabetic care. All this was done by proposing a national policy.

**Ryan CM et al. (2000):** The authors attempted to probe the magnitude of type 2 diabetes is linked with sluggish execution on functioning of learning capabilities, cognitive function, ability of psycho-motor function speed, and analytical problem-solution skills in middle-aged adults. Hence, they carried out a cross-sectional design study in order to evaluate 50 patients (age in the range 34-65 years, mean age being 50.8) with type 2 diabetes mellitus and 50 socio-demographically and clinically alike residential area control subjects without having diabetes. Each patient had undergone an exhaustive physical evaluation and an elaborated
neuropsychological appraisal. Factor analysis was employed to ascribe particular tests to one out of four cognitive areas namely learning capabilities, memory function, ability of psychomotor speed, and analytical problem-solving skills. Hierarchic multivariate analysis was employed to distinguish socio-demographic, clinical and biochemical parameters which are linked with cognitive malfunction. The results were very interesting with learning capabilities, memory function and analytical problem-solving skills remaining unaffected by type 2 diabetes mellitus. On the contrary, psychological as well as motor decelerating was anticipated by a diagnosis of diabetes with extra disagreement in psychomotor efficiency explicated independently by glycated hemoglobin and vibratory threshold level. The author’s concluded that middle-aged patients with type 2 diabetes mellitus demonstrate psychomotor degeneration that is linked with worsen glycemic control, whereas learning abilities, memory capabilities, and analytical problem-solving skills appear to be predominately intact. The evolution of psychomotor slowness may be an expression of a "central neuropathy" accelerated by chronic high blood sugar levels.

**Ryan CM and Geckle M (2000):** The authors carried out a literature review on the neurodegenerative correlatives and afteraths of type 2 diabetes which revealed two very fascinating findings. Along with verbal adaptation skills as well as memory skills which are most potential to be interrupted in comparison to the other cognitive skills namely attention function, executive function as well as psychomotor efficiency but what is most interesting is that these shortfalls are confined to elderly diabetic patients. Middle-aged patients suffering with either Type 2 diabetes or Type 1 diabetes are evidently protected as they are found to report impaired learning as well as memory impairments in that age group which is below 60 years. To answer the question as to for what reason do more seasoned grown-ups have such an elevated danger of diabetes-connected memory brokenness? In the creator's view, this advancement is an aftereffect of a synergistic principal collaboration between diabetes-related metabolic bombshells and the auxiliary and utilitarian modifications occurring in the focal sensory system (FNS) that are part of the typical maturing process. To basically assess that probability, the authors summed up what was already known with regards to reading and writing dysfunction in adult diabetics, and in addition they also probed the degree to which long-term hyperglycemia can adversely disrupt the integrity of the CNS coupled with age-related degenerative changes in mind structure.
and psychological capacity, noticing specific regard for the phenomenon of limit hypothesis of subjective hindrance.

**Senussi M et al. (2011):** - In the present study, Lincoln et al. aimed to determine that the Nottingham Assessment of Functional Foot care (NAFF) instrument which was initially created to assess the foot care conduct of individuals with diabetes is substantial concerning their psychometric properties. They chose patients going to the outpatient centers were approached to finish the NAFF. A similar arrangement of respondents was again approached to finish the NAFF again two weeks after the primary experience. There was a sum of 86 members, 60 (69.8%) of whom had present foot issues. The discoveries were very interesting since the dispersion of item responses pointed that all the response classes were used on most of the items. Internal consistency was found to be 0.61. Re-test information which was accessible from two-thirds of the respondents who had really consented to finish the NAFF for the next time (around sixty percent) also indicated a good consistency. The authors had found a strong association amongst test and retest data. Finally, the authors had concluded that the NAFF was internally consistent as well as reliable over time. They advocated that the diabetic patients with foot related disorders executed substantially better foot care behavior compared to those without foot problem. A minimum score of at-least 50 has been suggested by the authors to indicate further evaluation of foot care behavior if required.

**Sigurdardottir AK et al. (2007):** - The authors made an attempt to examine as to which elements bestow to betterment in the glucose control in intensive treatments among type 2 diabetes patients as described in clinical trials which are published in the first decade of 21st century. The authors examined the entire original and review papers from Medline and the Scopus using instructive intervention and adults with type 2 diabetes mellitus as keywords. All the data were analyzed with the help of a data-digging program. Out of the 464 articles collected by the authors, 21 review articles which have reported 18 studies and met the eligibility criteria. Information mining considers have shown that for the underlying glycated hemoglobin (HbA1c) level not exactly or equivalent to 7.9%, the diabetes instructive intercession programs accomplished a chickenfeed in HbA1c level, running from +0.1 to -0.7%. For starting HbA1c equivalent to more noteworthy than 8.0%, a significant decrease in HbA1c to a dimension of 0.8-2.5% was determined. Information mining pointed that diabetes span, useful substance and force dimension of training did not envision modifications in glycated hemoglobin levels. Along these
lines the creators' presumed that underlying HbA1c level is the main most pivotal consider
bearing upon improvements glycemic control in response to persistent instruction. Information
mining was observed to be an imperative catch and a delicate technique to look at results of
instructive medicines. Diverseness in conceptualization of medications and assorted variety of
instruments utilized for impact estimations could have incapacitated truthful revealing of useful
educational practices. Thus, commitment in instructive medicines all around seems to benefit
people with sort 2 diabetes. Utilization of compatible instruments is prescribed as it contributes
better opportunities to key out unequivocal outcomes with attendant development of clinical
rules.

**Strine TW et al (2005):** Diabetes-associated morbidity as well as mortality is mainly ascribable
to complexities such as heart disease, ischemic stroke, lower extremity amputation, kidney
related disease, retinopathy, and visual impairment, all of which can be potentially delayed or
prevented by strict glycemic control. The authors here attempted to examine the connection of
diabetes oriented self-management education (DSME) programs coupled with preventive health
related practices and behavioral change in 22,682 individuals with type 2 diabetes mellitus using
the database for the year 2001 and 2002 “Behavioral Risk Factor Surveillance System (BRFSS)”.
BRFSS is an on-going, multi-level state-based, haphazard-digit-dialed telephone-based survey
comprising of non-institutionalized adults of aged greater than or equal to 18 years. The authors
have reported that more or less 48% of all adult individuals with type 2 diabetes had never
participated in a DSME course. Amidst both diabetic individuals who are on insulin and those
who did not use insulin at all an any point of time during their disease course, individuals who
experienced DSME were found to be significantly to a greater extent more likely than those who
had not experienced training to be physically more active, to have undergone an annual dilated
eye exam and to have administered a flu vaccine as a pneumococcal vaccine, to have adequately
performing self-monitoring of blood glucose, and to have had visited a physician and also visited
other healthcare professionals like podiatrist for getting checked their feet for sores or any
abnormalities and measuring their hemoglobin A1C level in the previous year. Hence, the
authors concluded that the significance of DSME is of utmost importance in the advancement of
health-related practices that could preclude or retard potential diabetes related macrovascular and
microvascular complications amongst individuals with type 2 diabetes.
Macfarlane RM et al. (1999): - Macfarlane et al. have taken in charge of a planned investigation to look at the introduction of all ulcers which were found in a specific multidisciplinary foot care center between the time of first January 1993 till first August 1996, with detail reference to the components which had hastened ulceration or could have caused any postponements in the referral. Right around 66% of all ulcers were first found by the concerned patient or by a relative or a guardian, and the rest 33% being identified by a medicinal service proficient. The middle (go) time which go between beginning of ulcer and the primary expert survey was in certainty less of around four days, and the middle time between the main audit by a general doctor and first referral to the foot care master's facility was slightly on the higher side of around 15 days. Substantial delays with regards to referral to the podiatrist or a foot care specialist were estimated to have happened in only 39 cases. The most common precipitating factor for development of ulcer was found to be rubbing from footwear, which was mainly responsible for around 20 percent of the cases. Around 10% of the cases had resulted due to immobilization from other co-morbid illness, and a further of 24 cases was due to the aftermath of surgery. Including everything, the author’s concluded that professional elements have imparted to the evolution or deterioration of around 15% of the lesions. Hence, these study results should form the cornerstone of all the strategies contrived to downplay or prevent the onset of ulcer related problems particularly in those individuals known to be at high risk. Hence educational strategies regarding the same should be equally directed to both physicians as well as the patients.

Oyibo SO et al. (2001): - In the present study, the authors applied the below mentioned two ulcer classification systems and applied them to newly developing foot ulcers to equate them as forecasters of outcome: the Wagner (grade) and the University of Texas (LT) (grade and stage) wound classification system. The authors noted the ulcer size, visual aspect, clinical manifest of infection, signs of ischemia, and neuropathology at the time of presentation were noted, and the patients were then followed up until healing or for 6 months. Out of total 194 patients with newly developed foot ulcers, 67.0% were of neuropathic origin, 26.3% were of neuro-ischemic origin, 1.0% was of ischemic origin, and 5.7% had no identified central factors. Median with (interquartile range [IQR]) for the reported ulcer size at presentation time was found to be 1.5 cm2 (0.6-4.0). Lower-limb amputations were executed for 15% of the total ulcers, whereas 65% of the ulcers were healed and 16% were not healed at the end of the study period; remaining of
the 4% of patients died. The authors concluded that mending times were not imperatively divergent for each evaluation of the Wagner, yet there was a significant stepwise augmentation in recuperating time with every one of the phases of the UT framework and stage foreseen recuperating. Consequently, expanding stage, regardless of evaluation, is associated with increased danger of removal and extensive ulcer recuperating time. In this way, the UT framework's understanding of stage makes it the best indicator of result.

Singh N et al. (2005): - The authors wanted to systematically the existing literature to sum up the available evidence on the efficaciousness of various methods recommended for preventing the incidence of diabetic foot ulcers in the backdrop of primary care. They had carefully scrutinized and looked for the articles which were published between the years January 1980 till April 2004 applying database-specific keywords. Listings of recovered articles were also explored, along with the review of the recalled literature for to the point information, giving detail attention to the potential prospective or cohort studies as well as randomized clinical trials. Among the interesting results, the authors found that prevention of diabetic related foot ulcers commences with screening out for identifying the loss of protective sensation, which can be best achieved in the primary care setting with an abbreviated history from the patient and the use of simple monofilament test. Medical specialists’ may use biothesiometer in their clinics to quantify neuropathy, as well as measurement of plantar foot pressure, and evaluate lower limb extremity vascular condition using Doppler ultrasound coupled with ankle-brachial index. These measurements coupled with other findings as relevant from the history and physical evaluation should enable clinicians to distinguish patients on the basis of their risk profile and accordingly the clinicians can determine the type of intervention. The author’s concluded that educations of patients with regards to proper foot care as well as periodic assessment of foot checkups are effective interventions in order to prevent ulceration. Other potential effective clinical interventions may include optimizing plasma glucose control, cessation of smoking, intensive podiatric care, surgical operation of calluses, and certain types of preventative foot surgery. Nevertheless, the value of several types of prescription-based footwear for prevention of ulcer is yet not clear. Hence, significant evidence affirms the screening of all the patients with diabetes, particularly to discover those patients prone to develop foot ulcer. This subset of patients might gain from certain preventative interventions, letting in education of high-risk patients, use of
prescription-based footwear, intensive podiatric care, as well as evaluation for surgical interventions.

**Pemayun TGD, et al. (2015):** - As diabetic foot related ulcers (DFU) have been found to cause substantial morbidity along with high rates of amputation with regards to lower extremity primarily due to diabetic foot problems which can occur more frequently as compared to controls. The authors conducted the present study with the purpose that use of an epidemiological design to ascertain and to find out the risk factors related to subsequent amputation in hospitalized patients with DFU. Hence the authors conducted a hospital-based, convenience sampling case–control study of forty-seven DFU subjects who are already affected with lower extremity amputation (LEA) and an equal number of controls DFU subjects without LEA. They carried out matching of the controls to the cases with regards to age, gender as well as nutritional status in 1:1 ratio. The patients’ clinical and demographical data as well as all risk factors-related information were gathered from clinic notes using a short structural chart. The authors have used LEA as the outcome variable, and subsequently computed the relative risk. They have used univariate and stepwise multivariate logistic regression estimation method to evaluate the independent predictors or risk factors which are associated with LEA. Finally, there were 47 case–control pairs, all of whom were diagnosed cases with type 2 diabetes mellitus. A total of seven potential predictor variables hinted a promise of influence, the latter being defined as a *p value of less than or equal to* 0.15 upon univariate analysis. Multiple logistic regression identified levels of glycated hemoglobin level greater or equal to 8%, bearing of peripheral arterial disease (PAD), high levels of triglyceride in the blood, as well as hypertension as the independent predictors associated with subsequent LEA in DFU. Hence the author’s concluded that tight glycemic control, prompt investigation against PAD, and management of comorbid conditions like elevated triglycerides levels and hypertension are believed to be crucial to reduce the risk of amputation.

**Udosen AM et al. (2004):** - Diabetic foot ulceration as well as gangrene is a primary cause of morbidity and mortality. The present study has studied possible preventive self-foot-care practices in a group of diabetic patients who had presented with foot ulcer and gangrene. One hundred and two cases of diabetic emergencies had presented during the study period. Among all the cases, diabetic foot gangrene mattered for around one-fourth of the cases. Interestingly, the mean ulcer duration was found to be 4±3 weeks with mean ulcer–gangrene time interval being
1.2±0.5 weeks. Only nine patients had been exposed to any form of self-foot care education, around half of the patients have been treated for their ulcers by unorthodox means, and approximately 60% of the diabetic patients exercised no significant practices of foot care. Hence, the authors concluded that more far-flung education and widespread awareness is necessitated to forbid the ever-growing and serious problem of diabetic foot related gangrene and subsequent lower limb amputation.

**Nwosu C et al. (2017):** Amputation is the technique of excising the whole or part of a limb, frequently seen as a life saving measure. It is a cutting up surgical procedure changing the body structure and bringing forth severe operational deficit. It is a very frequent orthopedic surgical operation performed universally. The aim of the current study was to ascertain the blueprint and denotations for amputation in a tertiary care center in an effort to offer some preventive measures. The authors carried out a retrospective study of consecutive eligible patients who had undergone major limb amputations between the years January 2008 till December 2014. All case notes of patients were recovered with relevant selective information extracted and further analyzed. The authors studied a total of 112 amputations. The case of amputation in one-fourth of the patients was due to trauma, followed by diabetic foot gangrene in around 21% of cases. Around 42.9% of the removals were performed over the knee, trailed by beneath knee removals in around 37% of cases. The lower appendages were essentially engaged with 84.8% of cases and upper appendages in a modest number 15.2% of cases. Hence, the authors concluded that trauma was the most preponderant denotation for amputation in the present study followed by diabetic foot gangrene.

**Udosen A, et al. (2009):** This cross-sectional survey was basically carried out to gauge the attitude as well as perception with regards to surgical limb amputation. The authors attempted to ascertain the degree of knowledge, know-how and understanding of the denotations, merits as well as the prospects for the patients who undergoes amputation. Accordingly, the authors had used integrated questionnaires and administered it to the adult diabetes patients who underwent amputation in the orthopedic department of a tertiary care center in place called Calabar. The authors had obtained the data from the cross-sectional study and analyzed the same with a software namely EPI Info software version for windows. A total of one hundred and fifty-five participants had taken part and responded in this study. There was a slight preponderance of males 88 (57%). Around 90% of the participants, one hundred and forty respondents had know-
how regarding amputation as a surgical treatment method and 86% (134) of them knew that amputation is beneficial. Around 32% (fifty participants) suggested that they had no other choice to amputation if it is indicated by a doctor while 36 patients of those patients who would deny believing in the divine and traditional way of treatment. Around 86 patients regarded patients undergoing amputation as normal people with equivalent potential as normal individual while 14 participants (9%) regard the amputees as invalid individuals. Around 68% (One hundred and five) patients were mindful of the utility of artificial limb while 38 (25%) had no know-how of the artificial limbs. Around 85% (One hundred and thirty-one) of the study respondents regarded the physicians who perform amputation as life-savers while a meager 2% of the participants and only 9 (6%) considered the physicians who perform surgical amputation as individuals who derive pleasure by amputating limbs and as individuals who are apathetic to the patients' sufferings respectively. Hence, the authors concluded that although absolute majority of respondents have a good knowledge of amputation and would consent or advice others to accept the amputation of limbs, but there is still a strong necessitate producing more cognizance on the therapeutic potential of amputation as well as it clinically relevant indication.

Chen IW et al. (2015): - Diabetic subjects are at a heightened risk of developing diabetic foot ulcers (DFUs) as well as necrotizing fasciitis (NF). In the present study, the authors attempted aims to examine the clinical features and connected risk factors for amputation in diabetic patients suffering with DFU further complicated by NF. The authors retrospectively reviewed the charts of the patients who were treated at a major diabetic foot center in Taiwan between the year 2009 and 2014. Out of the total 2265 included cases, 110 had undergone lower-extremity NF. The authors had classified limb preservation outcomes as major LEA, minor LEA, or limb-preserved. The demographic as well as the clinical characteristics, laboratory values, and the bacterial culture results were gathered for analysis. Among the substantial chunk of the 110 patients with NF, 100 patients had accompanying DFUs (NF with DFU) and the rest of the ten patients had no DFU (NF without DFU). None of the patients with NF but without DFU had died nor had undergone leg amputated. Two of the NF patients with concomitant DFU died of related complications. The amputation rate in the surviving cohort which consisted of 98 NF patients with concomitant DFU was found to be 72.4% (46.9% had undergone minor LEA whereas 25.5% had undergone major LEA). Around Seventy percent of the NF patients without
concomitant DFU had only mono-microbial infections (60% with Streptococcus species), but in the remaining 81.4% NF patients along with DFU had suffered with polymicrobial infections. Anaerobic organisms were mainly responsible for the polymicrobial infections in patients with DFU and NF as identified in 66% of the patients. Multinomial logistic regression analysis disclosed and connection between high-grade Wagner wound classification (Wagner 4 stage and Wagner 5 stage) and incidence of LEA for major and minor LEA, respectively for NF patients with DFU. Additionally, a lower level of serum albumin protein was also found to be linked with major LEA. Accordingly the authors had summarized that once the DFUs were being complicated by NF, the relative risk of amputation in the patients had increased exponentially. The authors further add that treatment for NF patients with DFU on empirical basis should encompass the antibiotics for polymicrobial infections, letting in anaerobic organisms without fail. The high-grade wound system classifications with low serum level of albumin were also found to be consociated with LEA.

**Mendes et al. (2014):** - The present retrospective cohort study is an attempt to estimate three-year risk for ulceration of diabetic foot ulcer (DFU), amputation of lower extremity (LEA) and mortality as well as determine prognostic variables and evaluate derived models of accuracy. The authors obtained clinical records of all patients with diabetes from their diabetic foot clinic database consisting of outpatients enrolled from beginning of 2002 till the middle of 2010. A total of 644 patients with average age of 65.1 years and duration of diabetes of 16.1 (±10.8) years. The overall cumulative incidence for DFU was 26.6%, while for LEA it was 5.8% with a mortality of 14.0%. In a multivariate analysis, physical disability, history of peripheral arterial disease, number of complications and previous occurrence of DFU were found to be independent predictors of DFU. On the contrary, count of complications, foot pulses and previous history of DFU along with LEA and age, number of complications and previous DFU were found to be associated with death. A simplified regression model letting in previous DFU and number of complications found as predictors with high accuracy. Previous history of DFU was found to be associated with all outcomes, even after adjustment for number of complications, in addition to more complicated models. Hence, the authors concluded that DFU seems more than a marker of status of complication, having autonomous impingement on LEA and risk of overall death. The
models proposed by the authors in the present study may be relevant in other healthcare settings for identifying patients, who are at higher risk of DFU, mortality and LEA.

**Adler et al. (1999):** - The authors attempted to identify risk factors responsible for lower-extremity amputation (LEA) in people with diabetes as well as to estimate the incidence of LEA by conducting a prospective study. The possible risk factors assessed mainly consisted of incidence of peripheral vascular disease (PVD), presence of the sensory neuropathy, previous LEA, deformities of foot as well as ulcers, duration of diabetes and its treatment, and elevated plasma glucose. They found that PVD was found to be associated with a heightened risk for LEA. Also, other risk factors included are insensitivity to monofilament testing, ulcers of lower-extremities, previous history of LEA, and management with insulin after controlling for confounders like duration of diabetes and other factors in the model. Hence the authors from the prospective study concluded that presence of peripheral sensory neuropathy or PVD with foot ulcers (especially if they appear on the similar position as the ultimate LEA), previous amputation, and insulin treatment are all autonomous risk factors for LEA in patients with diabetes.

**Monteiro-Soares M et al. (2016):** - In the present study, the researchers attempted to deduce a novel model in order to separate out subjects with diabetes with concomitant active diabetic foot ulcer according to their risk of lower extremity amputation. They directed a planned companion contemplate incorporating every one of the subjects with diabetic foot ulcer going to a diabetic foot facility of a tertiary consideration medical clinic over a period of four years from 2010 to 2013. They had collected the variables at baseline and followed-up the same subjects until the healing of the foot ulcer or lower extremity amputation or death or for a period of at least 3 months from baseline. The authors carried out a logistic regression model which was used to derive the new model, and the area calculated under the receiver operating characteristic curve was evaluated for proposing the model which had the greatest discriminating power. According a total of around 293 patients was followed-up for a median period of 91 days. Around 20% of the patients required amputation, whereas 5.1% were lost to follow-up. The final model had included the parameters which had a clinical relevance for the evaluation of risk of diabetic foot (like status of neuropathy, deformity of the foot, presence of peripheral arterial disease and history of foot complications) in addition to multiple episodes of diabetic foot ulcer, presence of infection, any history or presence of dry or wet gangrene and osteomyelitis. This said model had an area
under the receiver operating characteristic curve of more than ninety percent (which is considered as excellent predictivity model) with a classification power of 0.89 (considered as good predictivity) for lower extremity amputation prediction. The model with regards to the particular high-risk group had demonstrated a positive likelihood ratio of 5 (with 95% Confidence Interval ranging from 3-8) and a predictive value of 58 (with 95% Confidence Interval ranging from 46-71). It is worth mentioning that only one incidence of minor lower extremity amputation had been reported in the low-risk group. The researchers thereby proposed a novel classification system namely DIAFORA which is an acronym for diabetic foot risk assessment. This novel classification system was found to be evenly or more exact for predicting amputation with regards to the lower extremity in high risk diabetic patients with foot ulcer when equated with the existing classification system.

Monteiro-Soares M et al. (2014): subjects with diabetes with associative dynamic diabetic foot ulcer as per their danger of lower furthest point removal. They led a forthcoming accomplice think about enveloping every one of the subjects with diabetic foot ulcer going to a diabetic foot facility of a tertiary care hospital. The analysts had efficiently checked on the current frameworks which are ordinarily utilized in the characterization of diabetic foot ulcers so as to consolidate an amalgamation of their methodological subjective issues and precision to foresee lower furthest point removal, as this may speak to a basic point in these patients' consideration. The two specialists sought, in various database or stores to be specific EBSCO, ISI, PubMed and SCOPUS, and in this manner chose examines which were autonomously distributed until May 2013 and announcing prognostic precision and additionally unwavering quality of explicit frameworks for patients with diabetic foot ulcer so as to anticipate lower furthest point removal. The creators had included 25 contemplates which had detailed a commonness of removal of lower furthest point somewhere close to a wide scope of 6% and 78%. At long last, eight diverse diabetic foot ulcer arrangement frameworks and portrayals of seven prognostic stratification were utilized to recover the writing with parameters especially tending to fringe blood vessel sickness or contamination at the ulcer site or profundity of ulcer. The characterization framework in particular Meggitt-Wagner, S(AD)SAD and Texas University were observed to be the most broadly approved, though the staying ten orders were inferred or approved just once. Shockingly, unwavering quality was accounted for in just a solitary one of the investigations, while precision measures were observed to be accounted for in just five examinations though another eight
examinations permitting their count. The creators in this way reasoned despite the fact that there are numerous order frameworks for ulcer of the diabetic foot result forecast demonstrate, however just a bunch of studies assessed their unwavering quality or outer legitimacy. The crux of the matter is that the studies seldom validated various systems at the same time and only a couple of described accuracy measures. Further studies are warranted for measuring dependability and precision of the available systems with their composing variables.

**Feng Y et al. (2010):** Diabetic peripheral as well as autonomic neuropathy is one of the leading complications of DM and is the front runner etiology of ulceration as well as leg amputations. Here, the authors attempted to perform a systematic review in order to evaluate the level of current evidence with regards to the predictive importance of the monofilament examination (ME) in anticipating the risk of ulceration and amputation in subjects with DM. Hence, the author’s searched the MEDLINE as well as PubMed database starting from November 2009 for screening the articles related to diabetic foot and SWME without any restrictions for language or publication date. Predictive studies bearing the unique information evaluating the prognostic estimation of the SWME for predicting the foot ulceration or LEA in subjects with DM were admitted in the determination criteria. Information were consistently determined and further dissected by two autonomous researchers to estimate the supreme dangers and relative dangers for every included study. The authors have observed a large number of 863 studies of which they found only nine articles to be relevant. These nine studies comprised of a total of around 11,000 subjects with diabetes mellitus. Among these nine studies, only six studies have evaluated the prognostic value with regards to diabetic foot ulceration. The authors found that the odds of the patients with suspected SWME is 2.5 times higher for developing a diabetic foot ulcer as compared to the patients with a negative SWME over a period of one to four years. Among these nine studies, only three of the studies evaluated the relative risk of amputation of lower extremity for the patients with positive SWME is 1.7 times higher within a follow-up duration of around 1.5 to 3.5 years. Thus, the authors concluded SWME to be an independent marker for the spread of foot ulceration in the future or amputation of legs in the diabetic patients. Hence, it can be considered as evidence-based instrument for identifying the patients who are prone to develop diabetic foot ulcer or amputation of lower extremity, thereby providing the clinicians with an easy cost-effective tool for early interference
and management. Thereby, further researches are required to be carried on shedding light on the relationship among SWME and LEA.

**De Berardis G et al. (2005):** The author attempted to look into the physician as well as patient related practices with regards to foot care in the setting of country specific results due to research program conducted in patients with Type 2 diabetes. The participants were made to respond to a questionnaire looking into whether the patients had experienced any formal education or any sort of information about foot care practices. It also wanted to determine how frequently they had got their examination of foot done in the previous year, and by and large how frequently they generally checked out their feet. The statistical inference was further calibrated for the participants’ case-mix and treating doctor-wise grouping. A total of 3564 patients were enrolled by 125 specialists in various diabetes out-patient clinics (DOCs) and 103 general practitioner clinics (GPs) across the country, of whom a meager 6.8% suffered due to complications of lower limb. The bearing of foot complexities was found to be associated with insulin regimen treatment, smoking cigarette, low degrees of educational qualification, and the bearing of other diabetes related microvascular and macrovascular complications. Approximately half of the patients described that they had not got their feet checked out by their treating physician and around one-third referred that they had not received any sort of foot related education. Patients, who had lower degrees of school education coupled with limited income, as well as obese and overweight individuals, in all likelihood were found as the ones who were to a lesser extent to encounter foot related education. It is interesting to find that healthcare practitioners had a tendency to perform examination of foot more frequently in males, patients belonging to lower income group, patients with previous history of foot complications, and patients who were treated with insulin, but surprisingly the foot examination was noted to be very low in those subset of patients who had the highest risk of foot complications, particularly in those patients with presence of diabetic neuropathy or with peripheral vascular disease (PVD). In most of the instances, the general practitioners tended to perform foot examination less often when compared to the diabetes specialists. Self- foot care examination was found to be performed in only two-third of the patients. The subset of patients who had a prior exposure to foot care education or had got their feet examined were more found to be in all likelihood to check their feet regularly. A significant proportion of Type 2 diabetic patients had not been offered enough foot care, even
when the major risk factors for lower limb complications were present. Finally, the knowledge, attitude and practice of the patient were found to be strongly correlated with the treating physicians’ attitudes. Hence, it can be concluded that the physician to be primarily responsible for the self-foot care related practices demonstrated by the patients.

**Ortegon MM et al. (2004):** - The authors aimed to project the lifetime health as well as the economic implications with regards to optimal prevention and management of the diabetic foot complications in accordance with the international standards and to ascertain the cost-effectiveness of these optimal interventions in the Dutch population. Hence, the authors have developed a risk-based Markov model to imitate the onslaught and advancement of different diabetic foot disease in subjects who were newly diagnosed with type 2 diabetes mellitus and further managed with standard of care according to the guidelines during their lifetime. The author evaluated the mean survival times as well as quality of life index, microvascular complications of foot, and associated costs as the outcome measures. The current standard of care was used as the reference comparison. Data from the other Dutch studies with regards to the epidemiology of diabetic foot complications, health care usage, and the other costs were complemented with the information obtained from published international studies to assess the developed model. The authors found that as compared to the current care, this guideline-based approach of care had led in bettered life expectancy, overall benefit in the quality-adjusted life-years (QALYs) and had reduced the incidence of foot complications. The lifetime costs involved in the management of the diabetic foot complications in accordance with the guideline-based care had led in a cost per QALY benefitted for less than 25,000 US dollars, even at levels of preventive foot care as low as meager 10%. Nevertheless, the cost-effectiveness diverged sharply, depending upon the level of diabetic foot ulcer reduction achieved. The authors thus concluded that management of the diabetic foot complications in accordance with the guideline-based care improves survival, brings down diabetic foot related complications, and is found to be cost-effective and further cost saving as compared to the standard of care.

**Ragnarson Tennvall G, and Apelqvist J. (2001):** - The authors aimed to examine the cost-effectiveness of compounded strategies for prevention of foot ulcers in diabetic patients with different risks categories for foot ulcers as well as lower extremity amputations. The researchers particularly examined whether the extra prevention expenditure associated with the current
recommendations would result in lower costs of developing foot ulcers and amputations in future. The authors have created four risk groups for eight possible health related outcomes by including a population of diabetic patients who are at the highest risk of diabetic foot ulcer. The authors have defined the optimal prevention in accordance with the International Consensus of the Diabetic Foot. The authors have incorporated assumptions of the model, transition of probabilities and other related data in the model based upon the published literature. The main effect measures in the study were cumulative incidences of diabetic foot ulcers, lower extremity amputations and all-cause mortality, associated expenditure, cost-effectiveness of the prevention strategy, and quality-adjusted life years. The authors have found that a compounded prevention strategy letting in patient education, foot care and specialized diabetic footwear is cost-efficient when the risk for foot ulcers and amputations of lower extremity can be decreased by 25%. This finding is valid for all subjects with diabetes who are at increased risk of developing foot ulcer except those patients who possess no specific risk factors. Hence, the authors concluded that allowing for all diabetic patients who are at risk or high risk for developing foot ulcers and lower extremity amputations with decent prevention would be a cost-efficient or even a cost-saving strategy.

Mason J et al. (1999):- The authors aimed to appraise the purpose of prophylactic strategies in bringing down the incidence of foot ulcers in subjects with Type 2 diabetes mellitus, both in the general population as well as in those patients who were identified to be at an increased risk of developing a foot ulcer by carrying out a systematic review and meta-analysis of the different interventions to preclude the occurrence of diabetic foot ulcers. Accordingly, the authors have evaluated the available studies which are in general inadequate in their capability to respond to the vital questions with regards to prevention of foot ulcers. Nevertheless, it has been found that where people with diabetes mellitus had experienced well-coordinated and regular foot care. The complications are further reduced with speedy recommendation to appropriate foot care specialist practicing with multidisciplinary teams when problems or their harbingers are likely to occur, ulcer morbidity can be substantially reduced. The authors finally concluded that foot ulcers are much common in people with diabetes mellitus and are expensive in terms of both patient mortality, morbidity and the use of healthcare resources. Accordingly, the authors suggested that proper foot care in people with diabetes must be devised to allow for monitoring,
proper education and speedy referral in such a manner which is acceptable to the diabetic patients as well as pragmatic for the local healthcare providers.

**Kneepkens T et al. (2006):** Here the authors attempted to develop a process of validating a new patient questionnaire for the foot protection behaviour. They have developed a pilot questionnaire and applied on healthcare professionals who were attending a specialized conference on diabetic foot in the year 2004. The authors aimed to dig into the magnitude to which concerned healthcare professionals would differ in their opinion of what actually constitutes optimal foot care behaviour. The study findings had disclosed surprising disagreements amongst various healthcare professionals with regards to the ‘accurate’ answers to the various options of the questions.

**McInnes A. (2010):** The authors have reported that diabetic foot complications are linked with very high rates of mortality as well as morbidity, still the level of patient awareness with respect to the foot related complications is substantially low. The authors had carried out an online cross-sectional survey in order to find out whether the clinical podiatrists and other associated healthcare professionals would differ in their beliefs with regards to optimal foot health behaviour, and if found to differ which are the specific elements they disagree. The authors had observed inter-professional differences with regards to the opinion on a range of foot care behaviour, including simple methods like toenail cutting. Nevertheless, in the extended absence of trial evidence, the authors have concluded that multidisciplinary consensus should be arrived on basic foot care behaviour in order to furnish a clear, coherent and reproducible advice for patients with diabetes.

**De Berardis G et al. (2004):** The authors looked into various facets with regards to foot care in around 3500 patients with type 2 diabetes recruited in 125 diabetes out-patient clinics and around 100 general healthcare professionals. Around, one-third of the patients announced that they had never undergone examination of their feet. The subset of patients who had previously experienced foot care education were 2.5 times more likely to get their feet re-examined by their treating physician and subsequently more likely to check their feet in a regular manner. Likewise, patients with existing foot complications, but not with peripheral vascular disease and concomitant cardiac-cerebrovascular disease, or diabetic neuropathy, were also more likely to
have their feet examined. The authors concluded that proper attention to foot complications is by and large poor, and a significant proportion of type 2 diabetic patients are not being provided foot education or examination, even in that particular subset of patients demonstrating a substantial increase in the risk of occurrence of diabetic foot related complications. Despite the presence of foot related complications or primary risk factors, only one-fourth of the patients did not pay any sort of attention to recommended foot care practices. Those patients who had previously had an experience of foot care exposure or had their feet examined were substantially more likely to perform self-foot care management. Hence, the study findings underscore the all-important role of healthcare professionals in tailoring patient practices towards optimal foot care.

**Solan et al. (2016):** - The authors here attempted to measure the diabetic foot care attitude in the background of a growth in prevalence of diabetes mellitus (DM). As it is known that DM is associated with many macro and microvascular complications among type 1 and type 2 diabetic patients. Amongst all the complications, foot related complications are the chairing causes of morbidity as well as mortality in upcoming countries. The authors aimed to find out the attitude of foot care among the patients with diabetes who were attending a Diabetic Center in Saudi Arabia. Hence, the authors carried out an observational cross-sectional study among the random sample of 250 patients. They have administered structured validated questionnaires to diabetes patients by their medical students in the hospital. The outcome variables measured were knowledge and practice with regards to foot care. The authors found a very high prevalence of diabetic foot (DF) among both the genders i.e. the males and females as 58.0% and 52.9%, respectively, without any difference between both the genders. Around one-fifth of study sample had reported history of foot ulcer. Almost half of the patients were found to have fair foot care knowledge. The variables namely sex, duration of diabetes and age had no significant correlation with the knowledge of foot care. The male subjects were found to be more compliant to habits like drying of foot by around 65.2%, on the contrary females were found to be applying more focus towards softening of skin by around 72.3%. No differences between male and female subgroups with regards to inspection of foot, toe nail care, proper compliance to medication and shoes check. Thereby the authors concluded that the knowledge as well as practice of foot care to be inadequate among DM patients. Hence the result of the present research has pointed the lacunae in attitude and emphasizes the urgent necessity for a well-disposed patient friendly
educational interference. It is crucial to actuate the function of foot care education to all patients having a direct contact with the patient, in order to downplay the diabetic foot related complications.

Bell RA et al. (2005): The authors of the present study attempted to evaluate the level of foot self-care executed in a rural set-up primarily composed of mixed ethnic population of elderly population in order to identify factors which were correlated with foot self-foot care management. Accordingly, the authors had chosen good number of patients from all over the globe. The authors had found that self-foot care practices or behaviors which have been reported for duration of at least 24 days per month varied from almost one-third to almost 80% for inspection of shoes. Four determinants were found to be demonstrated as how to care of the feet, female sex, having undergone neuropathy examination of the feet by a doctor in the previous year. All of the predictors being at a level of 5%. Hence, the authors concluded that the present study findings suggest that educating the patients with regards to foot self-care management may recommend routine self-foot care for all as well as for those who were depending on either conventional or unconventional support system for performing foot care less often compared to those who are able to perform it independently.

Madarshahian F et al (2014): The authors of the present study studies type 2 diabetic patients who were performing regular physical exercise versus those who did not. Hence, the authors have performed a comparative study on eligible patients, who were further divided into sub-cohorts. The cohort comprising of active individuals (80 patients) performing regular exercise for half an hour. On the other hand, the reference group admitted patients not performing exercise on a regular basis in the previous year. The data of the patients’ mainly demographic parameters was performed in order to appraise the mental functioning of the patients. The authors have found that MMSE score to be much more than active individuals. They also found a significant negative correlation between MMSE scores and BMI in the reference cohort. Nevertheless, no difference was found between the trial and reference cohort. Hence, the authors concluded that regular physical activity can aid in promoting cognitive status as well as self-foot care outcomes.

Bonner T et al. (2016): The author’s performed this systematic review of literature for all the published studies on the foot care functional knowledge and attitude practice management and interventions as an integral part of the diabetic foot care self-care management. The authors had
searched different database namely of randomized controlled trials. The authors have identified references from the studies included in it to identify and review any missing studies that might have been included by mistake. Finally, thirty studies had met the inclusion body criteria and were sorted out according to randomized clinical controlled trial, design of survey, cohort related studies cross-sectional design studies, exploratory qualitative studies as well as case series. Ameliorating complications of lower limb extremity and its related complications being correlated with type 2 diabetes can be done via efficient foot care intercession which admits self-foot care knowledge as well as foot care related practices. Hence, the authors concluded that forbidding these complications by interpreting the lower extremity complication related risk factors and possessing the power to deal with complications beyond the clinical encounter is a crucial part of a diabetes foot self-care management program. Intercessions and exploratory research studies directed to bring down lower extremity or foot related complications are still deficient. Hence, advance research is necessitated to try out self-foot care treatments across multiple ethnicity and populations in various geographical locations.

**Sarkar U et al. (2006):** While previous research work has established that ameliorating diabetes related self-efficaciousness can better self-care management conduct, very little is known with regards to the pertinence of self-efficacy management research across various race/ethnicity. The authors attempted to examine the kinship amongst diabetes related self-attitude and self-care outcomes conduct in a non-rural set-up. Hence, they administered an oral questionnaire in two languages viz. Mandarin and English to type 2 diabetes patients from the urban area. Accordingly, they validated instruments. They also carried out multivariate regression analysis to dig into the connections amongst attitude parameters and self-knowledge factors. The authors found that the connections between knowledge and attitude were reproducible across the ethnicity as well as the health literacy levels. Accordingly, the authors concluded that the self-attitude was connected with prognosis. Proper attempts must concentrate on elaborating the accomplishment of self-care management treatments to admit ethnically various populations all over the array of health literacy.

**Kim G et al. (2015):** The present study tested racial as well as ethnic differences in the kinship between diabetes related self-care efficacies as well as mental distress among elderly population suffering with diabetes mellitus. Hence, the authors have selected around 3000 adults aged more
than 60 years who are suffering with T2DM from a health survey in California and used hierarchical multivariate regression analysis for adjusting the covariates like age, ethnicity which could influence both self-efficacies with regards to diabetes as well as psychological distress. They interestingly found that the consequence of diabetes related self-efficacy on mental distress was higher for the Hispanics or Latinos as well as the Asians rather than non-Hispanic Whites. Hence, the authors concluded that diabetes related self-efficacy is linked with mental distress among the elderly diabetic patients and ethnicity profoundly mediates the relationship between diabetes related self-efficacy as well as psychological distress. Hence, enhancing diabetes related self-efficacy will aid in ethnic minority type 2 diabetes mellitus elderly patients to better their psychological wellbeing to a greater extent.

**Searle A et al. (2005):** - Foot ulcers require a long time to heal, and as a result there are very high chances that non-healing ulcers could be accompanied by wound infection, dry as well as wet gangrene, and finally resulting in amputation of the affected limb. In reality, these ulcers are frequent causes for hospitalization of DM patients. In this recent study, the researchers have demonstrated that diabetes patients with frequently present ulcers do report a more miserable quality of life (QoL) than patients whose ulcers had healed mainly without undergoing amputation of limb. The impingement of lower-limb ulcers on the health related QoL in patients with diabetes and their family members has also been looked into and found to shed a negative effect in all the four domains of health namely social, physical, economical as well as psychological and causing some subsequent negative changes in lifestyle. These effects in abbreviated social activities, enhanced tensions in the family, wastage of time from work life and a damaging impingement on general health. Likewise, the authors reported that people with frequent ulceration in the diabetic foot may have inadequate psychosocial accommodation to illness, elevated levels of depression, and less satisfaction from their personal lives.

**Vileikyte L et al. (2003):** The objective of the present study was to formulate an instrument to appraise the patients' understandings of the effect of peripheral neuropathy as well as foot ulcers on the patient’s QoL and to measure the psychometric attributes of this questionnaire in diabetes patients with different grades of severity and symptoms of peripheral neuropathy. Accordingly, the authors generated the questionnaire by interviewing two groups of patients (amongst which 35% accounted for previous foot ulcers). The psychometric analysis of the instrument namely
Neuro-QoL also admitted factor as well as dimension reduction analyses and measurement of reliability and internal consistency of the developed scale by Cronbach’s alpha. The results obtained were equated with those found after using the brief version of SF-questionnaires. It was unveiled by the authors that 3 physical symptom criteria when coupled with two psychosocial measures have a good reliability (alpha value in the range of 0.86-0.95). The Neuro QoL instruments have been found to be strongly linked with constructs of the neuropathic severity as compared to SF-12, with substantial heightened variance in overall quality of life. Hence, the authors concluded that Neuro QoL could dependably capture the key attributes of DPN patients' and is a vital tool for examining the effect of foot problem on the health-related quality of life in diabetes patients.

_Vileikyte L et al. (2006):_ - The authors here have used a model of illness based common sense behavior; developed and validated it for appraisal of participant’s subjective and enthusiastic theatrics of DPN determining the foot self-care. The questionnaire namely patient interpretation of neuropathy (PIN) questionnaire, developed from opinions given by the clinicians and by conducting interviews with diabetes patients of peripheral neuropathy. The questionnaire was administered in 495 patients of DPN who were being treated in U.K. and U.S. The psychological tests constituted of dimension reduction factor analysis. The factor analysis of the PIN questionnaire produced 11 scales, which demonstrated almost 70% variability in the behaviour of foot behaviour management amongst the type 2 diabetes subjects.

**Summary of review of literature:**

From all of the above-mentioned studies, it is evident that the health-related quality of life is severely affected in patients with type 2 diabetes and co-morbid diabetic foot disease viz. peripheral neuropathy, diabetic foot ulcers, Charcot foot etc. It is also very clear from all the studies that in the quest of achieving a strict glycemic control, the health-related quality of life is compromised primarily due to multiple daily injections to be administered in the subcutaneous region. Another interesting observation is that the diabetes self-management foot care education is also highly negligent in the patients with diabetes mellitus across the globe. The sense of apathy is very high in all sub-type of population namely female, male, economically sound as well as poor. Thus, it is of utmost importance that we have to gauge the quantum of the problem as well as to address the deficiencies with regards to foot care education.