

A STUDY ON DIETARY PATTERN OF DIABETICS AFFECTED WITH DIABETIC FOOT

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Abstract:

AIM & OBJECTIVES:

To study the dietary patterns among hospitalized diabetic patients effected with diabetic foot.

METHODOLOGY:

This is a study of 50 diabetic patients treated in Yashoda hospital, Secunderabad. During the period of January 2018 to April 2018. A protocol was designed for documentation including patient profile, Presence of risk factors, Co-morbidities and Complications, Clinical presentation, Investigations, Treatment given.

Dietary patterns of the hospitalized patients effected with diabetic foot was assessed with the help of 24 hours dietary recall method and structured questionnaire on knowledge, Attitude and practices regarding diabetes was administered to the patients and the data was analysed using Microsoft Excel.

RESULTS:

From the present study it was evident that regarding association of dietary pattern and diabetes, majority of the respondents believed that routine dietary pattern did not predispose to diabetes. Importance of exercise in prevention and control of diabetes was recognized by 32% and role of frequent blood sugar tests was realized by 40% of the respondents. Role of foot examination in prevention and control of Diabetes related diabetic foot was recognized by 20%; but only 4% of the respondents go for detailed foot examination.

INTRODUCTION

Diabetes mellitus is characterized by abnormally high levels of sugar (glucose) in the blood.

When the amount of glucose in the blood increases, e.g., after a meal, it triggers the release of the hormone insulin from the pancreas. Insulin stimulates muscle and fat cells to remove glucose from the blood and stimulates the liver to metabolize glucose, causing the blood sugar level to decrease to [normal levels](#).

In people with diabetes, blood sugar levels remain high. This may be because insulin is not being produced at all, is not made at sufficient levels, or is not as effective as it should be. The most common forms of diabetes are type 1 diabetes (5%), which is an autoimmune disorder, and type 2 diabetes (95%), which is associated with obesity. Gestational diabetes is a form of diabetes that occurs in pregnancy, and other forms of diabetes are very rare and are caused by a single gene mutation.

For many years, scientists have been searching for clues in our genetic makeup that may explain why some people are more likely to get diabetes than others are. "The Genetic Landscape of Diabetes" introduces some of the genes that have been suggested to play a role in the development of diabetes. [1]

COMPLICATIONS

Diabetes is justly recognized as an emerging global epidemic, representing one of the leading causes of morbidity and mortality worldwide. Hyperglycemia, the common characteristic of both type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM), has the potential to cause serious complications due to its insidious and chronic nature. Research has shown that to prevent diabetic complications such as, diabetic neuropathy, nephropathy, retinopathy, macro vascular complications, and miscellaneous complications all can be prevented with early diagnosis.

(a) **Pathogenesis of Diabetic Complications:** There is growing evidence that the underlying mechanisms in the pathogenesis of diabetic complications include oxidative stress created by the overproduction of reactive oxygen species (ROS) and defects in the insulin signal transduction pathway in which ceramide, a bioactive sphingo lipid, may have an important inhibitory effect [2,3].

(b) **Diabetic Neuropathy:** One of the most common complications of diabetes is diabetic peripheral neuropathy (DPN). Moreover, not only can chronic hyperglycemia have various negative effects on the central nervous system, but it can also cause gastroparesis [4,5]. The role of glycemic variability (GV), which is recognized as an important component of the overall glycemic control, in diabetic neuropathy

(c) **Diabetic Nephropathy:** Diabetic nephropathy (DN) is the major cause of end-stage renal disease, although its pathogenesis is not fully understood. Emerging evidence suggests that epigenetic modifications and some microRNAs may play a role in the pathogenesis of DN by altering the expression of several genes and controlling certain intracellular pathways [6,7]

(d) **Diabetic Retinopathy:** Nowadays, the importance of adequate glycemic control in the prevention of diabetic retinopathy (DR) is well established [8]. However, other factors may play a role in the pathogenesis of this complication of diabetes. There are an increasing number of studies on the associations of DR with various polymorphisms of genes such as vascular endothelial growth factor (VEGF) and eNOS gene [9,10].

(e) **Macrovascular Complications:** Prior studies have proposed that measuring biomarkers of atherosclerosis can be helpful in detecting macrovascular complications of diabetes, such as subclinical carotid disease [11].

(f) **Miscellaneous Complications:** Diabetic foot is a major complication of diabetes characterized by the presence of chronic ulcers that often fail to heal. In the pathogenesis of chronic ulcers, matrix metalloproteinases may play a pivotal role [12].

REVIEW OF LITERATURE

Patients with DM are prone to multiple complications such as diabetic foot ulcer (DFU). DFU is a common complication of DM that has shown an increasing trend over previous decades [13,14,15]. In total, it is estimated that 15% of patients with diabetes will suffer from DFU during their lifetime [16]. Although accurate figures are difficult to obtain for the prevalence of DFU, the prevalence of this complication ranges from 4%-27% [17,18,19].

To date, DFU is considered as a major source of morbidity and a leading cause of hospitalization in patients with diabetes. It is estimated that approximately 20% of hospital

admissions among patients with DM are the result of DFU [24]. Indeed, DFU can lead to infection, gangrene, amputation, and even death if necessary care is not provided. On the other hand, once DFU has developed, there is an increased risk of ulcer progression that may ultimately lead to amputation. Overall, the rate of lower limb amputation in patients with DM is 15 times higher than patients without diabetes. It is estimated that approximately 50%-70% of all lower limb amputations are due to DFU. In addition, it is reported that every 30 s one leg is amputated due to DFU in worldwide. Furthermore, DFU is responsible for substantial emotional and physical distress as well as productivity and financial losses that lower the quality of life

PREVENTION OF DIABETIC FOOT ULCERS: GLYCAEMIC CONTROL

Good glycaemic control is important in preventing neuropathy and peripheral vascular disease; two of the important complications predisposing to DFU. The Diabetes Control and Complications Trial (DCCT) in type 1 DM showed that keeping blood sugar levels close to normal slows the onset and progression of eye, kidney and nerve diseases caused by diabetes. It demonstrated that any sustained lowering of blood sugar helps, even if the person has a history of poor control. [28] The UK Prospective Diabetes Study (UKPDS) in type 2 DM showed that good glycaemic control is important, not only for short term well-being of the patient but to prevent the long-term complications. The endpoints of the studies were major clinical events which affect the life and well-being of patients, such as heart attacks, angina, strokes, amputations, blindness and renal failure. [29] These studies also showed that good control of hypertension in diabetic patients was important in reducing long term complications.

PREVENTION OF DIABETIC FOOT ULCERS: SCREENING AND EDUCATION

Education of all diabetic patients about foot care is considered an essential part of every diabetic clinic, however, until recently the evidence to support this has been lacking. The Cochrane database review "Patient Education for Preventing Diabetic Foot Ulceration", published in 2014 concluded that although foot care education translated into better knowledge and positive short term behavior change there was a lack of studies that showed that this impacted on the important clinical endpoints of DFU and amputation.[30] However, in 2015 an important paper was published that showed that, in high risk type 2 DM patients a 2 hour intensive education session led to a significant reduction in DFU over the next 6 months.[31] A pioneering package

of diabetes education, the Step by Step Foot Care Programme was established in Tanzania and is now used worldwide.[32]

Patients should be advised that meticulous attention to foot care and proper management of minor foot injuries are key to preventing ulcer formation. The need for daily feet inspection by the patient (or a caretaker), making an effort not to walk barefooted or get injuries to the feet, not to sit close to heaters or fires, wearing appropriate foot ware prevention of bathroom surgeries at home and avoidance of delays in presenting to hospital at the earliest onset of a foot lesion are the cornerstone of proper foot care. Gentle cleansing with soap and water, followed by the application of topical moisturizers or Vaseline, helps to maintain healthy skin that can better resist breakdown and injury. Good resources for patient education can be found at <http://iwgdf.org/step-by-step/>.

In the clinic the physician or nurse should inspect the patient's shoes for areas of inadequate support or improper fit. Patients should choose the correct shoe size and appropriate footwear (supportive shoes with an adequate toe box) to avoid ulcer formation and those with foot deformities or special support needs benefit from custom shoes. Foot inspection by clinic staff includes testing for neuropathy using a 10g Semmes-Weinstein monofilament or 128Hz tuning fork and peripheral vascular disease, ideally by measuring Ankle Brachial Pressure Indices (ABPIs) if foot pulses cannot be felt. Foot deformity and lesions, including minor lesions such as callus and tinea pedis, should be actively looked for and documented. A simple and quick diabetic foot assessment tool, designed to be completed in 60 seconds can be accessed at http://www.healthychange.ca/assets/files/Inlow_Tool_2010.pdf. [33] By reinforcing preventive advice and inspecting the patient's feet at routine follow-up visits, medical personnel can help the patient develop and maintain good foot-care habits.[34,35]

MANAGEMENT OF MINOR WOUNDS

Minor injuries and infections, such as cuts, scrapes, blisters and tinea pedis, can be unintentionally exacerbated by home remedies, for instance application of traditional medicine to wounds may delay healing. The use of iodine and eusol solutions for wound cleaning is not advised, but rather saline solutions should be used. Tinea pedis can be prevented by good foot hygiene and treated with topical antifungals such as miconazole or, if it is not available, gentian violet. Clinicians and nurses should inspect any minor wounds that do not heal rapidly.

Callus removal

Callus removal is another key step in preventing DFU. Callus is an area of thick, dry skin that develops when skin is exposed to excessive pressure or friction due to pressure on bony areas of the foot, badly fitting shoes and dry skin.

Calluses can lead to pressure necrosis of the underlying tissue and are often less sensitive to touch so if a diabetic gets traumatized around a callused area, they are less likely to notice, which may result in the development of ulcers. Patients are educated on the importance of avoiding bathroom surgery to remove the calluses on their own.

Debridement

Debridement eliminates non-viable tissue from wounds which acts as a barrier to wound repair. The dead skin inhibits the development of healthy new tissue making the affected area more susceptible to infection. The wounds may contain necrotic tissue which may take longer to heal; they may also be colonized with bacteria, producing an unpleasant odor. These necrotic tissues may contain abscesses which can develop into general infection. It is therefore important to debride the wound in order to speed the healing process and avoid the need for amputation. A novel approach to debridement is the application of medicinal maggot therapy. This has been successfully described in a cohort of DFU patients in Egypt. [36]

Antibiotics

In Europe 58% of diabetic foot ulcers are infected at the time of first presentation. [37] Infection rates from Africa are not known but are likely to be similar or higher. Hence, antibiotic therapy is very important in the management of diabetic foot ulcer the initial antibiotic regime is usually selected empirically based upon clinical experience and local preferences; cover of grampositive cocci is essential. Antibiotics are modified on the basis of clinical response and wound culture/sensitivity results. Superficial wound swabs are often misleading as wounds are frequently colonized by non-pathogenic strains, only deep tissue samples, often obtained by debridement, are microbiologically useful.

Amputation

Major amputation (above or below knee) is a last resort and should almost never be needed to manage a diabetic foot ulcer. Debridement may require the removal of necrotic and infected tissue resulting in minor amputation of one or more toes or part of the forefoot but these will leave the patient with a viable foot on which they can still walk, avoiding the devastating personal and economic implications of amputation. This is especially important where artificial

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MANAGEMENT OF DIABETIC FOOT ULCERS

DFU management needs a multidisciplinary approach. Often patients are in denial of their disease and fail to take ownership of their illness along with the necessary steps to prevent complications and to deal with the many challenges associated with the management of DFU.[38] Management of DFU includes optimal blood glucose control, prevention through education, foot inspection and treatment.

DIET AND DIABETES

The beneficial effect of the dietary pattern on diabetes mellitus and glucose metabolism in general and traditional food pattern was associated with a significant reduction in the risk of developing type-2 diabetes. The dietary pattern emphasizes a consumption of fat primarily from foods high in unsaturated fatty acids, and encourages daily consumption of fruits, vegetables, low fat dairy products and whole grains, low consumption of fish, poultry, tree nuts, legumes, very less consumption of red meat.[39,40,41] The composition of diet is one of the best known dietary patterns for its beneficial effects on human health that may act beneficially against the development of type-2 diabetes, including reduced oxidative stress and insulin resistance. High consumption of vegetables, fruits, legumes, nuts, fish, cereals and oil leads to a high ratio of monounsaturated fatty acids to saturated fatty acids, a low intake of trans fatty acids, and high ingestion of dietary fiber, antioxidants, polyphenols. The diets are characterized by a low degree of energy density overall; such diet prevent weight gain and exert a protective effect on the development of type-2 diabetes, a condition that is partially mediated through weight maintenance. Greater adherence to the diet in combination with light physical activity was associated with lower odds of having diabetes after adjustment for various factors.[42,43,44,45,46] On the other hand, a paleolithic diet (i.e., a diet consisting of lean meat, fish, fruits and vegetables, roots, eggs and nuts, but not grains, dairy products, salt or

refined fats, and sugar) was associated with marked improvement of glucose tolerance while control subjects who were advised to follow a diet did not significantly improve their glucose tolerance despite decreases in weight and waist circumference.[47,48,49] People most likely to get diabetes are: People who are overweight, upper-body obesity, have a family history of diabetes, age 40 or older, and women (50% more often than men).

DIETARY APPROACHES TO DIABETES

Food can be powerful in preventing and reversing diabetes. However, dietary approaches have changed as we have learned more about the disease. The traditional approach to diabetes focuses on limiting refined sugars and foods that release sugars during digestion-starches, breads, fruits, etc. With carbohydrates reduced, the diet may contain an unhealthful amount of fat and protein. Therefore, diabetes experts have taken care to limit fats- especially saturated fats that can raise cholesterol levels, and to limit protein for people with impaired kidney function. The new approach focuses more attention on fat. Fat is a problem for people with diabetes. The more fat there is in the diet, the harder time insulin has in getting glucose into the cells. Conversely, minimizing fat intake and reducing body fat help insulin do its job much better. Newer treatment programs drastically reduce meats, high-fat dairy products, and oils. At the same time, they increase grains, legumes, fruits, and vegetables. The study found that patients on oral medications and patients on insulin were able to get off of their medications after some days on a near-vegetarian diet and exercise program. During 2 and 3-year follow-ups, most people with diabetes treated with this regimen have retained their gains. The dietary changes are simple, but profound, and they work.

METHODOLOGY

DESCRIPTION

50 patients with diabetic foot were selected as a part of this study and individual analysis was done from the data obtained from the patient record and also a structured questionnaire was administered with their consent.

PARTICIPANTS:

The study was taken up by 5 students pursuing Post graduate diploma and each one followed 10 diagnosed cases of diabetic foot from one of the reputed Multispecialty hospitals of Hyderabad. Overall 50 subjects were analyzed.

METHOD:

A questionnaire was designed to know the dietary patterns among diabetic patients with diabetic foot. The questionnaire was consisted of 25 questions. Data such as anthropometric measurements, medical treatment plan such as medication or insulin and their dosages taken from medical record, diet habits, knowledge, attitudes and practices among diabetics were recorded. Dietary patterns of the hospitalized patients effected with diabetic foot was assessed with the help of 24 hours dietary recall method and structured questionnaire on knowledge, Attitude and practices regarding diabetes was administered to the patients and the data was analysed using Microsoft Excel.

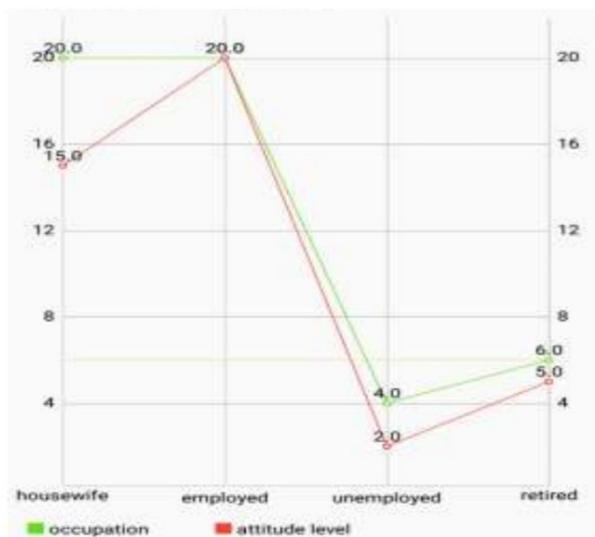
RESULTS AND DISCUSSION

Socioeconomic Profile of respondents: The response rate for the study sample was 100%. Total sample size of this study was 50 respondents. Out of total 50 respondents, 26 (52%) were male and 14 (48%) females. Mean age of the respondents was 62.5 +/-5 years, with minimum age of 20 years and maximum age of 85years.

Table 1: socioeconomic profile of the respondent.

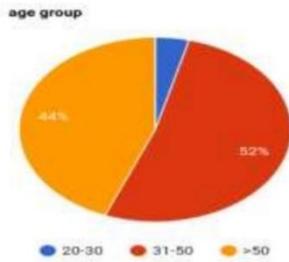
(n= 50)

<u>Gender of respondents</u>	<u>Frequency</u> <u>(No.)</u>	<u>Percentage</u>
Male	26	52%
Female	14	48%
<u>Age of respondents</u>		
20-30 years	2	1%
31-40 years	16	32%
41-50 years	10	20%
> 50 years	22	44%
Total	50	100%
<u>Profession of respondents</u>		
House wife	20	40%
Employed	20	40%
Unemployed	4	8%
Retired	6	12%
Total	50	100%



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The linear relationship of occupation and knowledge/attitude of the respondents is shown in (Fig.1).



Association of mean attitude/ knowledge with respect to occupation of personnel.

Attitude towards diabetes: Out of 50 respondents 42 (84%) believed that diabetes and its complications can be prevented but 16% had either poor or no knowledge of various strategies to do this.

Overall mean score of attitudes towards diabetes was found to be 38.25 on average.

Age group

Percentage of diabetic foot patients based on age group.

The most affected age group (52%) was between the age of 31-50 years.

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Table 2: knowledge regarding diabetes

Table-II shows the respondents claiming to have Knowledge regarding Diabetes (n=50). According to overall scoring of knowledge section, 34.5% of the respondents had poor/no knowledge regarding various aspects of diabetes mellitus, 43.88% of respondents had fair knowledge while only (21.6%) had good knowledge.

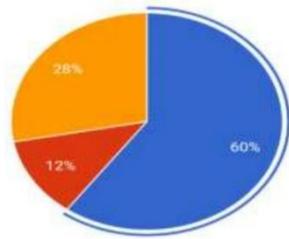
<u>Questions regarding knowledge of Diabetes</u>	<u>Fair Knowledge</u>	<u>No knowledge</u>
What is diabetes?	50 (100%)	-
What is cause of diabetes?	18 (36%)	14 (28%)

Ideal blood glucose range?	36 (72%)	14 (28%)
Proper diabetes management?	24 (48%)	26 (52%)
Best way to assess your diabetes Control	6 (12%)	44 (88%)
What is diabetic neuropathy?	10 (20%)	40 (80%)
Availed diet counseling	50 (100%)	-
Is diabetic foot caused due to uncontrolled diabetes?	24 (48%)	26 (52%)
Importance of maintaining normal blood glucose to prevent diabetes complications	42 (84%)	8 (16%)
Importance of foot care in diabetes	10 (20%)	40 (80%)

Knowledge of Diabetes: Out of 50 respondents no one (0%) were totally unaware about diabetes. Then respondents who claimed to have knowledge of diabetes were asked about the symptoms, causes, complications of diabetes and its possible impact on foot. About 34.5% on average respondents failed to show any knowledge of various aspects of diabetes. Remaining had some knowledge about clinical 43.88% as well as scientific (21.6%) aspects.

MEDICATIONS -

Treatment with insulin or oral medication among diabetics with diabetic foot:



On Insulin (60%)

On Insulin and hypoglycemic drugs (28%)

On hypoglycemic drugs (12%)

Majority (60%)

of them where on insulin.

Table 3

Practices: Various pertinent questions were asked regarding risk, prevention, management of diabetes and Diabetic foot. The responses are mentioned in Table-III.

General practices of respondents

<u>Practice</u>	<u>Percentage</u>
Following proper meal timings	40%
No exercise	68%
High calories between meals	36%
Skipping meals	84%
Inclusion of complex carbohydrates and Vegetables in diet	48%
Regular blood sugar testing	60%
Examination of foot	4%
Following strict diet meal plan to control diabetes	16%

Responding to the question regarding association of dietary pattern and diabetes, 60% of the respondents believed that routine dietary pattern did not predispose to diabetes. Importance of exercise in prevention and control of diabetes was recognized by 32% and role of frequent blood sugar tests was realized by 40% of the respondents. Role of foot examination in prevention and control of Diabetes related diabetic foot was recognized by 20%; but only 4% of the respondents go for detailed foot examination.

SUMMARY & CONCLUSION:

Lack of knowledge of diabetes was found in the surveyed community, more marked in males and employed among the respondents. Poor knowledge and practices regarding diabetes and diabetic foot in the community are important weaknesses to be addressed. Physician seeking habit, regular blood checking habit and visit to diabetologist and dieticians were strengths to be used by the dietitians to educate the respondents.

Suggestion: patients with diabetes and high risk foot conditions should be educated regarding their risk factors and appropriate management. A non-judgmental assessment of persons current knowledge and care practices should be obtained first. Behavioral Change Communication material for Awareness & Education has to be pictorial and method of dissemination has to be audio visual in addition to print media.

Employed (due to lifestyles) illiterate and younger age groups need more attention in any campaign of awareness and education. Role of dietitian in responding properly to the diabetics by creating awareness in the community regarding diabetes and its complication is very crucial. Referral of patients with diabetes to general physician for early screening is important. Physicians should screen every diabetic for Diabetic foot even if not asked. Advocacy of dieticians, physician and diabetologist is very important component of the department.

RECOMMENDATIONS

Diabetes has become a public health problem that seriously influences patients' quality of life. Determination of the glycosylated hemoglobin (HbA1c) level is the gold standard method of evaluating glycemic control in patients with diabetes.

Maintaining the HbA1c level at <7% can significantly reduce the risk of diabetes complications and improve the prognosis. However, to achieve such a goal, patients with diabetes are required to change their lifestyle based on their blood glucose levels and follow a specific treatment regimen to effectively control their fasting blood glucose and postprandial glucose levels.

Self-monitoring of blood glucose (SMBG) helps patients with insulin-treated diabetes to better understand the role of their blood glucose levels in improving glycemic control.

Modern dietary management of diabetes essentially involves modifications of the quality and quantity of food to be taken by the diabetic patient. The following guidelines are applicable to diabetes irrespective of type, weight status, age, gender, or occupation.

- Most of the carbohydrate consumed should be in the form of starch(polysaccharides) such as maize, rice, beans, bread, potatoes etc.
- All refined sugars such as glucose, sucrose, and their products (soft drinks, sweets, toffees, etc.) and honey should be avoided, except during severe illness or episodes of hypoglycemia. These foods contain simple sugar, which is easily absorbed causing rapid rise in blood sugar.
- Non-nutritive sweeteners, e.g., Canderel, saccharine, NutraSweet, aspartame are suitable sugar substitutes for diabetic subjects.
- Protein (fish, meat, beans, crab, crayfish, soyabean, chicken, etc.) and salt are restricted for those with diabetic nephropathy.
- Cigarette smoking should be avoided by diabetic patients. Alcohol should be taken only in moderation.
- Small meals spaced over the day, rather than 1 or 2 big meals, are helpful in avoiding post-prandial peaks in blood sugar.

Goals of MNT that apply to individuals at risk for diabetes or with pre-diabetes

To decrease the risk of diabetes and cardiovascular disease(CVD)by promoting healthy food choices and physical activity leading to moderate weight loss that is maintained.

Goals of MNT that apply to individuals with diabetes

1. Achieve and maintain

- Blood glucose levels in the normal range or as close to normal as is safely possible
- A lipid and lipoprotein profile that reduces the risk for vascular disease

- Blood pressure levels in the normal range or as close to normal as is safely possible
- 2. To prevent, or at least slow, the rate of development of the chronic complications of diabetes by modifying nutrient intake and lifestyle
- 3. To address individual nutrition needs, taking into account personal and cultural preferences and willingness to change
- 4. To maintain the pleasure of eating by only limiting food choices when indicated by scientific evidence.

FOOT CARE:

All individuals with diabetes should receive an annual foot examination to identify high risk foot conditions. This examination should include assessment of protective sensation, foot structure, vascular status and skin integrity.

People with neuropathy should have a visual inspection of their feet at every visit with health care Professionals.

People with neuropathy or evidence of increased plantar pressure will be adequately managed with well fitted walking shoes or athletic shoes and should use foot wear that cushions and redistributes the pressures

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