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LUZ MARINA ALFONSO DUTRA

DESFECHOS CLÍNICOS EM PACIENTES DIABÉTICOS TIPO2 COM ÚLCERA E/OU COMPLICAÇÕES PERIFÉRICAS: UMA ABORDAGEM MULTIDISCIPLINAR

BRASÍLIA, 2019

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Tese apresentada como requisito parcial para obtenção do Título de Doutor em Ciências da Saúde pelo Programa de Pós-Graduação em Ciências da Saúde da Universidade de Brasília.

Orientadora: Profa. Dra. Maria Rita Carvalho Garbi Novaes
Co-orientadora: Profa. Dra Mirian Conceição Moura

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Dedico este trabalho:

à meu pai, Antonio Justino Alfonso.

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Sumário

*“*Corta la vida o larga, todo
lo que vivimos se reduce
a un gris residuo en la memoria”**.**
(Ida Vitale)

DUTRA, Luz Marina Alfonso. Desfechos clínicos em pacientes diabéticos com úlcera e/ou complicações periféricas: uma abordagem multidisciplinar. 2019. 90 p. Tese (Doutorado) – Faculdade de Ciências da Saúde, Universidade de Brasília, Brasília, DF, 2019.

LISTA DE TABELAS

PROGNOSIS OF THE OUTCOME OF SEVERE DIABETIC FOOT ULCERS WITH MULTIDISCIPLINARY CARE

ASSESSMENT OF ULCERATION RISK IN DIABETIC INDIVIDUALS.

SCREENING FOR NEUROPATHY AND PERIPHERAL ARTERY DISEASE AMONG INDIVIDUALS WITH DIABETES MELLITUS TYPE II WITH OR WITHOUT ULCERS BY NURSES DURING SECONDARY CARE

IS IT POSSIBLE TO SUBSTITUTE THE MONOFILAMENT TEST FOR THE IPSWICH TOUCH TEST IN SCREENING FOR PERIPHERAL DIABETIC NEUROPATHY?

SYSTEMATIC LITERATURE REVIEW OF THE DRESSING IN THE TREATMENT OF WOUND INFECTIONS

LISTA DE FIGURAS E QUADROS

PROGNOSIS OF THE OUTCOME OF SEVERE DIABETIC FOOT ULCERS WITH MULTIDISCIPLINARY CARE

ARTIGO 3: SCREENING FOR NEUROPATHY AND PERIPHERAL ARTERY DISEASE AMONG INDIVIDUALS WITH DIABETES MELLITUS TYPE II WITH OR WITHOUT ULCERS BY NURSES DURING SECONDARY CARE.

Systematic Literature Review of the dressing in the treatment of wound infections

Resumo dos trabalhos apresentados:

ARTIGO 1: PROGNOSIS OF THE OUTCOME OF SEVERE DIABETIC FOOT ULCERS WITH MULTIDISCIPLINARY CARE. Arigo publicado na revista - Journal of Multidisciplinary Healthcare - classificado pelo Programa da CAPES - Qualis Medicina II como B2.

ARTIGO 2: ASSESSMENT OF ULCERATION RISK IN DIABETIC INDIVIDUALS. Artigo publicado na Revista Brasileira de Enfermagem - classificado pelo Programa da CAPES - Qualis Medicina II como B3.

ARTIGO 3: SCREENING FOR NEUROPATHY AND PERIPHERAL ARTERY DISEASE AMONG INDIVIDUALS WITH DIABETES MELLITUS TYPE II WITH OR WITHOUT ULCERS BY NURSES DURING SECONDARY CARE. Artigo submetido para a revista - Journal of Advanced Nursing - classificado pelo Programa da CAPES - Qualis Medicina II como B1.

ARTIGO 4: IS IT POSSIBLE TO SUBSTITUTE THE MONOFILAMENT TEST FOR THE IPSWICH TOUCH TEST IN SCREENING FOR PERIPHERAL DIABETIC NEUROPATHY? Artigo submetido para a revista - Indian Journal of Medical Research classificado pelo Programa da CAPES - Qualis Medicina II como B2.

ARTIGO 5: SYSTEMATIC LITERATURE REVIEW OF THE DRESSING IN THE TREATMENT OF WOUND INFECTIONS. Este trabalho está aguardando a atualização de um estudo e será submetido no final de 2019

ARTIGO 6: IDENTIFICAÇÃO E PREDIÇÃO DA POLINEUROPATIA SENSITIVO-MOTORA EM PACIENTES COM DIABETES TIPO 2 UTILIZANDO PARÂMETROS SIMPLES DE ESTUDO DE CONDUÇÃO NERVOSA. Este tranbalho está na fase de avaliação das informações coletadas

RESUMO

Introdução

O diabetes *mellitus* é um distúrbio metabólico caracterizado por hiperglicemia persistente. Atinge proporções epidêmicas, com estimativa de 415 milhões de casos no mundo. As úlceras nos pés constituem o problema mais prevalente, com incidência anual de 2% a 4% em países desenvolvidos e índices mais elevados naqueles em desenvolvimento. Faz-se necessário ressaltar que a abordagem da úlcera no pé por uma equipe multidisciplinar reduz as taxas de amputação. **Objetivo**: Identificar os desfechos clínicos no estudo de pacientes diabéticos com e sem úlcera, na atenção secundária. **Método**: O primeiro artigo foi um estudo de coorte prospectivo analítico que incluiu pacientes com úlcera no pé abaixo do tornozelo em um centro especializado. O segundo artigo teve delineamento transversal e analítico, realizado no ambulatório de referência de diabetes em três hospitais públicos do Distrito Federal; o instrumento utilizado foi a ficha de rastreamento de neuropatia e doença arterial periférica em pessoas com diabetes tipo 1 e 2, utilizadas na Secretaria de Saúde. O terceiro artigo foi um estudo transversal e analítico, com 220 pacientes com e sem úlceras, quanto aos desfechos neurovasculares periféricos em um ambulatório especializado. O quarto artigo apresenta um estudo transversal com 250 pacientes que comparou a eficácia do teste Ipswich Touch Test (IpTT) em relação ao monofilamento de 10 g em indivíduos diabéticos tipo 2. No quinto artigo foi realizada uma revisão sistemática com objetivo de avaliar a eficácia do Askina Calgitrol para o uso de feridas infectadas. **Conclusão**: A prevalência de neuropatia periférica em pacientes diabéticos se encontrou dentro dos valores esperados (49%). A dor neuropática foi prevalente entre os pacientes (63,2%). Foi comprovado que as úlceras mais complexas cicatrizam mais precocemente, porém foi utilizada uma terapia avançada na sua gestão. O tempo médio de cicatrização foi de 10 meses e 21 dias (SD=7,88). A osteomielite foi a única complicação relacionada à amputação (p=0,023). O Índice de Massa Corporal e a osteomielite foram fatores significantes para o atraso na cicatrização, respectivamente (p=0,025/p=0,013), e este primeiro resultado não foi encontrado na literatura. Os preditores mais relevantes para a ulceração foram o descontrole glicêmico, a perda de sensibilidade protetora plantar, a isquemia e a idade. O IpTT apresentou excelente concordância segundo o índice Kappa em relação ao padrão-ouro (0.819/ p<0.001). O último artigo foi uma revisão sistemática

que avaliou o Askina Calgitrol, mas não como cobertura eficiente para o tratamento de feridas infectadas.

Palavras-chave: Diabetes Mellitus; Neuropatia Diabética Periférica; Doença Arterial Periférica; Cuidado Multidisciplinar; Atenção Secundária à Saúde

ABSTRACT

Diabetes mellitus consists of a metabolic disorder characterized by persistent hyperglycemia. It reaches epidemic proportions, with an estimated 415 million people worldwide. Foot ulcers are the most prevalent problem with annual incidence of 2% to 4% in developed countries, and higher rates in developing countries. The approach of foot ulcers by a multidisciplinary team is necessary to reduce amputation rates. **Objective:** To identify clinical outcomes in the study of diabetic patients with and without ulcer in secondary care. **Method:** The first article had a prospective analytical cohort study in a specialized center that included patients with foot ulcer below the ankle. The second cross-sectional and analytical design was carried out at the diabetes reference outpatient clinic in three public hospitals in the Federal District; the instrument used was neuropathy screening and peripheral arterial disease in people with type 1 and 2 diabetes, used at the State Secretariat of Health. The third study was a cross-sectional and analytical study with 220 patients regarding peripheral neurovascular outcomes among patients with and without ulcers performed in a specialized outpatient clinic. The fourth paper was a prospective study with a 250-patient cohort comparing the effectiveness of the Ipswich Touch Test (IpTT) in relation to 10 g monofilament in type 2 diabetic subjects. The fifth article was a systematic review aimed at evaluating the effectiveness of Askina Calgitrol for the use of infected wounds. **Conclusion:** The prevalence of peripheral neuropathy in diabetic patients was within the expected values (49%). Peripheral Arterial Disease was more prevalent (63,2%). It has been proven that more complex ulcers heal earlier, but advanced therapy in ulcer management has been used. The mean healing time was ten months and twenty one day (SD=7,88). Osteomyelitis was the only complication related to amputation (p=0,023). The elevated Body Mass Index

and osteomyelite were significant factors for delayed healing respectively (p=0,025/p=0,013) , this result was not found in the previous literature. The most relevant predictors for ulceration were loss of glycemic control, loss of plantar protective sensitivity, ischemia and age. The Ipswich Touch Test showed excellent agreement according to the Kappa index in relation to the gold standard (0.819/ p<0.001) . It was not possible to show the effectiveness of the Askina Calgitro cover in the treatment of infected wounds.

CAPÍTULO 1 – INTRODUÇÃO

1.1 Considerações Iniciais

O diabetes mellitus (DM) consiste em um distúrbio metabólico caracterizado por hiperglicemia persistente, decorrente de deficiência na produção de insulina, na sua ação, ou em ambos os mecanismos, ocasionando complicações a longo prazo. Atinge proporções epidêmicas, com estimativa de 415 milhões de portadores mundialmente (1). Os gastos mundiais com diabetes em 2015 foram estimados entre US$ 673 e US$ 1,197 bilhão, com projeção para 2040 da ordem de US$ 802 a US$ 1,452 bilhão. Para o Brasil, o custo avaliado em 2015 foi de US$ 22 bilhões, com projeção de US$ 29 bilhões para 2040 (2). A estimativa mundial do gasto anual de um indivíduo para o controle do diabetes, em 2015, foi de US$ 1,622 a US$ 2,886 (1).

Estimativas brasileiras sobre despesas com o tratamento ambulatorial de indivíduos com diabetes no Sistema Único de Saúde (SUS) foram da ordem de US$ 2,108 por indivíduo, dos quais US$ 1,335 (63,3%) são custos diretos (3). O diabetes mellitus tipo 2 (DM2) corresponde a 90 a 95% dos casos de diabetes. Possui etiologia complexa e multifatorial, envolvendo fatores genético e ambiental, e geralmente acomete indivíduos a partir da quarta década de vida (4-5).

A incidência mundial de úlceras nos pés em indivíduos com diabetes mellitus é de aproximadamente 2% a 4%; a incidência cumulativa ao longo da vida é de 25% (6-7) e 85% destas úlceras precedem a amputação (8). Além disso, pessoas com diabetes têm 15 a 40 vezes mais chances de necessitar de amputação em comparação com a população em geral (9).

A neuropatia e a doença arterial periférica são as principais doenças de base que podem resultar em úlceras nos pés, que são uma complicação comum da infecção (10-11). Para identificar um paciente com risco de úlceras nos pés, é necessário rastrear os sinais ou sintomas de neuropatia periférica, ter uma história detalhada de ulceração do pé ou amputação de membros inferiores e verificar a presença de doença arterial periférica ou deformidades nos pés (12-14).

A neuropatia periférica nos pacientes diabéticos apresenta uma prevalência de 26% a 47%, e em particular afeta a função sensorial periférica (15). Assim, quando a neuropatia periférica está presente, há um risco maior de desenvolver uma

úlcera por perda de sensibilidade, trauma externo ou distribuição anormal da pressão óssea interna (2).

A doença arterial periférica (DAP) é outra complicação muito frequente, com prevalência entre 20 e 30% em pacientes diabéticos. Embora seja difícil diagnosticar precocemente as taxas de DAP devido à ausência de sintomas específicos, estudos mostram que há um aumento de três a oito vezes na prevalência e incidência de DAP em pacientes diabéticos comparados com indivíduos não diabéticos (16-18).

As úlceras do pé são consideradas crônicas, e seu progresso e cicatrização dependem da correlação de vários fatores, como idade, presença de infecção, necrose, doença arterial periférica, outras comorbidades, respostas imunológicas deficientes e fatores sociais, como o autocuidado (19-20).

Faz-se necessário ressaltar que a abordagem da úlcera do pé com uma equipe multidisciplinar torna-se necessária para a redução das taxas de amputação (21-22).

CAPÍTULO 2 – OBJETIVOS

2.1 Objetivo geral

Identificar os desfechos clínicos no estudo de pacientes diabéticos com e sem úlcera na atenção secundária.

2.2 Objetivos específicos

- Identificar os fatores de risco para ulceração do pé mediante o rastreamento de neuropatia diabética periférica e doença arterial periférica em indivíduos diabéticos tipos 1 e 2 assistidos em centros de referência;
- Analisar os fatores clínicos relacionados ao rastreamento de neuropatia periférica e doença arterial periférica em indivíduos com diabetes tipo 2 com ou sem úlceras do pé;
- Identificar os desfechos clínicos nos pacientes com úlcera;
- Avaliar a concordância e eficácia do teste Ipswich Touch Test (IpTT) em relação ao teste de monofilamentos em indivíduos com diabetes tipo 2;
- E identificar a eficácia da cobertura Askina Calgitrol para feridas infectadas.

CAPÍTULO 3 – MÉTODO

3.1. Caracterização dos estudos

O primeiro artigo foi um estudo de coorte prospectivo analítico (realizado no período de dois anos), de março a dezembro de 2017, em um ambulatório especializado em pé diabético. O estudo incluiu indivíduos com diabetes tipo 2 que tinham mais de 18 anos de idade e úlceras no pé abaixo do tornozelo, provenientes de cuidados de emergência ou da atenção primária. Foram excluídos indivíduos que apresentavam úlceras venosas, úlceras múltiplas, câncer ou doenças neurológicas e/ou que estavam tomando corticosteroides ou imunossupressores. Foi utilizado o Termo de Consentimento Livre e Esclarecido (APÊNDICE A). Este artigo no está no prelo (APÊNDICE B).

O segundo artigo foi realizado no período de março a dezembro de 2015 em três centros de referência da Secretaria de Saúde do Distrito Federal (SES/DF) em indivíduos diabéticos tipos 1 e 2, e faz parte do objetivo específico do primeiro estudo. Foi utilizada a ficha da atenção secundária padronizada pela Sociedade Brasileira de Diabetes (SBD) e pela SES/DF (ANEXO A). O estudo foi transversal e analítico, e incluiu indivíduos com mais de 18 anos de idade. Os critérios de exclusão abrangiam indivíduos com complicações neurológicas relatadas pelo paciente e confirmadas no prontuário.

O terceiro artigo é um objetivo específico do primeiro, foi um estudo transversal que pretendeu analisar os fatores clínicos em indivíduos com diabetes tipo 2 com ou sem úlceras no pé, rastreando ambos os grupos e comparando os fatores mais prevalentes.

Para o quarto artigo foi realizado um estudo transversal para comparar o Ipswich Touch Test como monofilamento de 10 g. Para medir a precisão dos testes, os pesquisadores analisaram sensibilidade e especificidade, teste de razão de verossimilhança e valores preditivos. Os critérios de inclusão abrangiam indivíduos com diabetes tipo 2 que não apresentavam úlceras ou amputação em nenhum dos dois pés. Foram excluídos pacientes que não apresentassem sequela de acidente vascular encefálico ou patologias neurológicas como esclerose, hipotireoidismo, doença renal crônica ou lúpus eritematoso, pois essas condições clínicas poderiam influenciar ou enviesar os resultados. Este último estudo foi realizado em um centro

de referência em pé diabético em Brasília, DF. Para este estudo foi realizada uma emenda, aprovada pelo Comitê de Ética em Pesquisa da Fundação de Ensino e Pesquisa em Ciências da Saúde (Fepecs).

O quinto estudo foi uma revisão sistemática de avaliação de uma cobertura de feridas infectadas.

3.2 Aspectos éticos

O estudo cumpriu todos os requisitos éticos em pesquisa orientados pela Resolução nº 466, de 12 de dezembro de 2012, do Conselho Nacional de Saúde, que dispõe sobre pesquisas envolvendo seres humanos e aponta que é necessário prever procedimentos que assegurem a confidencialidade e a privacidade, a proteção da imagem e a não estigmatização.

O protocolo de pesquisa foi submetido para avaliação do Comitê de Ética em Pesquisa da Secretaria de Saúde do Distrito Federal (CEP/SES/DF). Foi considerado aprovado e recebeu o Parecer nº 943.133 em 2 de fevereiro de 2015 (ANEXO B), colocando o artigo principal como objetivo geral e os outros como específico. Houve uma emenda em 2017, a fim de acrescentar o objetivo para realizar o Ipswich Touch Test e compará-lo com padrão-ouro, o monofilamento, no rastreamento de neuropatia em pacientes diabéticos tipo 2, sendo aprovado com o Parecer nº 2.166.868, emitido em 10 de julho de 2017 (ANEXO C).

CAPÍTULO 4 – RESULTADOS

Os resultados aqui representados são frutos das reflexões e análises sob diferentes perspectivas do tema abordado e serão apresentados no formato de quatro artigos.

4.1 ARTIGO 1: PROGNOSIS OF THE OUTCOME OF SEVERE DIABETIC FOOT ULCERS WITH MULTIDISCIPLINARY CARE.

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Dutra LMA, Melo MC, Leme LAP, De Carvalho MR, Mascarenha NA, Novaes MRCG. Prognosis of the outcome of severe diabetic foot ulcers with multidisciplinary care. JMH 194969.

Este artigo responde ao seguinte objetivo específico desta tese: avaliar os fatores que afetam os resultados de úlceras graves do pé em diabéticos.

Para se alcançar este objetivo, foi realizado um estudo analítico prospectivo com 34 indivíduos diabéticos com risco de amputação. Para isso foi avaliado o desfecho do acompanhamento de 2 anos de pacientes com úlcera de pé no ambulatório de nível secundário com uma abordagem Multidisciplinar

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ORIGINAL RESEARCH

Prognosis of the outcome of severe diabetic foot ulcers with multidisciplinary care

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Background: Approximately 2–4% of individuals worldwide with diabetes mellitus have foot ulcers. This study aims to assess the factors affecting the outcomes of severe foot ulcers in diabetic individuals.

Methods: An analytical prospective cohort study was conducted from March 1st, 2015, to March 1st, 2017. A total of 34 individuals was selected. The study included patients with foot ulcers below the ankle who were at risk of amputation. All tests used a <5% level of significance and confidence interval of 95%. A Pearson's chi-squared test and binary multiple regression were performed to assess the factors related to healing.

Results: Only 11.7% of the individuals required amputation; ulcers classified as 2/B according to the University of Texas Diabetic Foot Ulcer Classification System healed before the 1/B ulcers. Neuropathic ulcers were the most prevalent (58.8%); 61.8% healed after 1 year. Most of the individuals were overweight, 47.1% had reduced glomerular filtration rates, and 78.8% had glycated hemoglobin >7%. Body mass index and osteomyelitis were the two significant variables in logistic regression.

Conclusions: In this study, osteomyelitis was the main complication related to the risk of amputation, and elevated body mass index and osteomyelitis were the significant factors that induced a slower healing time.

Keywords: diabetes mellitus, diabetic foot, diabetes complications, multidisciplinary care

Introduction

The worldwide incidence of foot ulcers in individuals with diabetes mellitus is approximately 2–4%; the cumulative incidence throughout life is 25%, and the prevalence is 4–10%.[1,2] Additionally, people with diabetes are 15 to 40 times more likely to require lower-leg amputation compared to the general population.[3]

Neuropathy and peripheral artery disease are the main underlying diseases that may result in foot ulcers, which are a common complication of infection.[4,5] Foot ulceration that results in amputation hinders the quality of life while increasing morbidity and mortality; in addition, the treatment is expensive.[6] The lifetime risk for foot ulceration in people with diabetes is 15–25%.

In Brazil, which has a population of 7.12 million individuals with type II diabetes, an estimated 484,500 individuals present with ulcers, of whom it is estimated that approximately 81,000 require amputation each year and many will progress to death.[5]

Foot ulcers are considered chronic and their progress and healing depend on the correlation of several factors, such as age, the presence of infection, necrosis, peripheral artery disease, other comorbidities, deficient immune responses, and

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social factors such as self-care.[7,8] In light of the increased prevalence of diabetes in Brazil and the consequent increase in complications, including the risk of ulceration, that require management in which nurses play a key role, this study aims to assess the factors influencing the outcomes of foot ulceration in diabetic individuals.

Methods

Design, setting, and patient characteristicsDesign, setting, and patient characteristics

An analytical prospective cohort study was conducted from March 1st, 2015, to March 1st, 2017, in a center specializing in diabetic foot care, in Brasília, Brazil. The study included individuals with type II diabetes who were over 18 years old and had foot ulcers below the ankle that were classified under the Texas classification as either serious or infected, with a risk of osteomyelitis/amputation, proceeding from emergency or primary care. The following were excluded: individuals with venous ulcers, multiple ulcers, cancer, or neurological diseases and/or who were taking corticosteroids or immunosuppressants.

Data collection and measures

A total of 41 individuals was selected for the study, of whom 4 abandoned treatment and 3 died, leaving 34 individuals. In this work, a simple random sampling scheme, without replacement, was used to estimate populational proportions. The sample size was calculated with a sampling error of 5%. While the annual incidence of total ulcers in the population was 4%, we estimated a rate of 2% at this specialized level and calculated a sample size of 32 patients.

These patients were treated by a multidisciplinary team made up of an endocrinologist, neurologist, nutritionist, nurse and psychologist. Ulcers were evaluated according to the recommendations of the International Consensus on Diabetes, which uses the Texas Ulcer Classification as a standard. In this consensus, the ulcers were evaluated according to depth, vascular insufficiency, and infection.[9]

Protective plantar sensation was evaluated using Semmes-Weinstein monofilament testing (10 mg), vibration sensation with a 128-Hz tuning fork, thermal sensation with the handle of a tuning fork, and the Achilles reflex with a rubber hammer. To identify the risk of Peripheral Artery Disease, the Ankle-Brachial Index (ABI) was calculated using a manual continuous wave Doppler.

The evaluation of the ulcer was undertaken by the researcher and by trained nurses. Frequent debridement of nonviable tissue was undertaken by the nurses. Surgical interventions were only used in deep ulcers. Ulcer monitoring was carried out weekly in this center, with medication review, tissue evaluation and photographs.

The ulcers were also classified as neuropathic (absence of protective plantar sensation) ischemic (ABI below 90, or absence of a pulse), or neuro-ischemic.[10] Infection was diagnosed based on IWGDF[4] recommendations after considering the clinical characteristics and markers such as C-reactive protein (CRP) and the erythrocyte sedimentation rate (ESR). All the patients had a plain radiograph of the foot and, in the event of suspected osteomyelitis, magnetic resonance imaging was undertaken, although the Probe-to-Bone test was used for diagnosis of osteomyelitis.[4] Regarding management of the ulcer, negative pressure therapy was used in individuals whose ulcers were deeper and with exudate. The patients were followed over a two-year period, although the cutoff period for assessment of healing or amputation was 1 year. Healing was defined as the restoration of tissue over 2 consecutive evaluations. Other clinical findings were also studied, such as weight and waist circumference. The reference parameters for BMI were classified as normal (18.50–24.99), overweight (≥25.00), pre-obese (25.00–29.99), obese (>30.00), obese class I (30.00–34.99), obese class II (35.00–39.99), and obese class III (≥40.00).[11,12] The Cockcroft-Gault equation was used to estimate glomerular filtration.[13]

Multidisciplinary approach

All clinical patients referred to the Referral Center for diabetes and diabetic foot care were classified as a priority because they were considered to be at potential risk of amputation.

Usually, these patients came from primary care and emergency care.

All of the involved professionals had more than 5 years of experience in that health unit.

The first analysis was performed by the physician-endocrinologist and the nurse, who assessed the risk of amputation of the patient.

The evaluation was comprehensive and involved performing screening tests for the diagnosis of neuropathy, diagnosis of peripheral arterial disease, as well as ulcer management, including cleaning and debridement,

treatment, classification by the Texas scale, blood tests and X-rays or RNM of the foot.

Subsequently, the patients were referred to the nutritionist and psychologist. The nutritionist performed the nutritional diagnosis and orientation in an individualized way, recorded the anthropometric measures, and calculated the Body Mass Index (BMI).

The psychologist carried out the psychotherapeutic and psychoeducational accompaniment, stimulating adherence to the treatment.

Referrals to other specialists, such as social service, vascular surgery, etc., were performed as needed.

The evaluations of each professional were shared through the electronic medical record.

Subsequently, the team discussed the patient's clinical data and adopted behavior to elaborate the plan of care, respecting the patient's reality, expectations, and preferences for better adherence to treatment, which were focused on self-care.

Health education was carried out in a monthly group format with ulcer patients, with at least ten meetings planned annually.

While the contents were not predetermined, they were discussed previously with the patients and their families, to motivate more protagonism and adherence to treatment.

The contents were varied and included the prevention of complications, measures of promotion, self-care, counting of carbohydrates, and prevention of depression, among others.

The management of and approach to the ulcer were performed weekly, the nutritional evaluation was performed monthly, and the psychological follow-up was performed bimonthly.

After being discharged because the ulcers healed, the patients returned monthly to the diabetic-foot outpatient clinic because they were classified as being at high risk of reulceration.

If the final outcome was amputation, the patient was referred to the vascular surgery outpatient clinic because they were post-surgical and needed to be followed by another team.

Despite the weaknesses that the center's service presents, we can highlight positive factors, such as the patient's immediate acceptance into the center, team expertise, regular and multiprofessional follow-up, permanent health education with active participation of the patients and families, that were determining factors for amputation avoidance (Figure 1).

Data analysis

The study was divided into data description, tests of association and multiple logistic regression. The level of significance used in this study was 5%. The quantitative variables are presented as minimum values, maximum values, means and standard deviations (Table 2). The chi-squared test with a Monte Carlo simulation was used to assess possible associations between the Texas scale, osteomyelitis and healing (<1 year and >1 year). The variable of healing time did not present with a normal distribution per the Kolmogorov-Smirnov statistical test (p-value <0.001), so the nonparametric Kruskal-Wallis test was used to compare the healing time in each Texas scale category (Figure 2). Finally, multiple binary logistic regression was undertaken (Table 4).

Ethical considerations

This work was approved by the ethics committee of the Health Sciences Education and Research Foundation, Brazil, under Certificate n. 943,133. This work was conducted in accordance with the Helsinki Declaration, and all participants signed a written informed consent form.

Results

The study started with 41 individuals, but 4 left during the study follow-up, and 3 passed away; the final sample had 34 individuals (Table 1).

The most frequent ulcers encountered were those classified as 2/B according to the Texas classification, which are infected wounds with exposure of the tendon and capsules, although 64.7% of the patients did not have osteomyelitis. In 90.6% of the cases, antibiotics were used due to the high prevalence of infection. A minority of the patients required amputation and 45.5% had reulceration at a different location of the foot. Neuropathic signs, such as dry skin, fissures, mycoses, and deformities, were prevalent on all patients. There was a greater prevalence of overweight (41.2%) and class II obesity (20.6%), and 47.1% of the patients presented with a slightly reduced glomerular filtration rate.

The quantitative variables are presented with the minimum, maximum, mean, and standard deviation (Table 2).

The mean healing time was 10 months and 21 days. The GFR was mildly decreased in 47.1% of the patients; the mean GFR was 88.24. In 53.1% of the patients, the hemoglobin level was below the reference values, which is a sign of anemia. The mean glycated hemoglobin was

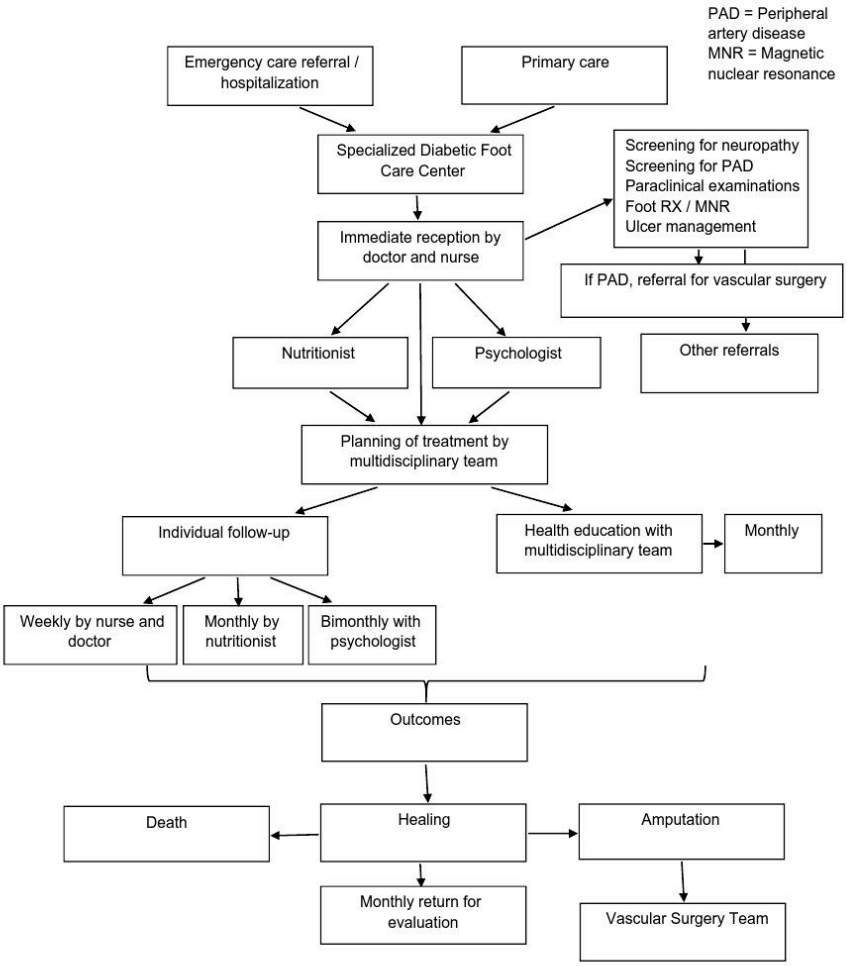

Figure 1 Flowchart of multidisciplinary approach.

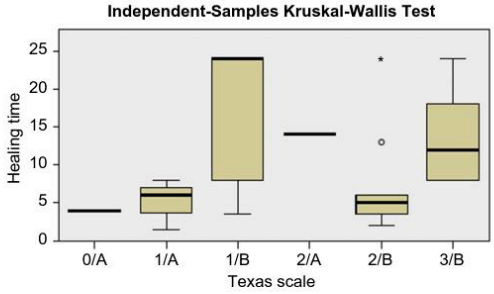

Figure 2 Independent-samples Kruskal–Wallis test between the Texas scale and healing time.

8.13%, and 78.8% of the patients had a glycated hemoglobin level above the mean normal value for glycated hemoglobin (7%). However, most of the patients had desirable total cholesterol (61.3%), desirable triglycerides (60.7%), and optimal LDL (60.7%), but low HDL (70.4%), because they were already undergoing treatment.

The deformities investigated were cavus foot, Charcot foot, valgus foot, and claw toes; 47.6% of the individuals did not have any deformity, 26.4% had claw toes, 11.76% had Charcot foot, and 14.7% had valgus foot and other deformities. Overall, 90.1% of the individuals were treated with antibiotics, while 88.2% had mixed microbiota. The

Table 1 Sociodemographic and clinical variables of the individuals with foot ulcers in a referral center for diabetes in Brasilia, Brazil, 2015–2017 (Total sample, N=34)

Variable	n	Absent	%	Variable	n	Absent	%
Work				**Osteomyelitis**			
Active	20	0	58.8	Yes	12	0	35.3
Retired	14		41.2	No	22		64.7
Schooling				**Previous ulcer**			
Elementary	17	0	50	Yes	21	0	61.8
High School	15		44.1	No	13		38.2
Higher Ed.	2		5.9	**Healing**			
Lives alone				<1 year	13	0	38.2
Yes	4	0	11.8	>1 year	21		61.8
No	30		88.2	**Debridement**			
Comorbidities				Yes	33	0	97.1
Yes	31	0	91.2	No	1		2.9
No	3		8.8	**Amputation**			
Previous amputation				Yes	4	0	11.7
Yes	9	0	26.5	No	30		88.3
				Reulceration			
				Yes	15	1	45.5
				No	18		54.5
No	25		73.5	**Use of antibiotics**			
Previous examination				Yes	30	1	90.1
Yes	16	0	47.1	No	3		9.09
No	18		52.9	**Dry skin, fissures, callosity**			
Place of the ulcer				Yes	28	0	82.4
Calcaneus	1	0	2.9	No	6		17.6
Dorsum	2		5.8	**Mycosis**			
Metatarsus	13		38.2	Yes	16	0	47.1
Toes	11		32.3	No	18		52.9
Midfoot	7		20.6	**Deformities**			
				Yes	18	0	52.9
Use of insulin				No	16		47.1
Yes	16	0	47.1	**Loss of protective plantar sensitivity**			
No	18		52.9				
Smoking				Yes	30	0	88.2
Yes	4	0	11.8	No	4		11.8
No	30		88.2	**BMI**			
Use of alcohol				Normal	6	0	17.6
Yes	11	0	32.4	Overweight	14		41.2
No	23		67.6	Class I obesity	6		17.6
Ulcer classification				Class II obesity	7		20.6
Without complications	3	0	8.8	Class III obesity	1		2.9
Neuropathic	20		58.8	**Glomerular filtration rate**		0	
Neuroischemic	11		32.4	Normal	12		35.3
ABI				Slightly reduced	16		47.1
Ischemic	11	0	32.3	Moderately reduced	3		8.8
Normal	10		29.4	Severely reduced	1		2.9
Calcification	13		38.2	Renal Insufficiency	2		5.9
Texas classification							
0/A	1	0	2.9				
1/A	4		11.8				
1/B	8		23.5				

(*Continued*)

Table 1 (Continued).

Variable	n	Absent	%	Variable	n	Absent	%
2/A	1		2.9				
2/B	13		38.2				
3/B	7		20.6				

Notes: ABI was categorized as ischemia (<0.90), normal (0.90–1.30), and calcification (>1.30); BMI was classified as normal (18.50–24.99), overweight (≥25.00), pre-obesity (25.00–29.99), obesity (>30.00), class I obesity (30.00–34.99), class II obesity (35.00–39.99), and class III obesity (≥40.00); GFR (ml/min/1.73 m^2) was categorized as normal (≥90), slightly reduced (60–89), moderately reduced (45–59), severely reduced (15–29), and renal insufficiency (<15).
Abbreviations: ABI, ankle-brachial index; BMI, body mass index; GFR, glomerular filtration rate.

Table 2 Clinical and laboratory data of individuals with foot ulcers in a referral center in Brasilia, Brazil, 2015–2017

Variables	Minimum	Maximum	Mean	Standard deviation
Age	31.00	80.00	58.85	11.19
Time since diagnosis (years)	0.67	35.00	15.64	9.83
Healing time (months)	1.50	24.00	10.21	7.88
Initial BMI	21.61	45.71	29.18	6.19
Final BMI	21.00	45.62	29.92	5.86
Waist circumference	73.00	140.20	101.79	17.17
ABI	0.00	2.50	1.18	0.51
GFR	12.60	211.50	88.24	45.57
Hemoglobin	8.70	28.50	12.88	3.49
Red blood cells	8.30	315.00	45.50	49.78
Platelets	122.00	785.00	290.34	118.20
HbA1c	4.50	10.70	8.13	1.37
Total cholesterol	88.00	264,00	178.29	45.77
CRP	0.40	24.00	5.01	5.88
Triglycerides	70.00	334.00	143.43	69.12
LDL	17.00	209.00	93.86	51.37
HDL	28.00	245.00	57.70	42.50

Abbreviations: BMI, body mass index; ABI, ankle-brachial index; GFR, glomerular filtration rate; HbA1c, glycated hemoglobin; CRP, C-reactive protein; LDL, low-density lipoprotein; HDL, high-density lipoprotein.

most common medications used were carbamazepines, including ertapenem and meropenem, in addition to ciprofloxacin associated with clindamycin. Only 11.7% of the individuals took antibiotics for gram-positive organisms (cephalexin and benzetacil).

Although most of the patients (23) had an increase in BMI during the study, there was no significant statistical difference between the initial and final values (p-value=0.060); the test used was the Wilcoxon test for paired samples.

The chi-square test was used to assess the association of the Texas scale with osteomyelitis and healing (<1 year and >1 year); there was no statistically significant correlation (osteomyelitis, p-value=0.074; healing, p-value=0.081). This means that the Texas scale was not different for groups with or without osteomyelitis and with healing times <1 year or >1 year.

The healing time was also compared based on all levels of the Texas scale (Figure 2). This analysis showed that there was a statistically significant difference in the healing time between at least two levels of the Texas scale (p-value=0.036). There was a significant difference between patients with 1/B and 2/B ulcers (p-value=0.048), in which the healing time was significantly higher for the patients classified as 1/B in relation to those classified as 2/B. There was no significant difference among the other groups.

The relationship of several variables with amputation (yes or no) and healing (<1 year and >1 year) was also investigated, and the odds ratio was calculated. The Pearson chi-square test was used to evaluate the association between the variables. Only osteomyelitis and amputation had a statistically significant association (p-value=0.023), which means that patients with osteomyelitis required significantly more amputations. No patient with osteomyelitis

Table 3 Factors associated with risk of healing (<1 year and >1 year) and amputation (yes or no) among individuals with foot ulcers in a referral center in Brasilia, Brazil, 2015–2017

	Healing (<1 year or >1 year)		Amputation (yes or no)	
Variables	Odds ratio	*p*-value	Odds ratio	*p*-value
Lives alone	–	0.260	–	1.000
Previous amputation	0.376	0.397	1.048	1.000
Osteomyelitis	0.268	0.158	–	0.023
Previous ulcer	0.343	0.267	–	0.290
Mycosis	1.061	0.934	1.231	1.000
Deformities	0.779	0.724	0.271	0.550
Loss of the protective plantar sensitivity	0.500	0.974	–	1.000
Glycated hemoglobin	0.833	1.000	0.818	0.872

required amputation; therefore, the odds ratio was not calculated (Table 3).

After the selection of variables, 2 explicit and significant variables remained: BMI and osteomyelitis. The odds ratio for BMI was 1.113, while for osteomyelitis it was 0.107. We can interpret this as meaning that with each increase in one unit of BMI, the patient presents with a 1.113 higher probability of their ulcer taking more than one year to heal. Osteomyelitis (categorical variable) was divided as yes (1) or no (2). Therefore, patients without osteomyelitis (2) presented with 0.107 times greater chance of taking more than one year to heal the foot, which means mathematically the inverse; that is, patients with osteomyelitis (1) had a 1/0,107=9.34 higher

Table 4 Logistic regression analysis of the healing response (<1 year and >1 year) in individuals with foot ulcers in a referral center in Brasilia, Brazil, 2015–2017

Logistic regression with all variables								
	B	**SE**	**Wald**	***df***	**Sig.**	**Exp(B)**	**95% CI for EXP(B)**	
							Lower	**Upper**
Age	−0.010	0.058	0.032	1	0.859	0.990	0.883	1.110
Lives alone	42.526	29,228.190	0.000	1	0.999	$2.94*10^{18}$	0.000	.
Amputation	−0.604	1.816	0.111	1	0.739	0.546	0.016	19.192
TEXAS classification	0.623	0.574	1.178	1	0.278	1.865	0.605	5.749
Osteomyelitis	−1.127	1.319	0.730	1	0.393	0.324	0.024	4.297
BMI	0.190	0.110	2.982	1	0.049	1.210	1.065	1.502
Previous ulcer	0.319	1.464	0.047	1	0.828	1.375	0.078	24.263
Mycosis	−0.363	1.227	0.087	1	0.767	0.696	0.063	7.705
Deformities	−0.770	1.420	0.294	1	0.588	0.463	0.029	7.490
LPPS	20.868	24,173.348	0.000	1	0.999	$1.15*10^{9}$	0.000	.
ABI	0.007	1.707	0.000	1	0.997	1.007	0.035	28.597
Ulcer classification	0.163	1.705	0.009	1	0.924	1.176	0.042	33.279
HbA1c	−0.376	0.437	0.741	1	0.389	0.687	0.292	1.616
Constant	−107.242	79,617.266	0.000	1	0.999	0.000		
Backward stepwise regression								
	B	**SE**	**Wald**	***df***	**Sig.**	**Exp(B)**	**95% CI for EXP(B)**	
							Lower	**Upper**
Osteomyelitis	−2.238	0.899	6.193	1	0.013	0.107	0.018	0.622
BMI	0.107	0.048	5.010	1	0.025	1.113	1.013	1.222

Abbreviations: BMI, body mass index; LPPS, loss of protective sensation; ABI, ankle-brachial index; HbA1c, glycated haemoglobin; B, beta; SE, standard error; Wald, wald test; Sig., statistical significance; Exp(B), exponential beta; CI, confidence index.

probability of their foot ulcer taking more than a year to heal in relation to those without osteomyelitis.

Discussion

This study, conducted in a referral center, shows that despite adverse situations hindering self-care, such as low education level, deep ulcers and decompensated diabetes, it is possible to avoid amputations when care is provided by a multidisciplinary team specialized in the care of the foot. Only 12.1% of the patients required amputation in association with osteomyelitis. The multidisciplinary approach is a key factor in decreasing reulceration and thus reducing the amputation rates, as previous studies have demonstrated.[14,15] In 61.8% of the cases, the healing time was longer than 1 year. The average healing time was 10 months and 21 days, and 45.5% of the patients had reulceration in this period. Reulceration has been reported previously,[16,17] and its incidence varies from 42% to 77.03%, regardless of the use of adequate shoes.[17,18] Other studies suggest that individuals with peripheral neuropathy and previous ulceration present with a rise in plantar pressure when compared with patients with neuropathy but with no history of ulceration, which may explain the reulceration.[19]

The most frequent site of ulcers in this study was the metatarsus, followed by the toes. In the TEXAS classification, 2/B ulcers, with exposure of the tendon and capsules, were the most common infection. The healing time was significantly higher for the patients with more superficial ulcers without exposure of the tendon and capsules (Texas 1/B) when compared to more severe cases, such as 2/B. This may be due to foot discharge, a key point in self-care, since individuals with superficial ulcers may not take the necessary rest and continue to wear inappropriate shoes. On the other hand, individuals with larger ulcers presented better diabetes self-care management and rest because of their higher risk of amputation. The more severe ulcers (2/B and 3/B) were treated with vacuum therapy since patients had more exudate. Previous research has demonstrated the efficacy of this therapy in chronic foot ulcers[20] because it improves the growth of granulation tissue and reduces edema, bacterial growth and infection, thus decreasing the risk of amputation.[21,22] In addition to increasing tissue perfusion, this technology encourages rest and foot discharge because it hinders walking.[23]

In order to manage the ulcerations, weekly surgical debridement was performed on almost every patient by trained nurses. A requirement for ulcer healing is the distribution of pressure and adequate debridement.[24] When performed systematically, debridement is probably as important as the suspension of plantar pressure to reduce the inflammatory reactions of a wound.[16] A randomized study has reported a significantly higher healing rate in centers where surgical debridement was performed.[25] In this study and in other research conducted in Brazil, ulceration was more prevalent among men (64.7%), which may be related to an active life as family providers and, consequently, to a lower attendance of medical appointments and worse control of the disease and the wound.[26]

Most of the patients were at risk of ulceration because they had already been diagnosed with neuropathy. Therefore, they lacked protective plantar sensation and deformities, which are key aspects of ulceration, and other signs, such as dry skin, fissures, and callosities. Neuropathic ulcers were the most prevalent, followed by neuro-ischemic ulcers (ABI below 0.90). Multicenter studies in Latin America and other countries have also demonstrated the prevalence of neuropathic ulcers,[26] in contrast with European multicenter studies where ischemic or neuro-ischemic ulcers were the most prevalent.[27] Peripheral artery disease was less frequent than neuropathy; 32.4% of the individuals had neuro-ischemic ulcers with ABI <0.90. In the Eurodiale multicenter study, 50% had peripheral artery disease, and 12% had critical ischemia.[26]

The infection diagnosis was clinical and also based on non-specific inflammatory markers, such as ESR and CRP, which were used for laboratory monitoring, mainly in cases of osteomyelitis. An elevated ESR or CRP indicates sensitivity to bone infection; however, evidence is still scarce, and there is no consensus about laboratory capacity for the diagnosis of osteomyelitis;[28] therefore, osteomyelitis was diagnosed with magnetic resonance imaging. Given that the majority of the participants in this study were outpatients, ertapenem was prevalent because it can be used in outpatient care and has a broad spectrum; other studies have treated osteomyelitis surgically.[29] Amputations were associated with osteomyelitis, and the risk of amputation for patients with osteomyelitis was 3.625 times greater than for those without osteomyelitis. This result differs from a retrospective study that described the depth of the wound as a predictive factor.[26] Another prevalent factor found in this investigation was that an increase of one unit in BMI was associated with a 1.113 times higher probability of a patient's foot ulcer taking longer than one year to heal. Although no study considering this outcome was found, it is known that individuals

with increased BMI and waist circumference are at higher risk for heart diseases and mortality.[30,31]

Although all the individuals in this study were followed by a nutritionist, most of them had gained weight by the end of the study. The gain was not significant and may have been influenced by the recommendation of absolute rest and time off work. A retrospective study has shown that patients with ulcers and neuropathy have higher mortality from ischemic heart disease.[32] An HbA1c level <7% is an international recommendation to avoid ulceration;[23] however, in this study, the average HbA1c was 8.13%, similar to the findings of other research. Other studies have found that HbA1c levels above the goal (>9) are an independent risk factor for reulceration. Most of the patients, however, did not receive insulin. Intensified glycemic control may decrease amputations and microvascular diseases, but there is no evidence that it reduces mortality.[33] Despite the overweight rates, the lipid and triglyceride levels of most of the patients were normal because they were undergoing medical treatment.

Limitations

This study presented two limitations. The first is related to the restricted number of participants involved. Despite the relevant information collected and the prospective follow-up, we cannot exclude the possibility that the results could vary with a larger sample size. The second limitation is that the study was conducted in the only specialized center that offers care to diabetic patients with foot ulcers in the city of Brasília. This means that certain sociodemographic characteristics and specific diseases may vary according to each region of the country, although people assisted in this center come from different locations, including other states.

Despite these limitations, this was the first prospective study using this approach that was performed in the city of Brasília. All the data collected assisted our team in identifying the factors that may influence the outcome of ulceration and the need to strengthen specialized teamwork.

Conclusion

Although some outcomes were present, such as low education level, infection, neuropathic ulcer, uncontrolled blood glucose levels, and reduced glomerular filtration rate, only 11.8% of the patients in this study required amputations. The more complex ulcers healed earlier, which may be related to more advanced therapy in the management of the wounds and better self-care, due to the risk of amputation. Osteomyelitis was the only complication related to the risk of amputation and – with raised body mass index – was significantly related to a delay in healing. The mean healing time was 10 months, although 61.8% healed after one year. In spite of the factors that limited healing, it is possible to state that having a multidisciplinary team specialized in caring for the diabetic foot is essential for avoiding amputations, as, in spite of there being deep and complex ulcers, few patients required amputation.

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Author contributions

All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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4.2 ARTIGO 2: ASSESSMENT OF ULCERATION RISK IN DIABETIC INDIVIDUALS.

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Este artigo responde ao seguinte objetivo específico desta tese: Identificar os fatores de risco para ulceração do pé mediante o rastreamento de neuropatia diabética periférica e doença arterial periférica em indivíduos diabéticos tipo I e II assistidos em centros de referência do Distrito Federal, Brasil.

Para se alcançar este objetivo, foi realizada um estudo analítico transversal, com avaliação de 117 indivíduos diabéticos atendidos em ambulatórios da SES Distrito Federal.

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RESEARCH

Assessment of ulceration risk in diabetic individuals

Avaliação do risco de ulceração em indivíduos diabéticos

Evaluación del riesgo de ulceración en los individuos diabéticos

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ABSTRACT

Objective: To identify the risk factors for foot ulceration through the tracing of diabetic peripheral neuropathy and peripheral arterial disease in individuals with type I and II diabetes, who were assisted in reference centers of the Federal District, Brazil. **Method:** a cross-sectional and analytical study, with the assessment of 117 individuals in outpatient clinics of the Federal District. Continuous variables were compared through *Mann-Whitney* test, and categorized variables, through Chi-square test for univariate analysis and Logistics regression test for multivariate analysis. **Results:** painful diabetic peripheral neuropathy was present in 37 (75.5%) of the individuals with neuropathy. Deformities and loss of protective plant sensibility were related to neuropathy (p = 0.014 and p = 0.001, respectively). Of the 40 (34.2%) individuals in the sample who presented peripheral arterial disease, 26 (65%) presented calcification risk. **Conclusion:** signs of painful peripheral polyneuropathy, peripheral arterial disease, deformities, loss of protective plantar sensibility, and dry skin were identified as risk factors for ulceration.

Descriptors: Diabetes mellitus; Diabetic neuropathies; Peripheral arterial disease; Nursing care; Secondary attention to health.

RESUMO

Objetivo: Identificar os fatores de risco para ulceração do pé mediante o rastreamento de neuropatia diabética periférica e doença arterial periférica em indivíduos diabéticos tipo I e II assistidos em centros de referência do Distrito Federal, Brasil. **Método:** estudo transversal e analítico, com avaliação de 117 indivíduos em ambulatórios do Distrito Federal. As variáveis contínuas foram comparadas por meio do teste de *Mann-Whitney*, e as variáveis categorizadas, dos testes de qui-quadrado para análises univariadas e regressão logística para análises multivariadas. **Resultados:** a neuropatia diabética periférica dolorosa esteve presente em 37 (75,5%) dos indivíduos com neuropatia. Deformidades e perda de sensibilidade protetora plantar tiveram relação com neuropatia (p = 0,014 e p = 0,001, respectivamente). Dos 40 (34,2%) indivíduos da amostra com doença arterial periférica, 26 (65%) apresentaram risco de calcificação. **Conclusão:** identificados sinais de polineuropatia dolorosa periférica, doença arterial periférica, deformidades, perda de sensibilidade protetora plantar e pele seca como fatores de risco para ulceração.

Descritores: Diabetes Mellitus; Neuropatias Diabéticas; Doença Arterial Periférica; Cuidados de Enfermagem; Atenção Secundária à Saúde.

RESUMEN

Objetivo: Identificar los factores de riesgo para la ulceración del pie de acuerdo con el rastreo de neuropatía diabética periférica y la enfermedad arterial periférica en los individuos diabéticos tipo I y II asistidos en los centros de referencia del Distrito Federal, Brasil. **Método:** Estudio transversal y analítico, con la evaluación de 117 individuos en ambulatorios del Distrito Federal. Las variables continuas fueron comparadas por medio de la prueba de *Mann-Whitney*, y las variables categorizadas, de las pruebas de chi cuadrado para los análisis univariados y la regresión logística para los análisis multivariados. **Resultados:** La neuropatía diabética periférica dolorosa estuvo presente en 37 (el 75,5%) de los individuos con neuropatía. Las deformidades y la pérdida de sensibilidad protectora plantar tuvieron relación con la neuropatía (p = 0,014 y p = 0,001, respectivamente). De

los 40 (el 34,2%) individuos de la muestra con enfermedad arterial periférica, 26 (el 65%) presentaron riesgo de calcificación. **Conclusión:** Identificadas las señales de polineuropatía dolorosa periférica, la enfermedad arterial periférica, las deformidades, la pérdida de sensibilidad protectora plantar y la piel seca como los factores de riesgo para ulceración.
Descriptores: Diabetes Mellitus; Neuropatías Diabéticas; Enfermedad Arterial Periférica; Cuidados de Enfermería; Atención Secundaria a la Salud.

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INTRODUCTION

An individual with a diabetic foot is under risk of ulceration, infections and/or destruction of deep tissues that are associated with neurological changes, several degrees of peripheral vascular disease and/or metabolic complications of diabetes in the lower limbs[1]. Because of this elevated risk of complications, health promotion and harm prevention actions become necessary. The incidence of feet complications in individuals with *diabetes mellitus* (DM) over a lifetime is estimated to be between 15% and 25% and, every minute, three amputations occur in people with DM worldwide[2]. Foot ulcerations are the most prevalent problem, with an annual incidence from 2% to 4% in developed countries, and higher incidence in countries under development. According to multicentered studies, the most crucial factors underlying the development of feet ulcers are sensory neuropathy, peripheral feet deformities related to motor neuropathy, foot trauma, and peripheral arterial disease (PAD)[3-4].

The tracing test for diabetic peripheral neuropathy (DPN) and PAD has a high degree of national and international recommendation, for presenting evidence on prevention of lacerations, ulcers, and amputations in diabetic individuals[5]. DPN has, as symptoms, numbness or burning sensations in the lower limbs, tingling, pricking, shocks, pains that can develop into deep pain, allodynia, and hyperalgesia; moreover, and more frequently, the decrease or loss of tactile, thermal, or painful sensibility. It can also be asymptomatic[3].

Another chronic complication with high prevalence is the PAD, which affects 50% of the DM patients, being five to ten times more frequent in this population than in people with no DM. From the individuals affected by it, 25% to 50% may be asymptomatic or show atypical symptoms, 30% have intermittent claudication, and only 20% present the severe form of the disease, which may evolve to critical ischemia[6-7].

In Brazil, the National Program of Diabetes is responsible for actions of health promotion and protection, harm prevention, diagnosis, treatment, rehabilitation, and maintenance of health. The diabetic individual should be assisted by a multiprofessional team and, in such assistance, the nurse develops health education activities in primary and secondary healthcare, establishes strategies for preventing harms, identifying risk factor and complications, and encouraging the adherence to treatment[8].

Considering the high rates of neuropathic complications and PAD in Brazil and worldwide, combined with the scarcity of research on the topic, this study aimed to identify the risk factors to foot ulceration, through the tracing of diabetic peripheral neuropathy and peripheral arterial disease in individuals with type I and II diabetes who were assisted in reference centers of the Federal District, Brazil.

OBJECTIVE

This study aimed to identify the risk factors to foot ulceration, through the tracing of diabetic peripheral neuropathy and peripheral arterial disease in individuals with type I and II diabetes who were assisted in reference centers of the Federal District, Brazil.

METHOD

Ethical aspects

The study followed the recommendations of Resolution No. 466/2012 of the National Health Council. It was approved by the Research Ethics Committee of the Foundation for Education and Research in Health Sciences from the Federal District and conducted in accordance with the ethical standards required.

Study design, place and period

A cross-sectional and analytical study, performed at the reference outpatient clinic of three public hospitals of the Federal District, from March to December 2015. The instrument used was the tracking sheet of DPN and PAD in people with type 1 and 2 diabetes (DM1 and DM2), validated by the Brazilian Society of Diabetes[9] and standardized by the Secretary of State for Health of the DF (SES/DF).

Sample and inclusion and exclusion criteria

The selected population comprised 134 diabetics who conducted examinations, of which 117 composed the sample: 27 individuals with DM1, and 90 with DM2. Inclusion criteria were: patients with DM1 or DM2 referred to DPN and PAD tracking and assisted at the secondary level. The exclusion criteria were patients with peripheral or central neurological disease, whose information was incomplete in the electronic medical records.

Study protocol

The tracking assessment was performed by nurses with experience in this type of care and trained for this purpose. Training of this professionals was conducted by the Brazilian Society of Diabetes with SES/DF. Such training aimed to reduce the risk of bias in the instrument application and to guide the interviewers' procedures in order to homogenize the nursing behavior, as well as to avoid misinterpretations that could compromise the results.

In the electronic medical record, information regarding time and type of DM, associated diseases such as systemic arterial hypertension, and glycated hemoglobin (HbA1c) values were collected. The evaluated clinical findings were: dilated vessels, dry skin, cracks, interdigital and nail mycosis, callosity, and edema, followed by evaluation of loss of plant sensitivity. Regarding the evaluation method, the individuals were questioned about discomfort or pain in the legs or feet.

Neuropathic symptoms and signs were extracted from the tracing sheet, in which are also described the information of clinical findings that identify deformities and the assessment of protective plant sensitivity loss. Thus, questions were asked, accompanied by the following answer possibilities: 1) What is the feeling on your feet or legs? (A) Burning, numbness, and tingling (2 points); (B) Fatigue, cramps, or pain (1 point); (C) Asymptomatic (0 points); (2) Which is the most frequent location? (A) Feet (2 points); (B) Leg (1 point); (C) Other location (0 points). (3) When do the symptoms occur? (A) During the night (2 points); (B) During the day and night (1 point); (C) Only during the day (0 points); (4) Ever woke up at night because of the symptoms? (If the person wakes up at night with symptoms, 1 additional point); (5) What relieves the symptoms? (A) Walking (2 points); (B) Standing up (1 point); (C) Sitting or lying down (0 points). The sum of points leads to the following symptoms classification: from 0 to 2 points, normal; 3 to 4 points, mild; 5 to 6 points, moderate; and from 7 to 9 points, severe.

In the assessment of neuropathic symptoms, the Achilles reflex exam and the test of vibratory, thermal, and painful sensitivity were performed. Achilles reflex was classified as absent (2 points for each foot); present at reinforcement (1 point for each foot); and present (0 points). Vibration was classified in: decreased or absent (1 point for each foot) or present (0 points). Pain was assessed considering the scores 1-2 (normal) and from 3 to 9 (ranges from mild to severe pain). Temperature was assessed and classified as diminished or absent (1 point for each foot) or present (0 points). The sum of the points allowed ranking the signs in the scale: from 0 to 2 points, normal; 3 to 5, mild; 6 to 8, moderate; and from 9 to 10, severe.

In addition to this classification, the evaluation of Visual Analogue Scale (VAS) was used to measure the intensity of the neuropathic symptoms, being 0 the value for when the person reported no pain and 100 mm the worst pain possible. After obtaining information from VAS and from symptoms and sign scores, the DPN was classified as: 1) painful diabetic polyneuropathy when the scores of symptoms were equal or greater than 5 and the neuropathic scores of signs were equal or greater than 3; 2) diabetic polyneuropathy with ulceration risk when the scores of signs were equal or greater than 6, with or without symptoms; and 3) asymptomatic diabetic polyneuropathy when the patient presented only the scores of signs. Neuropathic pain was considered only when the scores of symptoms were equal or greater than 5 and the VAS was equal or greater than 40 mm.

The evaluation instruments were: for vibration perceptions, a tuning fork 128 Hz; *Semmes-Weinstein* monofilament (10 g) for Plantar Protective Sensibility (PPS); a pick for painful stimulus; cold metal for thermal sensitivity evaluation; and hammer for Achilles reflex. For assessment of PAD, we resort to Arm-Ankle Index (AAI), using a manual 8 MHz Doppler of continuous waves. Interval of AAI between 0.90 and 1.30 was considered normal. The AAI under 0.9 determined the presence of PAD, and values over 1.30 were considered suggestive of arterial calcification[9].

Analysis of results and statistics

Data were presented through relative frequencies for qualitative variables, and through measures of central tendency for quantitative variables. Continuous variables were compared through *Mann-Whitney* nonparametric test. For categorized variables, Chi-square association tests were conducted for univariate analysis and generalized linear models. Multivariate analysis was assessed with binomial distribution and logit binding functions (logistic regression), using the *Akaike Information Criterion* (AIC) as a criterion for model selection. Initially, the complete model (all covariates) was considered and, through *stepwise* algorithm, the model with lowest AIC was reached, indicating the variables which contributed significantly to the likelihood, and, consequently those that possessed an explanation factor with response variable (PAD, DPN). In the final model, the variables that presented a p-value of $p < 0.05$ (alpha) were considered significant, estimating their chance ratio. The analyses were performed in the R environment of statistical computing, version 3.1.2.

RESULTS

Prevalence and classification of DPN are exposed in Table 1. Of the 117 individuals in the sample, 68 (58.1%) showed no DPN; from those, 43 (63.2%) presented no neuropathic pain. In other words, they presented symptoms but no clinical signs. Painful DPN was present in 37 individuals (75.5%) of the sample.

Table 1 – Classification of diabetic peripheral polyneuropathy, Health Secretariat Hospitals of the Federal District, Brasília, Brazil, 2015

Variable	n (%)
DPN*	
Yes	49 (41.9)
No	68 (58.1)
Present DPN*	
Asymptomatic (signs only)	10 (20.4)
Ulcer risk †	2 (4.1)
Painful ‡	37 (75.5)
Absent DPN*	
Neuropathic pain§	43 (63.2)
Without neuropathic pain	25 (36.7)

*Note: *Diabetic peripheral polyneuropathy; † score of signs ≥ 6, with or without symptoms; ‡ score of symptoms ≥ 5 and score of neuropathic symptoms ≥ 3; § score of symptoms ≥ 5, VAS ≥ 40.*

The assessed deformities (Table 2) were clawed fingers, cavus foot, Charcot foot and valgus. Individuals with no deformities had a higher tendency not to present DPN (p=0.1065) than those with deformity (p=0.0148), because the frequencies distribution was not homogeneous. Loss of protective plantar sensibility proved to be an influential factor for DPN (p<0.001). Prayer sign was not a common trait among the individuals. Regarding scores of symptoms, 43 (36.8%) had mild symptoms and 51 (43.65%) presented no signs. The VAS, which assesses the intensity of the symptoms, showed that 83.8% felt an intensity which was equal or greater to 40 mm. However, this isolated variable showed no relation to pain and DPN. PAD had no relation to DPN and neuropathic pain. In addition, from the 34.2% with PAD, 65% had an AAI greater or equal to 1.30, with calcification risk.

According to Table 3, the mean age of the sample (50.8 years) was a relevant factor for PAD (the null hypothesis at the level of 5% was rejected, concluding that age and PAD held association). Time of DM presented a statistically significant relation with PAD. Although most individuals have HbA1c superior to 7% or 53 mmol/mol, and meantime of 12 years of DM, 59.1% presented no statistical significance correlation to DPN and neuropathic pain. Many individuals exhibited risk 1 and 2 of ulceration, being recommended monitoring from three to six months with a specialized team.

To assess the relation of stratified clinical signs with DPN and neuropathic pain, generalized linear models were adjusted with logistic regression, as it can be seen in Table 4. The adjustment diagnosis of the model was done through simulated envelopes for the residuals. Considering an initial model with all the variables, AIC was used. In both cases, the model with the lowest AIC was composed only by the variable of dry skin, the only one to possess significant explanation (at 5% level) on DPN and neuropathic pain. Concerning PAD, no variable was significant, leading to the conclusion that they exert no influence on it, which resulted in a null model.

Table 2 – Clinical evaluation and classification of scores of neuropathic symptoms and signs, and peripheral arterial disease, Health Secretariat Hospitals of the Federal District, Brasília, Brazil, 2015

Variables	n (N=117)	%	DPN ‡ *p* value	Neuropathic pain *p* value
Deformity			0.0148	0.1065
Yes	48	(41)		
No	69	(59)		
PPS*			< 0.001	–
Present	56	(47.8)		
Absent	61	(52.2)		
Prayer sign			0.8450	0.999
Yes	43	(36.7)		
No	74	(63.3)		
Score of symptom			–	
Normal (0–2)	15	(12.8)		
Mild (3–4)	21	(17.9)		
Moderate (5–6)	43	(36.8)		
Severe (7–9)	38	(32.5)		
Score of signs			–	–
Normal (0–2)	51	(43.6)		
Mild (3–5)	42	(35.9)		
Moderate (6–8)	23	(19.6)		
Severe (9–10)	1	(0.9)		
VAS†			0.9999	0.9800
Lower than 40	19	(16.2)		
Equal or greater than 40	98	(83.8)		
Arterial disease			0.9207	0.1957
Yes	40	(34.2)		
No (0.90–1.30)	77	(65.8)		
Arterial disease			–	–
Yes (AAI ≤ 0.90) &	14	(35)		
Yes (AAI ≤ 1.30)	26	(65)		

*Note: ‡ Diabetic peripheral polyneuropathy * Loss of Protective Plant Sensitivity – conclusions at the significance level of 5%, according to Chi-square test; † Visual Analogue Scale; &Ankle-Arm Index.*

Table 3 – Association estimates of demographic and clinical data, Health Secretariat Hospitals of the Federal District, Brasília, Brazil, 2015

Variable	n (%)	Mean + deviation	DPN‡ *p* value	Neuropathic pain *p* value	PAD* *p* value
Age, years	5.8 + 13.8		0.767	0.4861	0.0344
Adult (18 to 59)	58 (49.6)				
Older adult (≥ 60)	59 (50.4)				
†DM type 1	27 (23.08)				
DM type 2	90 (76.92)				
Arterial Hypertension					
Yes	87 (74.00)				
No	30 (26.00)				
Diabetes Mellitus		12.46±8.5	0.2907	0.903	0.0306
Time/year†					
0 to 5	30 (25.65)				
6 to 10	30 (24.65)				
Over 10	57 (48.70)				
HbA1c		8.25+1.8	0.3281	0.9899	0.1172
<7	28 (24.00)				
≥7	89 (76.00)				

To be continued

Table 3 (concluded)

Variable	n (%)	Mean + deviation	DPN‡ *p* value	Neuropathic pain *p* value	PAD* *p* value
Ulceration risk[&]					
0	15 (12.80)				
1	48 (41.00)				
2	41 (35.00)				
3	12 (10.60)				

*Note: ‡ Diabetic peripheral polyneuropathy; * Peripheral arterial disease; †Diabetes Mellitus; [&]0: without DPN and PAD; 1: polyneuropathy, but with no evidences of deformities or PAD; 2: neuropathy with PAD or presence/absence of DPN; 3: history of ulcer or amputation*

Table 4 – Logistic regression measures of the feet clinical inspection regarding diabetic peripheral neuropathy, neuropathic pain, and peripheral arterial disease. Health Secretariat Hospitals of the Federal District, Brasília, Brazil, 2015

Variable	χ^2	F.D[&]	Initial model *p* value	Final model *p* value
DPN*				
Vessels	0.50	1	0.4762	–
Ringworm	0.33	1	0.5600	–
Dry skin	3.37	1	0.0661	0.0233
Callosity	0.63	1	0.4255	–
Edema	0.77	1	0.3786	–
Neuropathic pain				
Vessels	1.39	1	0.2379	–
Ringworm	0.04	1	0.8308	–
Dry skin	4.16	1	0.0413	0.0209
Callosity	0.76	1	0.3827	–
Edema	0.09	1	0.7585	–
PAD[#]				
Vessels	1.14	1	0.2857	–
Mycosis	1.03	1	0.3098	–
Dry skin	0.02	1	0.9879	–
Callosity	0.03	1	0.9868	–
Edema	0.05	1	0.817	–

*Note: [&] Freedom degree * Diabetic peripheral polyneuropathy; [#]Peripheral Arterial Disease; Decision criteria via AIC, through stepwise selection*

DISCUSSION

The DPN and PAD were prevalent in the individuals investigated and, despite being frequent complications, they are often underreported; when present, they increase the risk of ulceration and amputation, as well morbidity and mortality[9-10]. The prevalence of DPN can range from 2% to 50%, being found in Brazil a prevalence of 50.9%[10-11]. Diabetic peripheral neuropathy is the most prevalent among the neuropathies, constituting a risk factor that precedes ulceration; its severity depends on disease evolution, time with diabetes, and glycemic disarray. Regarding DM type, the prevalence rates of DPN may vary from 8% to 54% in people with DM 1, and from 13% to 46% in those with DM 2[8].

In this study, the prevalence of DPN showed results that were similar to other studies. Many people who did not present neuropathy suffered from neuropathic pain, that is, they had symptoms but no signs, such as tactile, thermal, and painful sensibility alteration, as well as reflex alterations. From the individuals evaluated, 69.3% had a therapeutic indication of neuropathic pain, with VAS equal or superior to 40, and symptoms with scores equal or superior to 5, being 36.8% of mild degree and 32.3%, severe.

Concerning the severity of the neuropathic symptoms found in this study, the results were similar to those of an international study, carried out in Toronto, which applied a numerical scale of neuropathic pain, resulting in 15.7% to 36.4% of mild symptoms; 13.8% to 57.1% of moderate pain; and 10% to 35% of severe pain[11-12]. Peripheral neuropathic pain is normally considered moderate to severe and is more frequent at night, which may lead to sleep disorders. Moderate pain may evolve to cutaneous allodynia, adversely affecting the quality of life of the individuals, in particular in the productive phase. It can also be cause for disruption of social and recreational activities, being associated with depression[11-13].

Dry skin was an important sign in the feet clinical inspection, not only for individuals who showed neuropathy, but also for those suffering neuropathic pain. Anhidrosis and dry skin are related to sensory neuropathy, which is associated with the impairment of the neurovegetative nervous system[13-14]. If not prevented or treated, they can make the skin scaly and cracked, which favors ulceration and the entry of micro-organisms, in addition to subsequent infections[14-15].

Deformities were also factors in association with DPN, which is related to motor neuropathy. These deformities, in conjunction with dry skin, constitute a potentializing risk factor for the foot ulcer. The mean of HbA1c values was above the recommended goals, with 75.2% of the individuals with DM 2 presenting 64 mmol/mol in a meantime of 12.46 years.

Glycemic control is an important recommendation to avoid chronic complications such as neuropathy, besides micro and macrovascular compromises[5,15]. However, the intensive glycemic control is more effective in preventing the progression of neuropathy in patients with DM 1 and DM 2. For each percentage point of decrease in the level of glycated hemoglobin, studies showed a reduction of 35% in the risk of chronic complications [16]. According to this study, the mean HbA1c found was 8.25%, meaning that most individuals were off the target set by the Brazilian Society of Diabetes, which would be below 7%[6].

Time of DM and age were factors associated with PAD. People with DM are twice as likely to have PAD when compared with those nondiabetics, being PAD a risk factor for higher amputation incidence. In addition, the proportion of

individuals with ischemic component has been demonstrated to be a causal factor of ulcer development in up to 50% of those with this disease[16-17]. A difficulty is that 40% of this population is asymptomatic, which slows the clinical diagnosis and raises the risk of ulceration and amputation[17-18].

Although PAD was not diagnosed in most individuals, the calcification of arteries was a prevalent factor, with AAI greater than 1.30, leading to a risk of cardiovascular diseases. A study points out that the main etiologic factor is arteriosclerosis[18-19]. The presence of PAD, even if asymptomatic, represents a marker of systemic vascular disease, involving coronary, brain, and renal vessels, and leading to a greater risk of heart attack, vascular accident, and death[8]. A study conducted in Brazil reports that the prevalence of PAD in people with DM was 13.7% (10/73), of which 9.6% showed calcification[19-20]. The results of this study emphasize the importance of the early tracking of PAD as a prevalent complication in diabetic individuals, as it allows the nurse to identify the need for referral to a specialized professional for the diagnosis, monitoring, and treatment, thus reducing the ulceration risk.

Other comorbidities, such as systemic arterial hypertension, were present in 74% of the individuals. This is a medical condition that is usually associated with DM 2, which leads to a higher risk of cardiovascular diseases and mortality[6]. Such association leads to the development of nephropathy, retinopathy, and diabetic cardiomyopathy, since systemic arterial hypertension increases the risk of micro and macrovascular injuries, raising, in turn, the risk of PAD[19,21]. However, these complications were not object of this study. Despite national and international consensus reporting the importance of tracing foot complications, this recommendation was singled out as the most neglected among health professionals worldwide[5,16].

Limitations of study

The limitations of this study are: lack of early investigation of hemoglobinopathies, which can interfere with the value of HbA1c; the cross-sectional design that does not allow temporal relations among variables; and the fact of the diabetic individuals had been referred to tracing when they already presented a sign or symptom of neuropathy or PAD.

Contributions to the farea of nursing and public health

The found results represent a relevant contribution to the field of nursing, because they confirm the importance of nurse's planning in the prevention of permanent complications to the diabetic individual, through the implementation of a protocol of performance and education in health by a multidisciplinary team. The implementation of such protocol ensures the quality integral care of the individual, which should be strengthened with systematized actions involving conducts directed to the nursing process. Such conducts, in turn, must consider the cultural context of the individual in the development of a nursing care plan. This study is the first to be held in Brazil by the application of a recommended and validated instrument to identify ulceration risk in the consultations carried out by nurses to diabetic individuals.

CONCLUSION

The prevalence of DPN found in this study was similar to what is reported in the literature; however, PAD had higher prevalence. In addition to these ulceration risk factors identified in the tracing, other findings were assessed in the clinical evaluation, such as deformity, dry skin, and loss of protective plantar sensibility. Dry skin was associated not only with DPN, but also with individual with neuropathic pain and no neuropathy. The tracing of DPN and PAD should be carried out at the primary level of care because it promotes faster access to specialists and the performance of tests with greater accuracy for the treatment. Ulceration risk tracing, from the primary care, is relevant in improving diagnosis and reducing complications such as ulceration and amputation.

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4.3 ARTIGO 3: SCREENING FOR NEUROPATHY AND PERIPHERAL ARTERY DISEASE AMONG INDIVIDUALS WITH DIABETES MELLITUS TYPE II WITH OR WITHOUT ULCERS BY NURSES DURING SECONDARY CARE.

Este artigo foi submetido na revista **Journal of Advanced Nursing** e aguarda a avaliação dos revisores. Esta revista está idexada nas bases PubMed, AMED: Allied & Complementary Medicine Database (British Library), British Nursing Database (ProQuest), CINAHL: Cumulative Index to Nursing & Allied Health Literature (EBSCO Publishing), Health Research Premium Collection (ProQuest), Health Source Nursing/Academic (EBSCO Publishing) MEDLINE/PubMed (NLM) ProQuest Central (ProQuest), Public Health Database (ProQuest), PubMed Dietary Supplement Subset (NLM), SCOPUS (Elsevier), classificado pelo Programa da CAPES - Qualis Medicina II como B1.

Dutra LMA, Melo MC, Moura MC, Bastos CR, Leme LAP, Vieira PC, Novaes MRCG, Screening for neuropathy and peripheral artery disease among individuals with diabetes mellitus type II with or without ulcers by nurses during secondary care. JCN 2019-0273.

Este artigo responde ao seguinte objetivo específico desta tese: Analisar os fatores clínicos relacionados ao rastreamento de neuropatia periférica e doença arterial periférica em indivíduos com diabetes tipo II com ou sem úlceras do pé.

Para se alcançar este objetivo, foi realizado um estudo analítico transversal com 220 indivíduos diabéticos tipo II.

Article type : Original Article

Screening for neuropathy and peripheral artery disease among individuals with diabetes mellitus type II with or without ulcers by nurses during secondary care.

Word count: 2912 (excluding abstract and reference list)

Running title: screening of complications of type II diabetes

Abstract

Aims and objectives: To analyze the clinical factors related to screening for peripheral neuropathy and peripheral artery disease among individuals with type II diabetes with or without foot ulcers.

Background

To identify a patient at risk of foot ulcers, it is necessary to screen for signs or symptoms of peripheral neuropathy and to check for the presence of peripheral artery disease or foot deformities.

Design

A transverse and analytical study was conducted in patients with type II diabetes with or without ulcers.

Methods

Data were collected between March 2017 and June 2018 by nurses. The Age, diabetes duration, glycated hemoglobin value (HbA1c) and body mass index (BMI) were assessed. Participants were recruited in a specialist outpatient center within the secondary level of care. The sample included 220 adults with a 95% Confidence Index (CI). To maintain rigor in the research, it was used STROBE checklist as a tool to support this.

Data analysis

Pearson's chi-square test for independence was used in a unidimensional approach followed by logistic regression. A significance level of 5% and a 95% confidence interval.

Results: Each unit increase in glycated hemoglobin increases the chance of having an ulcer by 1.259, and the loss of protective plantar sensation increases the probability of observing an ulcer by 2.45. Patients with ischemia have a probability of

having an ulcer that is 4.84 times greater than that of patients without vascular compromise. A one-unit reduction in age increases the probability of having an ulcer by 1.042.

Conclusions*:* The clinical predictors in the multivariate regression analysis in the group with ulcers were uncontrolled blood glucose levels as evidenced by changes in glycated hemoglobin, loss of protective plantar sensation, presence of ischemic signal, and age.

Relevance to clinical practice

Failures in the process of permanent health education as well as failure to track the foot from primary care increases the risk of complications, ulceration and amputation.

Keywords: Advanced Nursing, Adult Nursing, Advanced Nurse, Chronics Illness, Clinical, Clinical Nurse Specialist, Clinician Researcher, Diabetes, Diagnosis, Evidence - Based Practice.

Introduction

Diabetes incidence is increasing more rapidly in socioeconomically developing regions such as Latin America or Southeast Asia than in Western Europe and North America (Alangh, Chiu, & Shah, 2013; Wild, Roglic, Green, Sicree, & King, 2004). It is therefore appropriate to investigate the clinical and epidemiological characteristics in Brazil related to the complications resulting from diabetes, such as peripheral neuropathy and peripheral artery disease. It is estimated that 15–25% of adults with type II diabetes (DM II) develop complications such as foot ulcers at some point in their lives. These cause approximately 70% of nontraumatic amputations worldwide (D'Souza et al., 2016; International Diabetes Federation, 2013).

Background

To identify a patient at risk of foot ulcers, one needs to screen for the signs or symptoms of peripheral neuropathy, take a detailed history of foot ulceration or lower limb amputation, and check for the presence of peripheral artery disease or foot deformities (Apelqvist, Bakker, Van Houtum, Nabuurs-Franssen, & Schaper, 2000; Bus et al., 2016).

Peripheral neuropathy is the most common of neuropathies and affects the extremities. In particular, it affects peripheral sensory function. Accordingly, when peripheral neuropathy is present, there is a greater risk of developing an ulcer through loss of sensation, external trauma, or abnormal distribution of the internal bone pressure. Prevalence may vary between 26% and 47% in the diabetic population (Hwang et al., 2018).

Peripheral artery disease (PAD) is another highly frequent complication with a prevalence between 20 and 30% in diabetic patients. Its cumulative incidence is 45% 20 years after diagnosis with diabetes. Although it is difficult to diagnose the rates of PAD at an early stage due to the absence of specific symptoms, large-scale population studies have shown that diabetes is associated with a three- to eight-fold increase in the prevalence and incidence of PAD in diabetic patients compared with nondiabetic individuals (Jude, Eleftheriadou, & Tentolouris, 2010; Yamagishi & Matsui, 2018).

In the screening test for peripheral artery disease, in addition to taking pulse readings, it is important to use the ankle-brachial index (ABI) test, as studies show that it has a sensitivity of 95% and nearly 100% specificity in identifying PAD in

comparison with angiography (Khan, Rahim, Anand, Simel, & Panju, 2006; Scott, 2013). In this case, complications of the feet are among the most serious complications of diabetes mellitus, and in addition to suffering by the patient and their family members, are associated with high financial costs of treatment and with major social consequences (Schaper et al., 2016).

An ulcer is one of the most tragic outcomes, as it can lead to the risk of amputation. Although rates are high, ulcers can be reduced by 45%–85% through multidisciplinary and multiprofessional programs involving the patient. These programs include risk assessment, foot care education, preventive therapy, treatment of foot conditions and referral to specialists (Scott, 2013). The guidelines of the American Diabetes Association (2016a) recommend that all diabetic patients undergo at least one foot assessment annually to identify risk factors for ulcers or amputation beginning immediately after diagnosis with type II diabetes and five years after diagnosis with type I diabetes.

Although there have been many multicentric studies, it is important to characterize the population regarding socioeconomic, behavioral and regional factors.

Brazil is a continental country with a highly heterogeneous population with regards to race, color and educational level, and there is a shortage of descriptive data on the most relevant clinical outcomes in diabetic patients with ulcers.

Study Aim

In relation to this situation, this work aimed to analyze the predictive clinical factors related to neuropathy and peripheral artery disease among individuals with type II diabetes with or without ulcers.

Methods

Design

This study is transversal and analytical and was conducted among patients with type II diabetes.

Setting

Participants were recruited in a specialist outpatient center within the secondary level of care in Brasília, Federal District, Brazil. The sample included 220 adults with a 95% Confidence Index (CI).

Participants

Data were collected between March 2017 and June 2018 by nurses trained to administer the tests using an instrument for screening for risk of ulceration. Individuals were selected when they attended appointments in secondary care and included those diagnosed with type II diabetes with or without ulcers below the ankle. People with venous or arterial ulcers were excluded, as were patients diagnosed with neurological diseases.

Data collection

The data were applied with the instrument developed according to the International Working Group on Diabetics (Caldasolari, Nogueira-Machado, Vilar, & Pedrosa, 2013).

For assessment purposes, scores for the neuropathic symptoms were classified in decreasing order of severity (Figure I) . The following questions and possible answers are presented as possible:

Quadro 1. Scores for the neuropathic symptoms.

	Scoring	Score*
Do you feel:	☐ Burning, numbness or tingling: 2 points **OR** ☐ Fatigue, cramps or pain (stabbing or twinges): 1 point ☐ Asymptomatic (move on to the neurological test): 0 points	
What is the most frequently affected area?	☐ Feet: 2 points ☐ Legs: 1 point ☐ Other: 0 points	
When does the symptom occur?	☐ At night: 2 points ☐ During the daytime and nighttime: 1 point ☐ Only during the day: 0 points	
Have you ever woken up at night because of the symptom?	☐ No: 0 points ☐ Yes: 1 additional point	
What makes the symptom go away?	☐ Walking: 2 points ☐ Getting up: 1 point ☐ Sitting down or lying down: 0 points	
Total points	Asymptomatic (zero points)	

Notes: scores for symptoms - 0 to 2 points are normal; from 3 to 4 points is mild; from 5 to 6 points is moderate and from 7 to 9 is severe. (Pedrosa, Et al., 2014)

These algorithms allow the results to be classified as follows: scores for symptoms of 0 to 2 points are normal; from 3 to 4 points is mild; from 5 to 6 points is moderate and from 7 to 9 is severe.

The ankle reflex test and tests for vibration, temperature and pain sensation were used to assess neuropathic signs. When the reactions to these tests were absent or reduced, 1 point was attributed for each foot; if present, zero points were given. These algorithms allow neuropathic signs from 0 to 2 points to be classified as

normal; from 3 to 5 points as slightly altered; from 6 to 8 points as moderately altered; and from 9 to 10 as severely altered.

The instruments used were as follows: for protective plantar sensation: a 10-g monofilament; for thermal sensation, an aesthesiometer; for vibration sensation, a tuning fork; for pain, a toothpick; and for ankle jerk reflex, a rubber hammer. The hand-held continuous wave Doppler was used to screen for PAD, which was classified as follows: ischemic when below 0.90; normal when between 0.90 and 1.30; and calcified when > 1.30. In addition to these data, age, socioeconomic situation, diabetes duration, glycated hemoglobin value (HbA1c) and body mass index (BMI) were assessed. BMI was classified as follows: 18.50-24.99 (normal); ≥ 25.00 (overweight); 25.00-29.99 (preobese); >30.00 (obese); 30.00-34.99 (obese class I); 35.00-39.99 (obese class II); and ≥ 40.00 (obese class III) (World Obesity, 2015).

Data analysis

The Pearson chi-square test of independence was used in a unidimensional approach to ascertain any association between two qualitative variables; the null hypothesis is independence between the variables. The nonparametric Mann-Whitney *U* test was used for comparison between means to determine whether there is any difference between the groups' means (has/does not have ulcers).

Logistic regression was used in a multidimensional approach to ascertain – in the domain of selected information – which main variables determined the probability of an individual having an ulcer or not.

For both approaches, unidimensional and multidimensional, a level of significance of 5% and a confidence interval of 95% were used in all tests including those in the logistic regression.

To maintain rigor in the research, it was used Strengthening the Reporting of Observational studies in Epidemiology (STROBE) checklist as a tool to support this, view Complementary File 1.

Ethical considerations

This work was approved by the ethics committee of the Health Sciences Education and Research Foundation, Brazil, under Certificate n. 943,133. This work was

conducted in accordance with the Helsinki Declaration, and all participants signed a written informed consent form.

Results

A total of 232 patients were selected to participate in this study. As 12 patients did not provide their results for HbA1c, the final number of patients was 220. Table 1 shows the most prevalent clinical signs or symptoms, such as changes in skin color, deformities, loss of protective plantar sensation, stiff hand syndrome, moderate neuropathic signs and mild symptoms, and moderate pain. Regarding vascular complications among the individuals who experienced changes in their ulcer, we found ischemia and previous amputation.

Table 1. Assessment of the foot and of the risk of ulceration among individuals with DM II with or without ulcers.

		Has ulcer						*p-value
		No		Yes		Total		
		N	%	N	%	N	%	
Dry skin, cracks and fissures	No	22	16.67	18	20.5	40	18.2	0.4755
	Yes	110	83.3	70	79.5	180	81.8	
	Total	132	100.0	88	100.0	220	100.0	
Normal skin color	No	59	44.7	28	31.8	87	39.5	0.0556
	Yes	73	55.3	60	68.2	133	60.5	
	Total	132	100.0	88	100.0	220	100.0	
Mycosis	No	77	58.3	49	55.7	126	57.3	0.6969
	Yes	55	41.7	39	44.3	94	42.7	
	Total	132	100.0	88	100.0	220	100.0	
Appropriate footwear	No	110	83.3	75	85.2	185	84.1	0.7067
	Yes	22	16.7	13	14.8	35	15.9	
	Total	132	100.0	88	100.0	220	100.0	
Deformities	No	119	90.2	43	48.9	162	73.6	**0.0001**
	Yes	13	9.8	45	51.1	58	26.4	
	Total	132	100.0	88	100.0	220	100.0	
Loss of protective sensation	No	84	63.6	11	12.5	95	43.2	**0.0001**
	Yes	48	36.4	77	87.5	125	56.8	
	Total	132	100.0	88	100.0	220	100.0	
Stiff hand syndrome	No	131	99.2	78	88.6	209	95.0	**0.0004**
	Yes	1	0.8	10	11.4	11	5.0	
	Total	132	100.0	88	100.0	220	100.0	
Score: neuropathic symptoms [(a)]	Severe	26	19.7	24	27.3	50	22.7	**0.0035**
	Mild	19	14.4	27	30.7	46	20.9	
	Moderate	65	49.2	26	29.5	91	41.4	

	Normal	22	16.7	11	12.5	33	15.0	
	Total	132	100.0	88	100.0	220	100.0	
Score: neuropathic signs [(b)]	Severe	12	9.1	5	5.7	17	7.7	**0.0107**
	Mild	42	31.8	16	18.2	58	26.4	
	Moderate	43	32.6	48	54.5	91	41.4	
	Normal	35	26.5	19	21.6	54	24.5	
	Total	132	100.0	88	100.0	220	100.0	
ABI † Classification	Calcification	44	33.3	28	31.8	72	32.7	**0.0002**
	Ischemia	14	10.6	28	31.8	42	19.1	
	Normal	74	56.1	32	36.4	106	48.2	
	Total	132	100.0	88	100.0	220	100.0	
Previous amputation	No	127	96.2	68	77.3	195	88.6	**0.0001**
	Yes	5	3.8	20	22.7	25	11.4	
	Total	132	100.0	88	100.0	220	100.0	

Notes: [a] Score: neuropathic symptoms: index range, 0 to 2 points are normal; from 3 to 4 points is mild; from 5 to 6 points is moderate and from 7 to 9 is severe. [b] Score: neuropathic signs: index range, 0 to 2 points to be classified as normal; from 3 to 5 points as slightly altered; from 6 to 8 points as moderately altered; and from 9 to 10 as severely altered. (Pedrosa et al., 2014).
†Ankle-Brachial Index, Index range: ischemic < 0.90; normal between 0.90 - 1.30; and calcified when > 1.30 (Khan et al., 2006), *Significant difference between patient with and without ulcer (p <0,05

The outcomes presented evidence that males and married people were more likely to have ulcers.

Men with ulcers presented a statistically significant relation when compared to patients without ulcer (Table 2).

Table 2. Analysis of social information in individuals with DM II with or without ulcers.

		Has ulcer						***p-value*
		No		Yes		Total		
		N	%	N	%	N	%	
Sex	Female	85	64.4	36	40.9	121	55.0	***0.0006***
	Male	47	35.6	52	59.1	99	45.0	
	Total	132	100.0	88	100.0	220	100.0	

Notes: **Significant difference between patient with and without ulcer (p<0,05) (Pedrosa et al., 2014)

The results of Table 3 show a significant difference only in glycated hemoglobin and diabetes duration. The mean glycated hemoglobin for people who have an ulcer is higher than that of those who do not, and diabetes duration is also greater among the patients who have an ulcer.

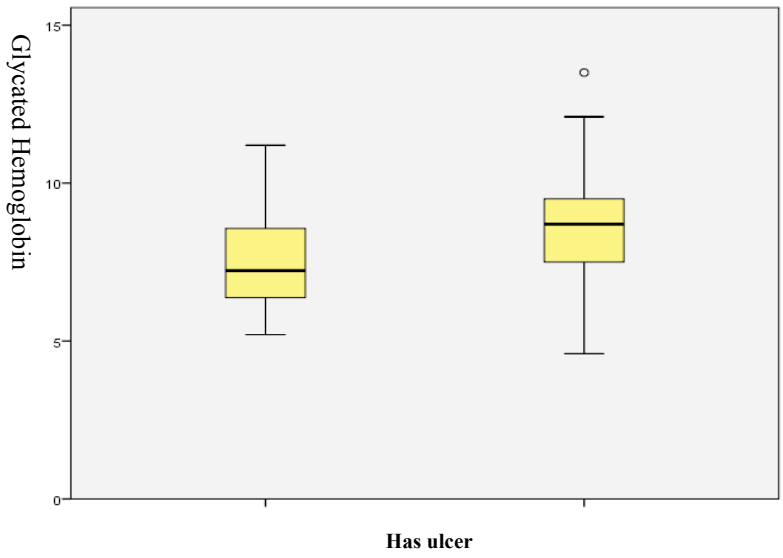
Table 3. Clinical factors in individuals with DM II with or without ulcers.

		Has ulcer			***p-value
		No	Yes	Total	
BMI ǂ	Mean	28.8	28.7	28.8	0.452
	Standard deviation	6.7	5.7	6.3	
	Variance	45.0	32.8	39.4	
Glycated hemoglobin §	Mean	7.7	8.5	8.0	**0.001**
	Standard deviation	1.5	1.5	1.6	
	Variance	2.3	2.4	2.5	
Age	Mean	59.2	58.5	58.9	0.593
	Standard deviation	11.8	9.8	11.0	
	Variance	139.5	96.6	121.9	
Diabetes duration	Mean	13.0	16.1	14.2	**0.020**
	Standard deviation	7.8	9.5	8.6	
	Variance	61.6	89.4	74.7	

Notes: Mann-Whitney test p< 0.05%, ǂ Body Mass Index, 18.50-24.99 (normal); ≥ 25.00 (overweight); 25.00-29.99 (preobese); >30.00 (obese); 30.00-34.99 (obese class I); 35.00-39.99 (obese class II); and ≥ 40.00 (obese class III) (World Obesity, 2015); § Value <7% - normal (Oliveira, 2016), *** (p<0,05)

As Figure 2 shows, there is greater variability in the values for glycated hemoglobin in the patients with DM II who have an ulcer. The box plot's central lines, representing the means, have different values, suggesting that the higher the value for uncontrolled blood glucose levels, the greater the affected individual's risk of ulcer.

Figure 2 Box plot of glycated hemoglobin among individuals with DM II in groups with or without foot ulceration.



Considering the level of significance of 5% and based on the table above (Table 4), it may be concluded that the best model is includes variables: “Glycated hemoglobin”, “Loss of protective sensation”, “ABI classification (ischemia)” and “Age”.

Table 4. Final model of logistic regression with the selected variables.

	Coefficient	CI 95%		Standard Error	¶ Wald	df‡	p-value ****	Exp (C) *****
		Inferior limit	Upper limit					
Glycated hemoglobin §	0.23	0.00264	0.45736	0.116	3.943	1	0.047	1.259
Loss of protective sensation (No)	-2.457	-3.2704	-1.6436	0.415	35.105	1	0.000	0.086
ABI classification †					10.935	2	0.004	
ABI classification (Calcification) †	0.022	-0.79336	0.83736	0.416	0.003	1	0.957	1.023
ABI classification (Ischemia) †	1.578	0.5588	2.5972	0.52	9.218	1	0.002	4.847
Age	-0.042	-0.07924	-0.00476	0.019	4.573	1	0.032	0.959
Constant	0.86	-1.75464	3.47464	1.334	0.416	1	0.519	2.363

Notes*:** § Glycated hemoglobina, †Ankle-Brachial Index - (ABI) - Index range: ischemic < 0.90; normal 0.90 - 1.30; and calcified when > 1.30 (Khan et al., 2006) –¶ Wald's test, ‡ degrees of freedom, *(p<0,05), ***** Exponentiation of the Beta coeficiente.

Discussion

Although risk factors for ulceration have been identified in previous studies, it is important to take into account the characteristics of each population studied. These factors may vary in different populations and are related to cultural and educational characteristics, the climate, and the ease with which health services may be accessed, among other factors. In the present work, the analysis using multivariate logistic regression showed four factors considered to be more relevant among patients with ulcers.

Glycated hemoglobin had a significant result among those patients with ulcers, as each unit increase raised the chance of having an ulcer by 1.259 (p=0.047); that is, uncontrolled blood glucose levels were an indirect factor for ulceration. There is no strong consensus in the literature regarding the influence of uncontrolled blood glucose levels on the risk of ulceration, although some studies have demonstrated that the intensive control of glycemic as evidenced by HbA1c (<7.0%) can reduce the risk of amputation in diabetic patients by 35% (Hasan et al., 2016) and delay neurovascular complications (American Diabetes Association, 2016b; Giovinco & Miller, 2015). Other studies have reported that people who present with glycemic control with an HbA1c of <7.0% are not excluded from the risks of complications in the feet, and the results regarding neuropathic complications have not been statistically significant (Callaghan, Little, Feldman, & Hughes, 2012; Khan & Junaid, 2017).

Regarding the loss of protective plantar sensitivity, it was relevant to assess not only the risk but also the relationship between risk and ulceration, as this complication increases the probability of observing the existence of ulcers in individuals by 2.45 or a (1/0.086) = 11.62 (p=0.002) higher chance of having an ulcer than individuals who maintained their plantar sensitivity. It is known that loss of protective plantar sensitivity, along with muscular atrophy related to peripheral neuropathy, results in deformities in the feet and results in increased risk of skin lesions in high pressure areas, which leads to callus formation and later ulceration (Boulton, 2013; Markakis, Bowling, & Boulton, 2016). These complications result from changes in the large peripheral nerve fibers (American Diabetes Association,

2016a), and both were significant in the group with ulcers. Although when deformities are present, the use of therapeutic footwear is recommended (Hingorani et al., 2016), most individuals wore rubber flip-flops due to the tropical climate. This had a negative influence on self-care by increasing the risk of drying of the skin and the presence of cracks and fissures, which were prevalent in both groups. Neuropathic symptoms such as pain, burning, tingling and cramps were of moderate intensity, with the results found resembling those of a separate study undertaken in Brazil (Parisi et al., 2016).

It was possible to identify that patients classified as ABI < 90 mmHg or as ischemic, have a probability of having an ulcer that is 4.84 greater than that of patients who do not have an ulcer (95% CI: 0.5588–2.5972, p = 0.002). Upon screening and determining that the patient presents a result for ABI below 0.90, it is necessary to refer the patient for vascular surgery for immediate diagnosis and treatment due to the high risk of peripheral obstructive disease, as this test has shown high specificity and a sensitivity of approximately 80% (Aboyans et al., 2012; Dachun et al., 2010).

Regarding age, when there is a reduction in patients' age of one unit, the risk of having an ulcer increases by 1.042 (p=0.032). In the present study, an increase in age is a protective factor, as when there is a unit reduction in age, the chance of having an ulcer increases by 1.042; this factor may be associated with life activities the productive phase of life and with the fact that many patients in this population work in agriculture, which differs from other results (Resnick et al., 2004).

Previous amputation was a significant variable in the univariate analysis among individuals with ulcers, confirming that these individuals are at high risk for further ulceration. Studies have shown that individuals with ulcers have a 50% probability of developing a further ulcer (Hinchliffe et al., 2016). Of patients who had undergone amputation, 81.2% stated that they had never had an examination of the feet prior to the event, and 74.1% said they had not received guidance on foot care (Santos, Carvalho, Souza, & Albuquerque, 2015). In the present study, more than 50% of the patients had never received a foot examination before. One can therefore perceive that there are failures in screening in primary care and onwards despite the recommendation that all patients with DM II should be screened for neuropathy at diagnosis; in many countries, this does not take place (American Diabetes Association, 2016a; Oliveira & Vencio, 2016; Santos et al., 2015). These data were

also found in multicentric studies conducted in Brazil; of patients with diabetes type II who visited specialized and nonspecialized centers, only 58% had received an examination of the feet in the previous year (Oliveira & Vencio, 2016).

Men were more significantly prevalent than women more prevalent and significant among the patients with ulcers. This may be a characteristic of this population because in Brazil, men's health is a concerning issue because men—as workers and breadwinners—often fail to attend doctors' appointments and as a result, are more vulnerable to the complications of diabetes. Other studies, both Brazilian and international, have confirmed in their results that men have a higher prevalence of ulcers than women (D'Souza et al., 2016; Khan & Junaid, 2017; Parisi et al., 2016; Wild et al., 2004).

Nail mycoses were not significant in this study, although they were considered a risk factor by the International Diabetes Federation. Obesity was found in both groups of patients but was not relevant in the patients with ulcers. Nursing as part of the multidisciplinary team has a role in the continuing education of diabetic patients after primary care. We noticed that there were flaws in this process because many patients are referred to the secondary stage because of the clinical situation presented, and many are not familiar with the process. Other factors that negatively influenced outcomes were accessibility to health services, poor education, and financial resources to have an adequate diet or buy adequate footwear.

Limitations

This study has some limitations, the first relating to the study design, as it is transversal. One characteristic of this method is the introduction of selection bias related to seasonality, as patients were selected and treated in the period in which the study was undertaken. However, the center where the study was undertaken is Brasília's only center providing secondary care and receives patients from various cities in the surrounding area. Furthermore, the screening was undertaken within the secondary level of care, which may have influenced the outcome of the results, as the majority of patients already had some complications related to the base disease or to diabetes. The fact that the study was conducted in Brasília's only reference center in this area and is a single-center study is a further limitation; it is difficult to generalize from its results.

Conclusion

The most relevant clinical predictors among patients with ulcers in this population were changes in HbA1c, loss of plantar protective sensitivity, ischemia, and age related to fewer elderly patients. In this population, more than 50% of the patients had not previously received a foot exam, and we can conclude that it is necessary to implement health education strategies in which nurses have a fundamental role in guiding patient self-care regarding neuropathy and disease peripheral artery to prevent ulceration.

Relevance for clinical practice: To classify the patient according to risk and to plan guidance according to the outcomes found, it is fundamental that screening for complications of diabetes in the feet should take place in primary care and onwards. This study noted weaknesses in the assessment of neurovascular complications in diabetic patients. Uncontrolled blood glucose levels, the loss of protective plantar sensitivity, ischemia and age were the most relevant predictors found by the nurses in secondary care settings. Failures in the process of permanent health education as well as failure to track the foot from primary care increases the risk of complications, ulceration and amputation.

Declaration of conflict of interest:

The authors state that they are not affiliated with or involved in any organization or entity with any financial interest or nonfinancial interest in the topic or materials discussed in this work.

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4.4 ARTIGO 4: IS IT POSSIBLE TO SUBSTITUTE THE MONOFILAMENT TEST FOR THE IPSWICH TOUCH TEST IN SCREENING FOR PERIPHERAL DIABETIC NEUROPATHY?

Este artigo **foi submetido** na revista **Indian Journal of Medical Research** e aguarda avaliação dos revisores. Esta revista está idexada nas bases DOAJ, Index Copernicus, Indian Science Abstracts, MEDLINE/Index Medicus, PubMed Central, Scimago Journal Ranking, SCOPUS, Web of Science. Esta revista está classificada pelo Programa da CAPES - Qualis Medicina II como B2.

Dutra LMA, Moura MC, Lima GO, Fernandez RNM, Fernandez RNM, Carvalho MR, Novaes MRCG. Is it possible to substitute the monofilament test for the Ipswich Touch Test in screening for peripheral diabetic neuropathy? IJMR 76-19

Este artigo responde ao seguinte objetivo específico desta tese: avaliar a concordância e eficácia do teste Ipswich Touch Test (IpTT) em relação ao teste de monofilamentos em indivíduos com diabetes tipo II.

Para se alcançar este objetivo, foi realizada um estudo analítico transversal com 250 indivíduos diabéticos tipo II.

RESEARCH ARTICLE

Is it possible to substitute the monofilament test for the Ipswich Touch Test in screening for peripheral diabetic neuropathy?

Abstract

Objective: This study aimed to assess the agreement and efficacy of the Ipswich Touch Test (IpTT) in relation to the monofilament test in individuals with type II diabetes **Materials and Method:** Transverse, analytical study. The inclusion criteria were: patients with type II diabetes (n=250) who did not present ulceration or amputation in either foot. The exclusion criteria were: to present cerebrovascular accident as sequela, or to have other neurological disabilities, hypothyroidism, chronic kidney disease or lupus erythematosus. Sensitivity, specificity, predictive values, likelihood ratio and Kappa index were calculated. Other factors assessed were glycated hemoglobin and BMI. **Results**: Most participants were female (71.2%), with HbA1c greater than 7% in 54.4% of patients. Mean age was 59.43 years old, mean time since diagnosis was 12.38 years. The Kappa index was 0.819 ($P < 0.001$), the IpTT had a sensitivity of 83.33%, specificity of 97.66%, positive predictive value of 85.71%, negative predictive value of 97.21%, positive likelihood ratio of 30.19%, and negative likelihood ratio of 0.17%. The level of significance used in the study was 5%. **Conclusion**: The IpTT presented high agreement and efficiency in relation to the gold standard – the 10 g monofilament test.

Keyword primary: **Adult Health, Diabetic Foot, Diabetes Mellitus, Diabetes Neuropathies, Diagnosis, Secondary Care.**

Runing Head: Diabetic Foot.

Introduction

Diabetic neuropathy is a complication of chronic diabetes and results from heterogenous conditions which impair nerve conduction. [1,2] Distal symmetric polyneuropathy (DSP) is the most common complication of both types of diabetes [3] and accounts for peripheral nerve dysfunction in diabetic patients after the exclusion of other types of diabetes, such as traumatic or neoplastic conditions and other systemic diseases[4]. This type of neuropathy is symmetric, depends on the length of the neurone [3], and may account for 75% of diabetic neuropathies. [5,6] DSP is an important cause of foot ulceration and Charcot arthropathy [7], leading to amputation and increases in economic costs. [8]

Manifestations can vary from subclinical symptoms to painful ones, such as burning, tingling, itching or prickling. [3] The pain is insidious and increases in severity due to impairment of the peripheral neurones. It can affect quality of life and mobility, and lead to mood disorders and relationship problems. [8,9]

The guidelines of the American Diabetes Association (ADA) and the Brazilian Diabetes Society (SBD) recommend that all people with diabetes should receive at least one foot assessment annually, to identify risk factors for ulceration or amputation, and that this should begin immediately after diagnosis with type II diabetes. [10,11]

The Ipswich Touch Test (IpTT) [12] is a simple way to undertake a screening test, principally in places with poor resources. Furthermore, it can be carried out by any trained health professional, and simply involves lightly touching the tips of the first, third and fifth toes, and the dorsum of the hallux, with the index finger for one to two seconds.[1, 12] Further studies in different locales are necessary to gather more information about this test and to validate it.[13]

Accordingly, this study aimed to evaluate the agreement and efficacy of the IpTT in relation to the monofilament test in individuals with type II diabetes, so as to contribute by providing evidence for a screening technique that is simpler and that can be undertaken at an early stage, to avoid ulceration.

Materials and Methods

Study design and setting

This is a transversal and analytical study, undertaken in a center specializing in attending diabetic patients, located in the center of Brasília. It is also a specialist center for patients with pathologies of the foot, including the neurovascular pathologies. Data was collected between September 2017 and March 2018. The study complies with the Declaration of Helsinki and was approved by the Committee of the Foundation for Ethics in Research (FEPECS) under certificate number 2.166.868. The consent document was signed by all patients before screening for neuropathy. Data analysis was centred on analysis of agreement and efficacy in the comparison of the IpTT with the monofilament test.

Participants

In total, 250 individuals who attended a diabetes outpatient center were assessed. The inclusion criteria were: individuals with type II diabetes who did not present ulcers or amputation in either foot. The exclusion criteria were: patients who did not present cerebrovascular accident as sequela, or neurological pathologies such as sclerosis, hypothyroidism, chronic kidney disease or lupus erythematosus, as these clinical conditions could influence or bias the results.[14]

Procedures

The individuals were assessed in a quiet environment, to avoid noise that could have interfered with the results. The tests were applied by physicians and nurses; a total of 6 professionals were trained to carry out the tests. Each test was applied twice to ensure greater accuracy, and was repeated by a third assessor if the results were inconsistent. Assessment was blinded.

The gold standard test for screening was the 10 g monofilament fiber, applied for a period of approximately 2 seconds to the hallux and to the 1st, 3rd and 5th metatarsal heads and the plantar surface of the hallux. The monofilament test was complemented with the use of a 125 Hz tuning fork placed on the dorsum of the hallux for a period of 2 seconds as a means of complementing the test. [11,15] The monofilament fiber was used with a maximum of 10 patients per day.

The IpTT was undertaken using the tip of the index finger for a period of approximately 2 seconds on the tips of the first, third and fifth toes.

When both tests presented 2 negative points, they were considered negative. Individuals were asked to close their eyes when they received the tests and to respond with the word “yes” when they felt the touch. The values for glycated

hemoglobin and BMI, taken from the electronic medical records, were also taken into account.

To classify the severity of the symptoms, the researchers used the instrument for screening symptoms developed by the Federal District's State Department of Health and in conjunction with the Brazilian Diabetes Society, following the recommendations of the International Working Group on the Diabetic Foot (IWGDF) .[16,17] The clinical symptoms were assessed in relation to pain, burning and tingling, and were compared using the Visual Analog Scale from 0 to 10, with 10 being the maximum pain reported.

These algorithms allow the results to be classified as follows: scores for symptoms from 0 to 2 points are scored as normal; from 3 to 4 points, as mild; from 5 to 6, as moderate; and from 7 to 9 as severe.

Statistical analysis

The Kappa index was used to describe the agreement between the monofilament and IpTT tests. To measure the accuracy of the tests, the researchers analyzed sensitivity and specificity, likelihood ratio test and predictive values; the Chi-squared test was used to compare the tests with the neuropathic symptoms. The data were analyzed using the Statistical *Package* for the *Social* Sciences (SPSS) software, version 21, 2015. The level of significance used throughout the study was 5%.

Results

In the sample study, most individuals were female, obese, were not using insulin, and were not meeting goals for glycemic control, as their HbA1c was higher than 7. Mean age was 59.43 years old and mean time since diagnosis was 12.38 years (SD 10.52), as shown in Tables 1 and 2.

Table 1. Descriptive analysis of the qualitative variables of individuals with diabetes (n=250).

Variable		N.	Percentage
Sex	Male	72	28.8
	Female	178	71.2
Insulin	Yes	118	47.2
	No	132	52.8
HbA1c †	Normal <7	102	40.8
	Decompensated >7	136	54.4
	Absent	12	4.8
BMI ‡	Normal	34	13.6
	Pre-obesity	61	24.4
	Obesity I	66	26.4
	Obesity II	41	16.4
	Obesity III	23	9.2
	Absent 25		10
Age range §	Below 60	112	44.8
	Above 60	138	55.2

Key: †Glycated hemoglobina (%); ‡ Body Mass Index, § years.

Table 2. Descriptive analysis of the quantitative variables of individuals with diabetes -(n=250).

Variable	Mean	Standard deviation	Minimum	Maximum
Age ¶	59.43	10.78	25.0	86.0
Time since diagnosis ¶	12.38	8.88	0.4	66.0
Glycated hemoglobin †	7.83	1.65	5.0	15.0
BMI ***	32.10	8.10	19.1	64.7

Key: ¶ years; † (%) percentage; ‡Body Mass Index.

Using the monofilament test as the gold standard, it was possible to calculate various indicators for the IpTT (sensitivity, specificity and predictive values).

The prevalence of loss of protective plantar sensitivity estimated by the gold standard test (monofilament) was 36 individuals out of a total of 250 individuals with diabetes, a prevalence of 14.40% for loss of sensitivity. It may be observed that the IpTT presented excellent results, with sensitivity of 83.33% and specificity of 97.66%. This means that, if the patient has loss of plantar protective sensitivity, the IpTT presents an 83.33% probability of identifying the loss of sensitivity (i.e., that it is truly positive – TP), and if the patient does not

have this loss, that it has a probability of identifying this absence of 97.66% (i.e., that it is truly negative – TN). The positive and negative predictive values were, respectively, 85.71% and 97.21%. This means that, among the individuals with positive results in the IpTT, the chance of the individual genuinely presenting loss of protective plantar sensitivity is 85.71%, and among the individuals with negative results, the chance of the individual genuinely presenting the loss is 97.21%.

The IpTT was highly accurate when compared with the monofilament test (positive likelihood ratio = 35.61), indicating that the chance of a patient having loss of sensitivity if the result of the IpTT was positive is 35.61 times greater than a patient with a negative result in this test (Table 3).

Table 3. Sensitivity, specificity and predictive values of the IpTT for loss of protective plantar sensitivity, using the monofilament test as the gold standard, among individuals with diabetes - (n=250).

	IpTT
Sensitivity (%)	83.33
Specificity (%)	97.66
Positive predictive value (%)	85.71
Negative predictive value (%)	97.21
Positive likelihood ratio	30.19
Negative likelihood ratio	0.17

It may be observed that with the prevalence estimated for this study (14.40%), the positive predictive value (PPV) is 85.71%, and the negative predictive value (NPV) is 97.21%, as also shown in Table 3.

The researchers used the Kappa index to assess the agreement between the two tests, with a result of 0.819 ($P < 0.001$), indicating high agreement between both tests, this being statistically significant at the level of significance of 5% (Table 4).

Using Pearson's Chi-squared test, the researchers classified the symptoms as mild, moderate or severe, and related them to loss of protective plantar sensitivity in each test. As a result, they identified a relationship of significance between loss of protective plantar sensitivity and severe symptoms ($p<0.001$).

Discussion

The present study evidenced that in six points the IpTT is reliable in screening for neuropathy, as the Kappa index was 0.819 ($p<0.001$) in relation to the 10 g monofilament test, showing excellent agreement. These results are similar to those of a study undertaken previously, comparing both tests, and which found agreement between them of $k = 0.849$, $p < 0.0001$ [12]. That the agreement found in the present work is slightly inferior may be related to the exclusion criteria, as – besides amputated patients – we excluded those with neurological conditions, kidney diseases, hypothyroidism and lupus erythematosus. The results also showed high sensitivity, of 83.33%, and specificity of 97.66%. Other similar studies were not found comparing the results of the IpTT and monofilament test for discussion of the results. It is important to emphasize that although the monofilament test is an easy instrument to handle and is of low cost, it presents high sensitivity and specificity [18, 19] for diagnosing the presence of peripheral neuropathy. In this study, the majority of the patients were female, obese, were not meeting goals for glycemic control, were not using insulin, had a mean age of 59.43 and a mean time since diagnosis with diabetes of 12 years. The characteristics found in the sample were similar to those of another, multicentric, study undertaken in Brazil, evaluating the risk factors for ulceration with regard to sex, mean age, time since diagnosis with diabetes and Hba1C values. [20] The mean prevalence of peripheral diabetic neuropathy worldwide varies between 16% and 66%. [15,19] The present study found a percentage of 14.40% (36) of patients with loss of protective plantar sensitivity with the monofilament test. The lower prevalence found in the present study may be related to the sample size or to the need for greater accuracy teste for diagnostic confirmation. The recommendation both in Brazil and internationally is that patients with type II diabetes should be screened for peripheral neuropathy as soon as they are diagnosed with diabetes; [11] nevertheless, in Brazil this assessment is rarely carried out by health professionals in primary care, due to the lack of instruments such as the monofilament. This neglect can happen not only because of the lack of instruments but also because of the lack of training of health professionals, who do not know the relevance of this screening. We consider that the early evaluation in health services is relevant in order to avoid ulceration and amputation, as it allows to develop an individualized care plan, as well as to enable her to refer the patient to specialists

where necessary. We believe that this simple screening method (the IpTT) which presents a high level of agreement and specificity, may alert health professionals as a tracking strategy in places where access is difficult. As patients with diabetes frequently present painful sensory neuropathy and clinical symptoms, such as burning, pain, tingling and paresthesia, whose nature is progressive, [2,4,5,11,15] we assessed the neuropathic symptoms and classified them as mild, moderate or severe, and related them to loss of sensitivity. We concluded that in both the monofilament test and the IpTT, patients who presented more severe neuropathic symptoms presented significantly greater loss of protective plantar sensitivity than patients with lower scores.

Table 4. Measures of agreement (Kappa index) between the IpTT and monofilament test, and association of these tests with scores for neuropathic symptoms used in assessing loss of plantar sensitivity in diabetic patients - (n=250).

		Value	*P*
Measures of agreement	**Kappa**	0.819	< 0.001
Measures of association (monofilament v. neuropathic symptoms)		25.753	< 0.001
(Pearson's Chi-squared test) (IpTT v. neuropathic symptoms)		19.887	< 0.001

One multicentric study showed similar results, as 50% of patients presented moderate or severe pain. [20] Another study reports that symptoms are not a reliable indicator of neuronal harm, as some patients with symptoms of severe pain have little sensory deficit, while others – without painful symptoms – have feet which are completely numb [21]. Considering that peripheral neuropathy can cause ulceration, and that this is a major public health problem due to its negative impact on psychic and physical health, the risk that it brings of greater mortality, and the high costs it imposes on the state and family [22, 23] it is necessary to encourage health professionals to screen for neuropathy as soon as diabetes is diagnosed.

Conclusion

We concluded that the results of the IpTT for screening for peripheral neuropathy presented excellent agreement according to the Kappa index – 0.819 ($p<0.001$) – in relation to the gold standard, and that its results are efficient according to the values presented for sensitivity and specificity. As a result, this means of assessment may be recommended in poor areas where the monofilament is not available for screening, as the IpTT is a simple means of identifying the risk of ulceration. Further studies need to be undertaken to compare the results in different populations.

Limitations

This study presents limitations related to the study design, as it is transversal. Another limitation is that the tests were undertaken in a single diabetes center located in Brasília – although, in this city, it is the only secondary center, and these patients come from various regions or cities located around Brasília, thus characterizing different populations. A further limitation is that the records in the electronic medical records were incomplete regarding BMI and values for HbA1c. Studies discussing the test were not found, which limits comparison with other results.

Conflict of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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4.5 ARTIGO - SYSTEMATIC LITERATURE REVIEW OF THE DRESSING IN THE TREATMENT OF WOUND INFECTIONS

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Este trabalho ainda não está finalizado, realizarei uma nova atualização até final de 2019

Abstract

Objective: to assess the efficiency of Askina® Calgitrol® dressing in infected wounds. **Method:** research was done in the databases Latin American and Caribbean Health Sciences Literature, Cochrane Central Register of Controlled Trials, Cochrane Library, National Library of Medicine, Scientific Electronic Library Online, Biomedical Database, Cumulative Index to Nursing and Allied Health Literature, as well as in gray literature. The primary outcomes were healing time, and bacterial load. The secondary outcomes were side effects and cost. The papers included in the review were published from 2010 to 2019. **Results:** 3 clinical trials were found. Positive results were identified regarding the efficiency of this dressing, such as better healing rates, improvement in the amount of microorganisms, and cost-effectiveness; however, further research is necessary, for these studies present methodological limitations. **Conclusion:** No significant results were found that could tell if Askina® Calgitrol® dressing is more effective in wound infections than other dressings.

Key-words: Wound care, nurse, review.

Introduction

There are many definitions used to categorize the impact of bacteria on a wound and the patient. Some practitioners continue to use the concept that >105 microorganisms per gram of tissue constitutes infection. Whilst this might remain true

in some circumstances, this does not account for factors that might compromise the patient's immune response or for particularly virulent bacteria (Australian Wound Management Association, 2011).

Wound infection may cause systemic diseases, such as Systemic Inflammatory Response Syndrome (SIRS) and Multiple Organ Dysfunction Syndrome (MODS). The classical signs of infection are pain, warm, swelling, redness, and functional loss, which can be accompanied by purulent fluid, fever, and foul smelling in chronic wounds (Australian Wound Management Association, 2011; Siddiqui & Bernstein, 2010). Wounds are colonized by bacteria mainly when the immune system is unable to prevent bacteria proliferation. This is evidenced by the host's response, which varies as the wound is critically colonized (delayed healing) or locally affected (bacteria multiply as healing is interrupted and tissues are damaged) (Chamanga, Hughes, Hilston, Sparke, & Jandrisits; 2015).

Topical antimicrobial dressings, including those that contain silver, are used to prevent or manage a wide range of wound infections. Some studies have demonstrated the inefficacy of silver in wound healing; however, these studies identified sh. ortcomings regarding the long-term use and lack of clinical indication of silver (Michaels et al., 2009; Vos, Ubbink, Vermeulen, 2010). A Cochrane review has shown a lack of sufficient evidence that dressings containing silver prevent wound infection or promote healing. Also, no study was found about Calgitrol® isolatedly, that is, without association with silver (Higgins et al., 2011).

The Calgitrol® range is designed to provide continuous controlled silver ion release in the bed of the wound. It is indicated for use in critically colonized or infected wounds, including pressure ulcers, arterial venous ulcers, second degree burns, and ulcers of diabetic foot traumatic wounds. Calgitrol® contains more silver than similar products (546-1,6 mg/100cm^2) (Higgins et al., 2011). In light of that, this

review aimed at assessing the effectiveness of Askina® Calgitrol® dressing in infected wounds.

Method

This review was registered in International prospective register of systematic reviews **PROSPERO: n CDR 42016033101.**

A systematic review of the literature was performed. The acronym PICO, which stands for Patient, Intervention, Comparison and Outcome, was use in order to develop the research question. P represents the population, comprising individuals older than 18 suffering from infected wounds, burns, ulcers, diabetic foot ulcers, and chronic ulcers. I stands for intervention: Askina® Calgitrol®. C stands for control: the control group was composed by individuals who received other treatment for the wound infections, either as inpatients or as outpatients. Last but not least, O stands for the outcomes assessed: healing time, bacterial load, and recovery of tissue types. Thus, the research question was, is Askina® Calgitrol® dressing effective in infected wounds?

Types of intervention

The primary interventions assessed in the experimental group were all kinds of Askina® Calgitrol® dressings — Calgitrol® Ag, Calgitrol® THIN, and Calgitrol®Ag cream — in comparison to other types of dressings or remedies. The primary outcomes were healing time, and bacterial load. The secondary outcomes were side effects and cost.

Studies' design

The studies included in the review were randomized or quasi-randomized clinical trials, observational studies (prospective and retrospective cohort studies,

case-control studies, and cross-sectional studies), published in English, Portuguese, and Spanish. Non comparative studies were excluded, such as case reports, case series, review articles, comments, and letters. Papers were included if they had been published between 2010 and 2019 and the study population included individuals older than 18 suffering from infected wounds treated with calcium alginate silver or Askina® Calgitrol®. The wounds included were burns, diabetic foot ulcers, trochanteric ulcers, and other types of infection.

Databases and search strategy

The search was conducted using Latin American and Caribbean Health Sciences Literature (Lilacs), Cochrane Central Register of Controlled Trials (Central), in The Cochrane Library, National Library of Medicine/NLM (Medline)/PubMed, Scientific Electronic Library Online (SciELO), Biomedical Database (Embase), and Cumulative Index to Nursing and Allied Health Literature (CINAHL). The search strategies were used according to the descriptors Medical Subject Heading (MeSH) and Health Sciences Descriptors (DeCS), and to terms related to the research problem, (Boolean operators (AND) being 'wound healing' and 'bandages'). The methodological quality of the studies was reached through the Cochrane Collaboration's tool. The articles selected were transferred to a Mendeley library, and then deduplication was conducted. Presented on Figure 1.

Figure 1 – Search strategy

" wound healing"[All Fields] AND "bandages"[All Fields] AND "silver"[All Fields] OR (Cicatrizacion[All Fields] AND ("drug effects"[Subheading] OR ("drug"[All Fields] AND "effects"[All Fields]) OR "drug effects"[All Fields] OR "de"[All Fields]) AND Heridas[All Fields]) AND "Vendajes"[All Fields] AND "Plata"[All Fields] OR "Cicatrizacao"[All Fields] AND and[All Fields] AND "Bandagens"[All Fields] AND and[All Fields] AND "Prata"[All Fields]

Source: data processed by the authors

Screening

The titles and abstracts of the papers were read by two independent blind reviewers and categorized into included or excluded. In case of disagreement, the study was categorized by a third reviewer. Full texts of the included papers were then read and assessed again according to the eligibility and inclusion criteria.

Data extraction and management

Detailed data of the studies included were extracted and summarized by two reviewers who used a data extraction sheet. Data were extracted by one review author, and subsequently by another one, in order to assure the review's accuracy. Discrepancies were solved by means of discussion. The duplicates found among databases were excluded. Duplicates were included in the review and assessed together with the other ones for data extraction. The data extracted comprised types of wound, number of randomized subjects, primary outcomes, follow-up time, funding source, and side effects.

Risk of bias

The evaluation of clinical trials followed the recommendations of the Cochrane Collaboration (Higgins et al., 2011).

Results

A total of 1120 potentially relevant references were found of which 612 were excluded because they were duplicates, and 475 were excluded during the screening, Figure 2. Consequently, 16 articles were selected for full reading, 3 of

which met the inclusion criteria. Those were randomized clinical trials (RCTs) whose characteristics are presented on Table 1

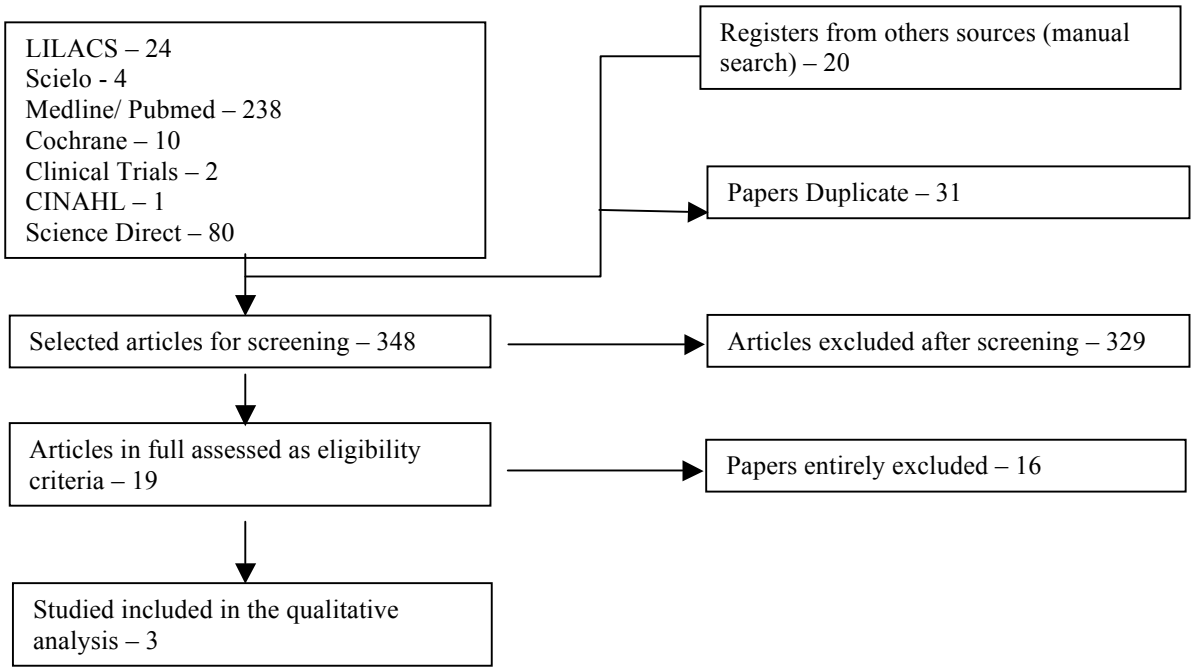

Figure 2 — Screening and selection of the studies

Source: data processed by the authors

Quadro 1 — Objectives, inclusion and exclusion criteria, and interventions of each study.

	Chuangsuwanich, 2013	**Trial, 2010**	**Opasanon, 2010**
Objective of the	Analyze the cost-	To compare the	To compare the

study	effectiveness of alginate silver dressing compared with silver zinc sulfadiazine cream in the treatment of pressure ulcers and to compare wound healing (wound size, grade, tissue characteristics, and amount of exudate)	efficacy and tolerability of a new ionic silver alginate matrix (AskinaCalgitrol Ag) with that of a standard silver-free alginate dressing (Algosteril)	efficacy of AskinaCalgitrol Ag® and 1% silver sulfadiazine (1% AgSD) in the outpatient management of partial-thickness burn wounds at Burn Unit, Siriraj Hospital
Study population	Patients aged > 20 years with pressure ulcer(s) in the sacral or trochanteric area.	Patients with pressure ulcers (PUs), venous or mixed aetiology leg ulcers, diabetic foot ulcers or accute wounds	Patient with partial-thickness burn wounds, less than 24 hours post-burn injury, and total body surface area (TBSA) less than 15%
Exclusion criteria adopted in the study	1) Pressure ulcers with (1) necrotic tissue that could not be managed with adequate debridement and clinical evidence of apparent infection. 2) Patients with a known history of hypersensitivity to any part of the drugs or products used in this study, known history of hypersensitivity to sulfa derivatives or	Allergy to any component of the dressings under study, patients with burns, ulcers Patients aged under 18 or over 80	Full thickness burns, pregnancy, immunocompromised patient and patient with known hypersensitivity to alginate silver dressing or AgSD

	history of glucose-6-phosphate dehydrogenase deficiency		
Intervention group	Askina ® Calgitrol ® n (10)	Askina Calgitrol n (20)	AskinaCalgitrol Ag n (30)
Control group	Silver zinc sulfadiazine cream (AgZnSD). n (n=10)	Algosteril — Standard silver-free alginate dressing . (n=22)	1% silver sulfadiazine (1% AgSD). (n=35)
Time of follow-up	Eight weeks for each patient.	15 days, with examinations being performed on days 1, 8, and 15	Follow-up until complete wound closure, that is, when all areas of initial injury had fully re-epithelialization.
Outcomes objetives and subjetives	Healing of the ulcer, and the Pressure Ulcer Scale for Healing (PUSH), cost of treatment	Change in the local infection score. Secondary outcome measures were the bacteriological status of the wound and tolerability, acceptability and usefulness.	Pain scores, number of wound dressing change, nursing time and time of burn wound healing
Results as described by authors	The two groups had no significant difference regarding the healing scale used, the size of the wound and the amount of exudate. However, there was a significant difference regarding the tissue type score, which was better in	Most patients had chronic wounds, such as pressure ulcers (57%), venous or mixed leg ulcers, or diabetic foot ulcers (29%), and acute wounds (14%). The clinical scores of infection were 8.9 ± 2.4 and 8.6 ± 3.2 in the Askina Calgitrol	The results suggest that Askina Calgitrol Ag® significantly decreases the level of pain, the frequency of dressing changes and the healing time compared with 1% AgSD treated group.

the experimental group (p=0.015). Also, the treatment cost was significantly lower in the AISD group (p<0.0001).	Ag group and the Algosteril group respectively (not significant), but decreased significantly in both groups at day 15, 3.8 ± 2.9 in the Askina Calgitrol Ag group (p=0.001) and 3.8 ± 3.4 in the Algosteril group (p=0.007). There was no significant difference between the two groups on day 15.

Source: data processed by the authors

Results of each study (meta-analysis not feasible)

The 3 studies assessed had different outcomes, which lead to the heterogeneity of the results; therefore, we conducted a qualitative assessment.

The trial conducted by Study 1, Chuangsuwanich et al. (2013) aimed at assessing two dressings, alginate silver dressing — Askina® Calgitrol® (AISD) — and silver zinc sulfadiazine cream (AgZnSD), in the treatment of pressure ulcers. Demographic data such as age, sex, body mass index (BMI), grade and location of the wound, and associated co-morbidities such as mellitus, hypertension, dyslipidemia, and old cerebrovascular accident, were compared, but there was no statistically significant difference between the groups. Also, there was no significant difference in the reduction of PUSH score (Healing of the ulcer, and the Pressure Ulcer Scale for Healing) (P = 0.402), wound size (p = 0.504), or volume of exudate (P = 0.557). The reduction in the tissue type score was statistically significantly better in the AISD group than the AgZnSD group (P = 0.015). The cost of treatment was 377.17 vs. 467.74 USD in the AISD and Ag- ZnSD groups, respectively (P < 0.001), for a 8-week period. Presented on Table 2 and Figure 3.

The trial conducted by Study 2, Trial et al. (2010) compared the use of Askina and algosteril. A total of 42 individuals were randomized. The study identified a statistically and clinically significant reduction in clinical scores between days 1 and 15 for the test and control dressings, thus demonstrating that both the dressing tested and the control dressing were adequate, with signs of inflammation and infection. The proportion of wounds with improvements in the bacterial status on day 15 was always higher in the intervention than in the control group, but without statistical significance or consistent significance across assessors. Presented on Table 2 and Figure 3.

This was the only study reporting no adverse event during the study period (there was no report regarding the healing times). Clinical scores of infection were comparable in both groups at inclusion, 8.9 ± 2.4 and 8.6 ± 3.2 in the Askina® Calgitrol® Ag group and the Algosteril group respectively (not significant), but decreased significantly in both groups at day 15, 3.8 ± 2.9 in the Askina® Calgitrol® Ag group (p=0.001) and 3.8 ± 3.4 in the Algosteril group (p=0.007). There was no significant difference between the two groups at day 15. Although there was also no significant difference in the bacteriological status between the treatment groups, a trend in favor of Askina® Calgitrol® Ag was found for the relative risk of improvement, especially in patients who were not treated with antibiotics either at the beginning of the study or during it. No differences between groups were observed regarding local tolerance, acceptability, and usefulness of the dressings.

The study conducted Study 3, Opasanon, Muangman, & Namviriyachote (2010) compared the efficacy of Askina® Calgitrol® Ag and 1% silver sulfadiazine (1% AgSD). The area of burn treated was significantly higher in Askina® Calgitrol® Ag and group (7·93 ± 1·18% and 2·77 ± 0·41%, *P* < 0·02). As for the pain scores, the group control and the experimental group registered, respectively, 6,08 ± 2•33 p <0,02 and 2,23 ± 1,87; the number of wound dressing change (14,00 ± 4•18) and (2•93 ± 1•17) p <0•02. The nursing time (minutes) was 13•29 ± 4•19 e 8•47 ± 6•16) p <0•02. Healing time, in days, in Askina Calgitrol Ag group was 7 ± 3•51, significantly shorter than in the control group (14 ± 4•18, P < 0•02). The study concludes that Askina Calgitrol Ag is an effective dressing managing the partial-thickness burn wounds at the outpatient clinic. Though it was not the objective of this study, the author assessed pain score, number of wound dressing changes, and nursing time. The individuals treated with Askina® Calgitrol® Ag presented less pain

(2·23 ± 1·87 versus 6·08 ± 2·33, *P* < 0·02). No side effect was reported in the study. Presented on Table 2 and Figure 3.

Quadro 2 — Risk of bias assessment in nonrandomized studies

Bias – Chuangsuwanich, 2013	**Author's judgment**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "patients were randomly divided into two groups by drawing from a sealed envelope for each group". Comment: It does not describe how the sequence was generated
Allocation concealment (selection bias)	Unclear risk	Comment: It does not give details, for example if they were "opaque envelopes" or if there was centralized randomization
Blinding of participants and personnel (performance bias)	Unclear risk	Comment: It is not clear whether or not the participants knew the treatment received, but given that the outcome was based on objective measurement (see below), it is possible that the knowledge of the treatment received did not influence the outcome.
Blinding of outcome assessment (detection bias)	Low risk	Quote: "[the wound] was examined and scored by an independent operator, plastic surgeon, who was blinded to the dressing protocol."
Incomplete outcome data (attrition bias)	Low risk	22 individuals were randomized and 20 were analyzed
Selective reporting (reporting bias)	Low risk	Results on the outcomes previously described in

		methodology
Other sources of bias (Conflict of interest)	Low risk	Quote: “No potential conflict of interest relevant to this article was reported”

Bias – Trial, 2010	**Author’s judgment**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: “dressings were randomly allocated to patients using sealed envelopes.” Comment: It is not described how the sequence was generated.
Allocation concealment (selection bias)	Unclear risk	Comment: It does not give details, for example if they were “opaque envelopes” or if there was centralized randomization.
(1) Blinding of participants and personnel (performance bias) For progression of presence and intensity of the clinical signs	High risk	Comment: It does not describe whether or not there was blinding and it is a subjective outcome and thus highly susceptible for bias
(1) Blinding of outcome assessment (detection bias) For progression of presence and intensity of the clinical signs	High risk	Comment: It does not describe whether or not there was blinding and it is a subjective outcome and thus highly susceptible for bias
(2) Blinding of participants and personnel (performance bias) For Quantitative culture: colony forming units per gram (cfu/g) of tissue	Low risk	Quote: “assessed by the study investigator” Comment: It does not describe whether or not there was blinding but it is an objective outcome and thus unlikely to be influenced by the knowledge of the treatment received
(3) Blinding of outcome assessment (detection bias) For Quantitative culture: colony	Low risk	Quote: “independent experts in microbiology undertake a blind assessment of the two laboratory

forming units per gram (cfu/g) of tissue		reports”
Incomplete outcome data (attrition bias)	Low risk	Comment: Results present all individuals randomized for clinical symptoms, and for quantitative culture the results had 6/42=14% of missing data.
Selective reporting (reporting bias)	Low risk	Results on the outcomes previously described in methodology
Other sources of bias (Conflict of interest)	High risk	Quote: (1) “The study was sponsored by B. Braun Medical SAS”, (2) “...Askina calgitrol Ag was provided by the sponsor (B. Braun Medical SAS”

Bias – Opasanon, 2010	**Author's judgment**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "... patients were identified and randomized into two groups..." Comment: It is not described how the sequence was generated.
Allocation concealment (selection bias)	Unclear risk	There is no description
Blinding of participants and personnel (performance bias)	High risk	There is no description of blinding and the outcome was subjective and thus susceptible for bias
Blinding of outcome assessment (detection bias)	High risk	There is no description of blinding and the outcome was subjective and thus susceptible for bias
Incomplete outcome data (attrition bias)	Low risk	All results presented with all individuals who were randomized
Selective reporting (reporting bias)	Low risk	Results on the outcomes previously described in methodology
Other sources of bias (Conflict of interest)	Unclear risk	There is no description of conflict of interest or funders

Risk of bias assessment of the studies analysed, are presented briefly on Figure 3.

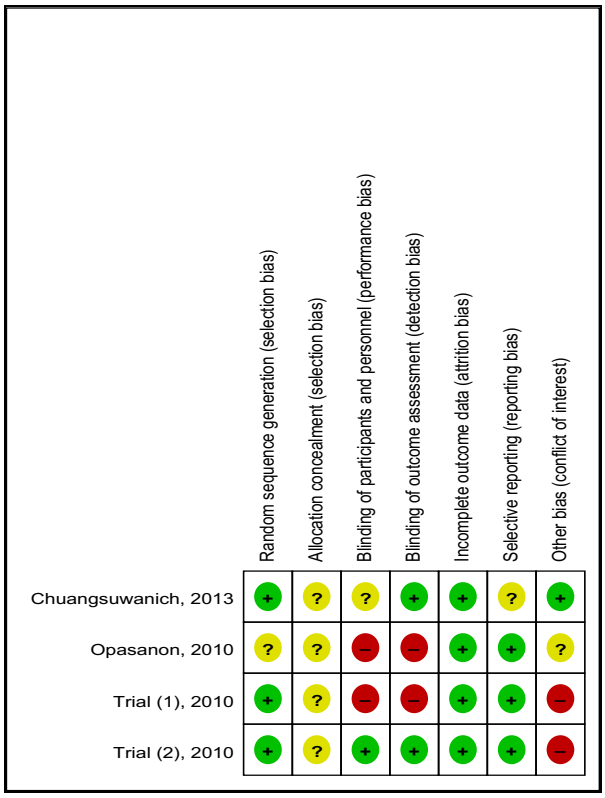

Figure 3: Risk of bias assessment of the studies

Source: data processed by the authors

Note 1: + means low risk of bias; - means high risk of bias; and ? means unclear risk of bias.

Note 2: Trial (1): for the subjective outcome, for progression of presence and intensity of the clinical signs; Trial (2) for the objective outcome, colony forming units per gram (cfu/g) of tissue in culture.

Discussion

This review provides no support for the claim that Askina® Calgitrol® is more effective than other standard treatments, for the treatments assessed by the studies were diverse and used in different wounds from 2010 to 2019. It was not previously searched because this patch was not yet available. But we have to consider that the number of studies found was small. The results of a small randomized control trial indicate that the tissue type score was statistically significantly better in the Askina® Calgitrol® group than in the silver zinc sulfadiazine cream group (P = 0.015). However, the quality of the reports of the studies found is hindered by the several

methodological limitations of the studies. A systematic review with silver dressings concludes that there is no evidence sufficient evidence to state that dressings containing silver or topical agents promote healing of wounds or prevent wound infection. It is important to reflect that the pharmaceutical industry has promoted important technological advances, but there is a need for studies with larger populations and evidence to place the products on the market. Few studies have been found in humans being the objective of this study but there are preclinical tests that have shown some efficacy against some bacteria. Observational studies on Askina® published recently provide information on its effectiveness. An *in vitro* study has shown that silver ion is effective against resistant organisms, such as *aureus*, resistant to meticillin Staphylococcus (MRSA) (Hooper, Williams, Thomas, Hill, & Percival; 2012). The study Chuangsuwanich et al. (2013) made a microbiological evaluation of the use of Askina® dressings and observed no bacterial growth among the patients from the beginning of the study until eight months later; the bacteria assessed was *Enterobacter cloacae-moderate* and *Acinetobacterbaumannii-moderate*, which reveals the bactericidal sensitivity to Askina® dressing. A pre-clinical trial shows the bactericidal effect of Askina® Calgitrol®, for there was maximal killing of *P. aeruginosa* bacteria and reduction of bacterial count. As for *E. coli*, Askina® Calgitrol® behaved similar to *P. aeruginosa*, except for maximal killing, which was 6 hours (Aramwit, Muangman, Namviriyachote, & Srichana; 2010).

In the national literature, no articles were found evaluating the effectiveness of wound coverage.

Limitations of the study

Some of the limitations were the difficulty to interpret the results due to lack of information regarding randomization, allocation, study limitations, and sample size.

Disclosure of conflict of interest

There is no conflict of interest.

Conclusion

Even though the studies suggest Askina® Calgitrol®'s efficacy in the treatment of wounds and burns when compared to other dressings, which correspond to the totality of studies involving human beings, we could not find conclusive evidence to support that hypothesis because the studies found were scarce, had few subjects, lasted short periods, and had unclear or high risk of bias.

This review contributes to nursing practices related to the choice of the ideal dressing. The study of the effectiveness of this dressing will make nurses more confident in dealing with infected wounds.

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CAPÍTULO 5 – CONCLUSÃO E RECOMENDAÇÕES

Neste estudo foram avaliados os desfechos clínicos de pacientes com e sem úlcera em centros de referência do Distrito Federal. Com os resultados obtidos, concluiu-se que:

- A prevalência de PND encontrada neste estudo foi similar ao já reportado na literatura;
- A doença arterial periférica foi mais prevalente do que em outros estudos;
- Achados clínicos de neuropatia foram prevalentes nos pacientes diabéticos independentemente da presença de neuropatia periférica;
- Os preditores clínicos mais relevantes entre os pacientes com úlcera em relação aos sem úlcera foram descontrole glicêmico, neuropatia periférica, isquemia e idade;
- Apesar de eventos adversos como baixa escolaridade, descontrole glicêmico, redução da taxa de filtração glomerular e úlceras graves, somente 11,8% dos pacientes amputaram;
- As úlceras mais complexas cicatrizaram primeiro, relacionadas ao uso de tecnologia mais avançada para tratamento e autocuidado, como o repouso.
- A osteomielite associada à amputação foi um resultado já evidenciado na literatura anterior;
- O Índice de Massa Corporal (IMC) elevado e osteomielite apresentaram relação com o retardo na cicatrização da úlcera. Esses achados não foram encontrados em relatos anteriores;
- A maioria dos pacientes cicatrizaram após um ano;
- E, o estudo mostrou eficácia do IpTT quando comparado ao monofilamento de 10 g.

Recomendações

- Realizar o rastreamento da PND e DAP nos pacientes diabéticos desde a atenção básica pelos profissionais de saúde, para identificar o risco de complicações e ulceração e, assim, encaminhar para outros níveis de atenção

quando necessário;

- Implantar um protocolo de atendimento dos pacientes que consultam nos prontos-socorros e que apresentam úlcera. Sugerimos que antes de serem encaminhados para cirurgia, sejam encaminhados para a equipe especializada em pé diabético para realizar uma avaliação multidisciplinar e assim, diminuir o risco de amputação;
- Fortalecer a educação permanente em saúde de indivíduos diabéticos e familiares, desde a atenção básica, para motivar o autocuidado e mudanças para um estilo de vida saudável;
- Munir os ambulatórios de equipe multidisciplinar e especializada para oferecer uma assistência integrada e ampliada no acompanhamento dos pacientes com úlcera.
- Capacitar professionais de saúde que assistem os pacientes com risco e/ou ulceração desde a atenção básica até o nível secundário;
- Adquirir para os ambulatórios de atenção secundária tecnologias mais avançadas para o tratamento das úlceras, ou estabelecer parcerias para esse fim;
- Ampliar a discussão sobre a implantação do IpTT em locais de difícil acesso para prevenir o risco de ulceração;
- Fortalecer a oficina de órtese e prótese para ofertar ao paciente os insumos e equipamentos necessários, tanto na fase aguda da úlcera quanto depois da sua cicatrização, e evitar a reulceração;
- Melhorar a integração da cirurgia vascular com a equipe do pé diabético para que o paciente possa realizar intervenções, principalmente na presença de DAP;
- E capacitar a comissão de curativos das instituições públicas para adquirir coberturas com evidência de eficácia.

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ANEXO A - FORMULÁRIO PARA AVALIAÇÃO DE NEUROPATIA E DOENÇA ARTERIAL PERIFÉRICA

SECRETARIA DE ESTADO DE SAUDE
SUBSECRETARIA DE ATENCAO PRIMARIA A SAUDE
DIRETORIA DE CICLOS DE VIDA E PRÁTICAS INTEGRATIVAS EM SAÚDE
COORDENAÇÃO CENTRAL DE DIABETES
Programa de Neuropatia e Pé Diabético
SOCIEDADE BRASILEIRA DE DIABETES - DF

Formulário para Avaliação de Neuropatia e Doença Arterial Periférica – Uso Hospitalar
Ambulatório de Referência

Nome:

_____

Registro: ☐☐☐.☐☐☐ **OU Crondalfa:** ☐☐☐.☐☐☐ **Idade:** ☐☐

Diabetes Tipo 1 ☐ **Diabetes Tipo 2** ☐ **Telefone:** ☐☐–☐☐☐☐–☐☐☐☐

1. Inspeção (assinale o achado positivo ou negativo):

Achado Clínico	Não	Sim
Vasos dilatados dorsais	☐	☐
Pele seca, rachaduras, fissuras	☐	☐
Cor da pele normal	☐	☐
Micose interdigital	☐	☐
Micose ungueal	☐	☐
Pêlos presentes	☐	☐
Calosidades	☐	☐
Edema	☐	☐
Calçados adequados	☐	☐

2. Deformidades (assinale o achado positivo ou negativo):

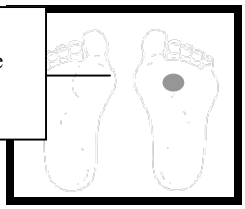
Não ☐ Sim ☐ Não ☐ Sim ☐ Não ☐ Sim ☐ Não ☐ Sim ☐

3. Perda da sensibilidade protetora (PSP):

Monofilamento (ausente em qualquer área de teste)*

Não ☐ Sim ☐

→ * Áreas de testes: 1º, 3º, 5º metatarsos e hálux bilateralmente (assinale)



4. Limitação da mobilidade articular (sinal da prece): Não ☐ Sim ☐

5. Escore de sintomas neuropáticos (assinalar e pontuar o escore). Em relação aos pés e perna:

	Pontuação	Escore
Você sente ?	☐ Queimação, dormência ou formigamento: 2 pontos **OU** ☐ Fadiga, câimbras ou dor (facada, pontada): 1 ponto ☐ Assintomático (passe para o exame neurológico): 0 ponto	
Qual o local mais frequente ?	☐ Pés: 2 pontos ☐ Pernas: 1 ponto ☐ Outro: 0 ponto	
Quando ocorre o sintoma ?	☐ Durante a noite: 2 pontos ☐ Durante o dia e à noite: 1 ponto ☐ Apenas durante o dia: 0 ponto	
Já acordou à noite pelo sintoma ?	☐ Não. ☐ Sim: 1 ponto adicional	

O que alivia o sintoma ?	☐ Ao caminhar: 2 pontos ☐ Ao levantar-se: 1 ponto ☐ Ao sentar-se ou deitar-se: 0 ponto	
Total de pontos	Assintomático (zero ponto)	

6. Escore de sinais neuropáticos (assinalar e pontuar o escore):

Teste neurológico	Pontuação	Escore
Reflexos aquileus	☐ Ausente: 2 pontos para cada pé ☐ Presente ao reforço: 1 ponto para cada pé ☐ Presente: 0 ponto	
Vibração	☐ Diminuída ou ausente: 1 ponto para cada pé ☐ Presente: 0 ponto	
Dor	☐ Diminuída ou ausente: 1 ponto para cada pé ☐ Presente: 0 ponto	
Temperatura	☐ Diminuída ou ausente: 1 ponto para cada pé ☐ Presente: 0 ponto	
Total de pontos		

7. Diagnóstico de PND (polineuropatia diabética periférica):

Escore de SINTOMAS	Escore de SINAIS
☐ 0 – 2 Normal	☐ 0 – 2 Normal
☐ 3 – 4 Leve	☐ 3 – 5 Leve
☐ 5 – 6 Moderado	☐ 6 – 8 Moderado
☐ 7 – 9 Grave	☐ 9 – 10 Grave

Avaliação da intensidade do sintoma neuropático - Escala Visual Analógica (EVA):

Sem dor- 0 ——————————— Pior dor possível – 100 mm

Mensuração: ☐☐☐ mm **Intensidade (assinale):** ☐ Leve < 40 ☐ Moderada ≥ 40-69 ☐ Grave ≥ 70 mm

PND dolorosa	Escore de sintomas ≥ 05 e Escore de sinais neuropáticos ≥ 03	☐ Não	☐ Sim
PND com risco de ulceração	Escore de sinais ≥ 06 com ou sem sintomas	☐ Não	☐ Sim
PND assintomática (somente escore de sinais)	☐ Leve ≥03	☐ Moderada ≥05	☐ Grave ≥07
Dor neuropática (apenas)*:	Escore de sintomas ≥ 05 (sem sinais) EVA ≥40 mm	☐ Não	☐ Sim

* Requer intervenção terapêutica: Escore sintomas ≥ 05 e ou EVA Escore ≥ 40 mm

8. Doença Arterial Periférica (DAP): Palpação dos pulsos e tomada do ITB*

Pé direito	Pulso arterial pedioso	☐ Presente	☐ Diminuído ou ausente
	Pulso arterial tibial posterior	☐ Presente	☐ Diminuído ou ausente
Pé esquerdo	Pulso arterial pedioso	☐ Presente	☐ Diminuído ou ausente
	Pulso arterial tibial posterior	☐ Presente	☐ Diminuído ou ausente

ITB*	Pressão Sistólica Artéria Tibial Posterior	Pressão Sistólica Artéria Pediosa	Pressão Sistólica Artéria Braquial
Direita			
Esquerda			

ITB D = ☐,☐☐

ITB E = ☐,☐☐

*** INDICE TORNOZELO-BRAÇO**: Pressão Sistólica Máxima ÷ Pressão Sistólica Braquial Máxima. Efetuar independente da palpação detectada.

09. Classificação do ITB (IWGDF, 2012). Assinale:

☐	ITB > 1.30*	**Calcificação (risco de DCV)**
☐	ITB 0.90 – 1.30	**Normal**
☐	ITB < 0.90*	**Anormal (sugestivo de DAP)**
☐	ITB < 0.60*	**Isquemia significativa**

ITB < 0.9 ☐ Não ☐ Sim → Encaminhar para Cirurgia Vascular

10. Amputação: ☐ Não ☐ Sim: → ☐ Maior (acima do tornozelo) ☐ Menor (abaixo do tornozelo)

11. Úlcera prévia: ☐ Não ☐ Sim

Classificação causal:
☐ Neuropática (PND ± deformidades)
☐ Isquêmica (DAP presente)
☐ Neuroisquêmica (DAP + PND ± deformidades

→ Aplique o formulário de Seguimento de Úlcera (local)

12. Úlcera ativa: ☐ Não ☐ Sim

13. Classificação do risco e seguimento - indique o risco: ☐

Risco	Definição	Recomendação de tratamento	Seguimento
0	Sem PND Sem DAP	Educação Calçados apropriados	Anual (equipe atenção básica: clínico/enfermeiro)
1	PND ± Deformidades	Prescrição de calçados (dispensação pela Oficina de órtese prótese). Considerar cirurgia profilática	Cada 3-6 meses (equipe especialista)
2	DAP ± PND	Prescrição de calçados. Consulta e seguimento com Cirurgia Vascular	Cada 2-3 meses (equipe especialista)
3	Histórico de úlcera ou amputação	Como em 1, Seguimento combinado com Cirurgia Vascular	Cada 1-2 meses (equipe especialista)

Fonte: Diretrizes – SBD, 2012-2013. Classificação: *International Working Group on the Diabetic Foot, 1999,* 2001; DAP - *Progress Report of the IWGDF*, 2012.

Médico / Enfermeiro Responsável:_____
(nome e carimbo)

Regional de Saúde:

Formulário confeccionado com base no Termo de Cooperação Técnico-Científico assinado entre a SBD-DF e SES-DF, em 21 de junho de 2012
Pedrosa HC, Tavares SF, Saigg MAC, Batista MCP, Carvalho PS. Anexo. Em: Pedrosa HC, Vilar L, Boulton AJM (Eds), Em: Neuropatias e Pé Diabético. AC Farmacêutica, Rio de Janeiro, 2013 pp 295-302

ANEXO B – PROTOCOLO COMITÊ DE ÉTICA EM PESQUISA

Secretaria de Estado de Saúde do Distrito Federal

COMITÊ DE ÉTICA EM PESQUISA - FEPECS/SES-DF

Plataforma Brasil

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Fatores prognósticos no desfecho de úlcera no pé em pacientes diabéticos assistidos no Sistema único de Saúde

Pesquisador: LUZ MARINA ALFONSO DUTRA

Área Temática:

Versão: 2

CAAE: 39200514.2.0000.5553

Instituição Proponente: FUNDAÇÃO DE ENSINO PESQUISA

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 943.133

Data da Relatoria: 01/02/2015

Apresentação do Projeto:

Sem alterações;

Objetivo da Pesquisa:

Sem alterações;

Avaliação dos Riscos e Benefícios:

Sem alterações;

Comentários e Considerações sobre a Pesquisa:

Sem alterações;

Considerações sobre os Termos de apresentação obrigatória:

A pesquisadora atendeu a pendencia anexando currículo da orientadora.

Recomendações:

Apresentar relatório de acordo com o desenvolvimento do projeto,atraves da Plataforma \Brasil.

Conclusões ou Pendências e Lista de Inadequações:

Projeto aprovado.

Situação do Parecer:

Aprovado

Endereço: SMHN 2 Qd 501 BLOCO A - FEPECS
Bairro: ASA NORTE **CEP:** 70.710-904
UF: DF **Município:** BRASILIA
Telefone: (61)3325-4955 **Fax:** (33)3325-4955 **E-mail:** comitedeetica.secretaria@gmail.com

ANEXO C – PROTOCOLO COMITÊ DE ÉTICA EM PESQUISA

FUNDAÇÃO DE ENSINO E PESQUISA EM CIÊNCIAS DA SAÚDE/ FEPECS/ SES/ DF

Secretaria de Estado de Saúde do Distrito Federal

Plataforma Brasil

PARECER CONSUBSTANCIADO DO CEP

DADOS DA EMENDA

Título da Pesquisa: Fatores prognósticos no desfecho de úlcera no pé em pacientes diabéticos assistidos no Sistema único de Saúde

Pesquisador: LUZ MARINA ALFONSO DUTRA

Área Temática:

Versão: 4

CAAE: 39200514.2.0000.5553

Instituição Proponente: FUNDAÇÃO DE ENSINO PESQUISA

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 2.119.444

Apresentação do Projeto:

APRESENTAÇÃO DE EMENDA AO PROJETO.

Objetivo da Pesquisa:

Sem alterações;

Avaliação dos Riscos e Benefícios:

Sem alterações;

Comentários e Considerações sobre a Pesquisa:

Sem alterações;

Considerações sobre os Termos de apresentação obrigatória:

Justificativa da Emenda:

Desejo realizar um estudo sobre a prevalência de neuropatia diabética entre os pacientes selecionados para participar deste estudo, realizando o Teste do Toque de Ipswitch e comparando-o com outros métodos de avaliação de neuropatia diabética (monofilamentos Semmes-Weinstein, com monofilamento de 10 g, sensibilidade vibratória utilizando o diapasão de 128 Hz, sensibilidade térmica com biotensiômetro, reflexos de Aquiles utilizando o martelo e eletroneuromiografia). Justificar alteração (es) mencionadas: A inclusão deste novo objetivo e a realização de um teste mais simples, com boa reprodutibilidade e

Endereço: SMHN 2 Qd 501 BLOCO A - FEPECS
Bairro: ASA NORTE **CEP:** 70.710-904
UF: DF **Município:** BRASILIA
Telefone: (61)3325-4955 **Fax:** (33)3325-4955 **E-mail:** comitedeetica.secretaria@gmail.com

A. I., & Donohoe,
M. (2011). The ipswich touch test: A simple and novel method to identify inpatients with diabetes at risk of foot ulceration. Diabetes Care, 34(7), 1517–1518. https://doi.org/10.2337/dc11-0156. Aguardando manifestação desse Comitê quanto à apreciação e aprovação. A EMENDA terá validação somente com o parecer de aprovação deste CEP/Fepecs. LUZ MARINA ALFONSO DUTRA Nome completo dopesquisador responsável pela pesquisa.

Recomendações:

PENDENCIA-Considerando o tempo em que projeto está em andamento apresentar Relatorio parcial de acordo com o desenvolvimento do projeto,atraves da Plataforma Brasil.(justificando e relatando as dificuldades e estabelecendo um prazo para a sua conclusão).
Solicitamos apresentar se foi realizada justificativa de prorrogação e se não foi solicitada, favor apresentar.

Conclusões ou Pendências e Lista de Inadequações:

Emenda pendente.

Considerações Finais a critério do CEP:

PENDÊNCIA- Considerando o tempo em que projeto está em andamento apresentar Relatório parcial de acordo com o desenvolvimento do projeto, através da Plataforma Brasil.(justificando e relatando as dificuldades e estabelecendo um prazo para a sua conclusão).
Solicitamos apresentar se foi realizada justificativa de prorrogação e se não foi solicitada, favor apresentar.

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_729626_E2.pdf	20/05/2017 11:24:55		Aceito
Outros	EMENDA.pdf	04/11/2015 15:40:36	LUZ MARINA ALFONSO DUTRA	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE.pdf	04/11/2015 15:33:22	LUZ MARINA ALFONSO DUTRA	Aceito
Outros	Curriculum orientadora ¿ MARIA RITA CARVALHO GARBI NOVAES.pdf	22/12/2014 10:46:15		Aceito

ANEXO D – PROTOCOLO COMITÊ DE ÉTICA EM PESQUISA

FUNDAÇÃO DE ENSINO E PESQUISA EM CIÊNCIAS DA SAÚDE/ FEPECS/ SES/ DF

PARECER CONSUBSTANCIADO DO CEP

DADOS DA EMENDA

Título da Pesquisa: Fatores prognósticos no desfecho de úlcera no pé em pacientes diabéticos assistidos no Sistema único de Saúde

Pesquisador: LUZ MARINA ALFONSO DUTRA

Área Temática:

Versão: 5

CAAE: 39200514.2.0000.5553

Instituição Proponente: FUNDAÇÃO DE ENSINO PESQUISA

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 2.166.868

Apresentação do Projeto:

Sem alterações;

Objetivo da Pesquisa:

Sem alterações;

Avaliação dos Riscos e Benefícios:

Sem alterações;

Comentários e Considerações sobre a Pesquisa:

Sem alterações;

Considerações sobre os Termos de apresentação obrigatória:

Documento enviado pela pesquisadora:

Este projeto encontra-se em execução quanto aos objetivos e métodos estabelecidos no cronograma inicial, por ser tratado de um projeto de doutorado. Esta seguindo o cronograma estabelecido, sendo análises dos dados estatístico e revisão bibliográfica. Solicito prorrogação até junho de 2018.

Relatório parcial de atividades:

Endereço: SMHN 2 Qd 501 BLOCO A - FEPECS
Bairro: ASA NORTE **CEP:** 70.710-904
UF: DF **Município:** BRASILIA
Telefone: (61)3325-4955 **Fax:** (63)3254-9551 **E-mail:** comitedeetica.secretaria@gmail.com

- Todos os testes e tabelas apresentadas nesse documento foram elaboradas utilizando os softwares Microsoft Excel e o R. A amostra estudada possuía 29 indivíduos analisados todos diabéticos que apresentavam ulcera no pé.A variável Pele seca apresentou 23 pacientes, ou aproximadamente 82% da amostra, que apresentava a característica, contra 5 pacientes ou 18% que não apresentam. Indicando que os pacientes estudados têm mais chance de apresentar essa categoria.A variável Tipo de diabetes apresentou 26 pacientes, ou aproximadamente 93% da amostra, que apresentava a diabetes tipo 2, contra 2 pacientes ou 7% que apresentavam a tipo 1. Indicando que os pacientes estudados têm mais chance de apresentar a diabetes tipo 2.A variável Localização da Úlcera apresentou 3 categorias que possuíam as maiores frequências, ou seja, que os pacientes têm maior chance de apresentar ulcera nesses locais. Essas localizações são o Metatarso, Plantar e o Pododáctilo, que juntas representam quase 80% dos casos.Geramos as probabilidades estimadas do paciente se curar antes dos 4 meses definidos e comparamos com o resultado real respectivamente.

Recomendações:

Apresentar Relatorio parcial e final de acordo com o desenvolvimento do projeto,atraves da Plataforma Brasil.

Conclusões ou Pendências e Lista de Inadequações:

Emenda aprovada.

Considerações Finais a critério do CEP:

* Realizar notificação em 6 meses, apresentando o relatorio parcial ou final da pesquisa.

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_729626_E2.pdf	21/06/2017 22:17:53		Aceito
Outros	EMENDA.pdf	04/11/2015 15:40:36	LUZ MARINA ALFONSO DUTRA	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE.pdf	04/11/2015 15:33:22	LUZ MARINA ALFONSO DUTRA	Aceito
Outros	Curriculum orientadora ¿ MARIA RITA	22/12/2014		Aceito

Outros	CARVALHO GARBI NOVAES.pdf	10:46:15		Aceito
Folha de Rosto	folha de rosto.docx	13/11/2014 16:50:35		Aceito
Outros	termo de concordancia.docx	13/11/2014 15:46:24		Aceito
Outros	curriculum.docx	13/11/2014 15:45:58		Aceito
Projeto Detalhado / Brochura Investigador	projeto.doc	21/10/2014 10:20:00		Aceito

Situação do Parecer:
Aprovado

Necessita Apreciação da CONEP:
Não

BRASILIA, 10 de Julho de 2017

Assinado por:
Geisa Sant Ana
(Coordenador)

APENDICE A - TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

O(a) senhor(a) estão sendo convidados a participar da pesquisa: **"Fatores prognósticos no desfecho de úlcera no pé em pacientes diabéticos assistidos no Sistema Único de Saúde"**. O nosso objetivo é analisar os fatores preditivos sociais, neuroisquêmicos e metabólicos no desfecho de úlcera no pé em pacientes diabéticos tipo II.

Será realizado pela Universidade de Brasília (UnB), Programa de Pós-graduação em Ciências da Saúde, nível de doutorado.

O(a) senhor(a) receberão todos os esclarecimentos necessários antes e no decorrer da pesquisa e lhes asseguramos que seu nome, não aparecerá, sendo mantido o mais rigoroso sigilo por meio da omissão total de quaisquer informações que permitam identificá-la.

A avaliação do desfecho da úlcera será realizada por meio de uma consulta de enfermagem, que trata da aplicação de um questionário semi-estruturado, avaliação da ferida e acompanhamento, avaliação de resultados laboratoriais sanguíneos, avaliação do índice de Massa Corporal (IMC) no ambulatório de pé diabético do HRAN, com um tempo estimado de realização de entrevista e IMC de 20 minutos e avaliação da ferida 20 minutos.Também uma equipe de saúde realizará ao acompanhamento. Não existe obrigatoriamente, um tempo pré-determinado para responder as perguntas. Será respeitado o tempo de cada um para respondê-la. Informamos que o(a) senhor(a) poderão recusar a responder qualquer questão que lhe traga constrangimento, podendo desistir de participar da pesquisa em qualquer momento sem nenhum prejuízo para o O(a) senhor(a).

Os resultados da pesquisa serão divulgados na Universidade de Brasília e Secretaria de Saúde do Distrito Federal, em eventos científicos, podendo ser publicados posteriormente. Os dados e materiais utilizados na pesquisa ficarão sobre a guarda do pesquisador.

Caso o(a) senhor(a) tenha qualquer dúvida em relação à pesquisa, por favor, entre em contato com Luz Marina Alfonso Dutra, na instituição pelo telefone: 3325-4354 e pelo celular 8175-7514, no horário comercial das 8 às 12 e das 14 às 18 horas.

Este projeto foi Aprovado pelo Comitê de Ética em Pesquisa da SES/DF. As dúvidas com relação à assinatura do TCLE ou os direitos do sujeito da pesquisa podem ser obtidos por meio do telefone: (61) 3325-4955.

Este documento foi elaborado em duas vias, uma ficará com o pesquisador responsável e a outra com o sujeito da pesquisa.

_____

Nome / assinatura

_____

Pesquisador Responsável_ Nome e assinatura

Brasília, ___ de _____de _____