



Determinants of foot related complications among diabetic patients at Jaramongi Oginga Odinga teaching and Referral hospital

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Abstract

Objective: The objective of the study was to assess the determinants of foot related complications among diabetic patients at Jaramongi Oginga Odinga Teaching and referral hospital. Design. The study was a descriptive cross-sectional study.

Setting: The study was conducted at Jaramongi Oginga Odinga Teaching and referral Hospital (JOOTRH), located in Kisumu County Sample. The study utilized simple random method. The study therefore proposed to use 100 patients. The sample was picked through random simple method. The type 2 diabetic patients who came to the diabetic clinic and met the inclusion and exclusion criteria was picked (n = 81).

Analysis: Data was analyzed through descriptive statistics, Chi square test of independence and logistic regression.

Main outcome measures: Prevalence of foot complications, demographic characteristics, self-care characteristics and footcare practices.

Results: The respondents were asked to indicate their background characteristics based on the age group, gender, marital status and the level of education. Findings in Table 1 revealed that, established that 78% of the respondents were aged 41 years and above with a mean age of 43 years indicating that type two diabetes is more prevalent in relatively older people. The study further established that male patients were more than their female counter parts at 64%. Age, gender and marital status did not significantly influence development of foot complications. Respondents' level of education was the only demographic characteristic that significantly influenced development of foot complications, timing of blood glucose levels did not significantly influence development of foot complications. Daily inspection of feet, use of special protective footwear, and satisfaction with self-care education received at JOOTRH, significantly influenced development of foot complications.

Conclusion: The study established that development of foot complications was associated with the patients' knowledge on self-care. Recommendations. The study also recommends that the government of Kenya through Ministry of Health should ensure adequate capacity building and training of diabetes specialists. This will increase knowledge of patients and subsequently reduce number of foot complications. In addition, the researcher recommends that further studies on diabetes self-management knowledge could be done in other counties in Kenya in order to generalize the results.

Keywords: Diabetic foot, complications, kisumu County, JOOTRH, Kenya, patients

Introduction

Background

Diabetes mellitus is a chronic disease and is among the top four non communicable diseases [NCDs]. Just like the other three NCDs (cardiovascular diseases (CVD), cancers, and chronic respiratory diseases) diabetes is of long duration and generally of gradual progression, World Health Organization (WHO, 2015) [14]. In 2013 the global burden of diabetes was estimated to be 382 million people. The International Diabetes Federation (IDF) estimates that this figure is likely to rise to 592 million by the year 2035 (IDF Atlas, 2013). It is also estimated that about 14% of the population in Kenya have impaired glucose (Kenya National strategy for the prevention and control of non-communicable diseases 2015-2020).

Foot complications have the capacity to diminish a person's quality of life. Foot self-care behaviors, including daily inspection of feet, professional treatment, hygiene, and proper shoe gear help minimize the risk of foot complications. McCook-Martinez *et al.*, (2009) found that when patients were properly informed about foot care, disease-associated morbidity, hospitalization, and amputation rates were lower than for those that did not have

foot care information (Lavery *et al.*, 2013). Diabetic patients account for 70% of all patients experiencing lower extremity amputations. The risks of lifetime diabetic foot ulcer could be as high as 25% and studies also revealed that 15% to 17% of these ulcers result in surgical intervention (Abu-Oamar, 2014) [1]. Males especially had more amputations at a younger age than women and also suffered more co morbidities (Bruun, Siersma, Guassora, Hostein, & Oivarius, 2013) [3].

The CDC also reported that diabetes accounted for 65,700 or 65% of non-traumatic, lower limb amputations (CDC, 2011). According to Abu-Qamar (2014) [1] diabetes self-management education was a key strategy in the prevention of foot ulceration, which was one of the most common causes for hospitalization for patients with Type 2 diabetes. Patients with lower limb amputations are faced with numerous challenges and experts have acknowledged that with appropriate self-management knowledge on preventative activities the risk of amputations can be reduced up to half. Numerous studies have demonstrated that regular inspections and proper foot wear were very important in foot ulcer prevention (Abu-Qamar, 2014) [1]. Foot ulcers are seen frequently at many tertiary clinics in

Kenya and are associated with poor glycaemic control, infection, hypertension and dyslipidemia (Kenya National Diabetic Strategy, 2010) [7]. The WHO report that diabetics require up to triple the healthcare resources compared to non-diabetics. Diabetes threatens Kenya's healthcare system and the wider economy with loss of productive workforce (Maina *et al.*, 2011). Whereas most foot complications are seen in tertiary clinics, the current study will assess foot complications in a tier five teaching and referral hospital. In addition, anecdotal evidence shows that there is a high prevalence of foot related complications. Studies are yet to be done to confirm this.

A global consensus has emerged that various factors play an important role in the care of chronic diseases (Becker, Gates & Newsom, 2004) [2]. Diabetes self-management is a process in which the knowledge, skills, and abilities required for a patient to adequately manage his or her condition are facilitated (Corobian *et al.*, 2001) [5]. Diabetes self-management activities include a range of activities, such as ensuring adequate nutrition, regular physical activity, appropriate medication use, foot care, regularly monitoring blood glucose levels, and maintaining a healthy lifestyle (Schoenberg *et al.*, 2008) [11]. Previous studies have suggested that individuals with diabetes may not follow recommended guidelines for diet and exercise management (Wens *et al.*, 2005). Some studies have found that poor diabetes self-management among diabetes patients led to long-term diabetic complications (Shansi *et al.*, 2011). Past studies assessing determinants of foot complications among diabetic patients were done in different geographical regions, however they were not conclusive (Schoenberg *et al.*, 2008) [11]. Therefore, the researcher found it necessary to conduct this study. The objective of the study was to Assess the determinants of foot related complications among diabetic patients.

Methods

The study was conducted in Kisumu County and ethics approval was obtained from Masinde Muliro University of Science and Technology ethics board and a research permit from the National Council for Science and Technology. On recruitment, the respondents were informed about the objectives of the study and were assured confidentiality. They were informed that they were free to withdraw from the study at any time without any repercussions and verbal and signed informed consent sought. No further approval was needed since the project did not require access to patients or personal data.

Research Design

Research design refers to the plan and structure of investigating so conceived as to obtain answers to research question. Creswell (2009) and Cooper and Schindler (2007), define a descriptive survey as a design concerned with finding out the what, where and how of a phenomenon. The study designs adopted for this study was descriptive cross-sectional because they employ quantitative approaches, where self-administered questionnaires were used for data collection. Polit & Hungler (2010) observed that a descriptive research design was used when data was collected to describe persons, organizations, settings or phenomena. The purpose of the design was to gather data at a particular point in time with the intention of describing the nature of the existing conditions (Burns and Grove, 2011) [4].

Therefore, the descriptive survey was deemed the best strategy to fulfill the objectives of this study.

Study setting

The study was conducted at Jaramogi Oginga Odinga Teaching and referral Hospital (JOOTRH), located in Kisumu County. Kisumu County is one of the 47 Counties in Kenya. It lies within longitudes 33° 20'E and 35° 20'E and latitudes 0° 20'South and 0° 50'South. The County is bordered by Homa Bay County to the South, Nandi County to the North East, Kericho County to the East, Vihiga County to the North West and Siaya County to the West. The County covers a total land area of 2,009.5 km² and another 567 km² covered by water. The population of the county according to the 2009 Population and Housing Census was estimated at 968,909 persons with 474,687 males and 494,222 females. The County consists of seven constituencies namely: Kisumu East, Kisumu West, Kisumu Central, Seme, Nyando, Muhoroni and Nyakach. There is a total of 35 wards in the county. JOOTRH was preferred as the study site because it is the Major Referral Hospital in Nyanza, Western & North Rift Kenya, serving a population in excess of 5million; average annual outpatient visits are 197,200 and inpatient admissions of about 21,000. JOOTRH serves this population as the regional referral hospital.

Participants

Mugenda and Mugenda (2008) defined population as all elements (individuals, objects and events) that meet the sample criteria for inclusion in a study. The target population was type two diabetic patients at JOOTRH. According to the hospital's permanent diabetes register, the hospital sees an average of 220 patients per month. Out of this number, the hospital sees an average of 120 type 2 diabetics per month. The study utilized simple random method. The study therefore proposed to use 100 patients. The sample was picked through random simple method. The first type 2 diabetic patient who came to the diabetic clinic and met the inclusion and exclusion criteria was picked as respondent number one. Every other alternate patient that also met the criteria was included in the study for example the first client that met these criteria was respondent number one, the third client was respondent number two, the fifth client was respondent number three and so on. Patients that had already participated in the study were not included in case they were met in subsequent visits to the clinic during the study period. Type 2 diabetes patients in the medical and surgical wards who met the inclusion and exclusion criteria also participated in the study. They were selected randomly through balloting.

Questionnaire

The data was obtained using structured and interviewer administered questionnaires. The questionnaire was in three parts i.e. socio-demographic factors, clinical information and a 28-item questionnaire consisting of 5-point response scale (strongly agree = 5, agree = 4, neither agree nor disagree = 3, disagree = 2, and strongly disagree = 1) modified from Michigan Diabetes Research Centre according to whom the alpha coefficient for the twenty-eight items was .76, suggesting that the items have relatively high internal consistency. Scale scores were computed by summing the scores for the individual items constituting the scale. Each item on the scale had a maximum score of one

and a minimum of zero. If respondent knew the answer either by strongly agreeing or agreeing or by strongly disagreeing or disagreeing, they would get a score of one. If the respondent said that they did not know or answered wrongly then they would score a zero.

Data Analysis

Data analysis was done using the statistical program for social sciences (SPSS) version 25. Inferential and descriptive statistics were used to analyze data. The completed questionnaires were checked for errors and completeness and entered into Microsoft 2010 Excel and subsequently analyzed with version 20 of Statistical Package for the Social Sciences (SPSS Inc. Chicago). Raw data collected was analyzed by assigning numerical values to each response and entered into a coding table. Thereafter the numerical numbers representing responses from the questionnaires were transferred to a code sheet so as to obtain quantitative results from the closed ended questionnaires. Categorical variables were compared using chi-square tests. A multiple logistic regression model was used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) between diabetes self-management knowledge and the foot complications of type 2 diabetes, adjusting for potential confounders.

Results

Questionnaires were administered to the respondents present both at the diabetes clinic and at the wards. Out of the 100 questionnaires administered to the respondents, a total of 81 fully responded to the questionnaire giving a response rate of 81%. The response rate was sufficient and representative and conforms to Mugenda & Mugenda (2003) [10] stipulating that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and above is excellent. The respondents were asked to indicate their background characteristics based on the age group, gender, marital status and the level of education. Findings in Table 1 revealed that, established that 78% of

the respondents were aged 41 years and above with a mean age of 43 years indicating that type two diabetes is more prevalent in relatively older people. The study further established that male patients were more than their female counter parts at 64%, majority of the respondents were married (77%) and most of the patients had secondary level of education and above with a percentage of 64%. The summary of their responses is given in Table 1.

Table 1: Background characteristics of respondents

| Demographics | | Frequency | Percent |
|-----------------|---------------------|-----------|---------|
| Gender | Male | 52 | 64.0% |
| | Female | 29 | 36.0% |
| | Total | 81 | 100.0 |
| Marital Status | Single | 8 | 10.0% |
| | Married | 62 | 77.0% |
| | Separated | 3 | 4.0% |
| | Widowed | 7 | 9.0% |
| | Total | 81 | 100.0 |
| Education level | No formal education | 2 | 3.0% |
| | Primary | 27 | 33.0% |
| | Secondary | 32 | 40.0% |
| | College | 14 | 17.0% |
| | University | 6 | 7.0% |
| | Total | 81 | 100.0 |
| Age Bracket | 21-30 years | 2 | 2.0% |
| | 31-40 years | 16 | 19.6% |
| | 41-50 years | 22 | 27.0% |
| | 51-60 years | 20 | 25.0% |
| | 65 years & above | 21 | 26.0% |
| | Total | 81 | 100.0 |

Demographic characteristics and Foot Complications

The study’s objective was assessing factors influencing development of foot complications. Age, gender and marital status did not significantly influence development of foot complications. Respondents’ level of education was the only demographic characteristic that significantly influenced development of foot complications s shown in Table 2

Table 2: Demographic characteristics and Foot Complications

| Demographic Characteristics | | Had DM Related Foot Complication | | OR (95%CI) | P value |
|-----------------------------|---------------------|----------------------------------|----------|------------------|---------|
| Characteristic | Categories | Yes n (%) | No n (%) | | |
| Age (in years) | Below 50 | 8 (20) | 32 (80) | 1.29 (0.45-3.7) | 0.635 |
| | 50 and above | 10 (24) | 31 (76) | | |
| Gender | Male | 9 (17) | 43 (83) | 2.15 (0.74-6.24) | 0.154 |
| | Female | 9 (31) | 20 (69) | | |
| Marital status | Not Married | 5 (26) | 14 (74) | 0.74 (0.23-2.44) | 0.62 |
| | Married | 13 (21) | 49 (79) | | |
| Level of education | Primary and Below | 11 (38) | 18 (79) | 0.26 (0.09-0.76) | 0.011 |
| | Secondary and Above | 7 (13) | 45 (87) | | |

Foot Complication and Clinical Information

This study established that the number of years a patient had had diabetes, the type of treatment they were on and their

family history of diabetes did not significantly influence their development of foot complications as shown in Table 3.

Table 3: Foot complication and clinical information

| Disease & Care Characteristic | | Had DM Related Foot Complication | | OR (95% CI) | P Value |
|-------------------------------|---------------|----------------------------------|---------|---------------------|---------|
| Characteristic | Categories | Yes | No | | |
| Years with Disease | Above 8 Years | 7 (22) | 25 (78) | 1.03 (0.35-3.03) | 0.95 |
| | Below 8 Years | 11 (22) | 38 (78) | | |
| On Treatment | Yes | 13 (21) | 49 (79) | 0.74 (0.23-2.44) | 0.62 |
| | No | 5 (26) | 14 (74) | | |
| Family history of diabetes | Yes | 12 (24) | 39(76) | 1.23 (0.41-3.71) | 0.71 |
| | No | 6 (20) | 24 (80) | | |

Foot Complications and Self-Care Related Characteristics

The sought to determine whether development of foot complications was influenced by the respondent’s blood

glucose monitoring activities. The study established that timing of blood glucose levels did not significantly influence development of foot complications as shown in Table 4.

Table 4: Blood glucose testing and foot complications

| Test blood Glucose | | Had a DM related complication | | OR (95%CI) | P value |
|--------------------|------------|-------------------------------|----------|------------------|---------|
| | Categories | Yes n (%) | No n (%) | | |
| Before breakfast | Yes | 35 (85) | 6 (15) | 0.4 (0.13-1.2) | 0.96 |
| | No | 28 (70) | 12 (30) | | |
| After meals | Yes | 26 (81) | 6 (19) | 0.71 (0.24-2.14) | 0.54 |
| | No | 37 (76) | 12 (24) | | |
| Only at the clinic | Yes | 20 (65) | 11(35) | 3.38 (1.14-10) | 0.24 |
| | No | 43 (86) | 7 (14) | | |

Foot Care Practices and Foot Complications

Studies have shown that foot care practices are the single most important factor in preventing and managing foot related complications. The study sought to establish if daily foot inspection, use of special foot wear and satisfaction with self-management teaching influenced development of foot complications amongst diabetes patients at JOOTRH. P

value, Odds Ratio (OR) and 95% Confidence Interval (CI) were used to demonstrate difference within different groups. Values were statistically significant if p</=0.05. Daily inspection of feet, use of special protective footwear, and satisfaction with self-care education received at JOOTRH, significantly influenced development of foot complications as shown in Table 5.

Table 5: Foot care practices and foot complications

| Foot care practices | | Had a DM related complication | | P Value | OR (95% CI) |
|-------------------------|------------|-------------------------------|----------|---------|------------------|
| | Categories | Yes n (%) | No n (%) | | |
| Foot inspection | Daily | 4 (8) | 44 (92) | <0.001 | 0.12 (0.04-0.38) |
| | Not daily | 14 (42) | 19 (58) | | |
| Protective footwear | Yes | 6 (11) | 51 (89) | <0.001 | 0.12 (0.04-0.42) |
| | No | 12 (50) | 12 (50) | | |
| Satisfied with teaching | Yes | 4 (8) | 46 (92) | <0.001 | 0.11 (0.03-0.37) |
| | No | 14 (45) | 17 (55) | | |

Foot Related Complication and Resources to Aid in Acquisition of Self-Care Management Knowledge

The study viewed resources as source of information regarding diabetes self-management knowledge and diabetes educators who are instrumental in implementation of diabetes related health policies and facilitating diabetes self-management teaching. Source of information whether

from health care worker, print media, friends etc. did not seem to significantly influence development of foot complications. Respondents who said they were aware that diabetes educators are available at JOOTRH had fewer foot related complications compared to those who said that they were not aware or that the educators were not always present as demonstrated on Table 6.

Table 6: Foot related complication and Resources

| Self-Care Resource Characteristic | | Had DM Related 1Foot Complication | | OR (95%CI) | OR (95% CI) |
|-----------------------------------|---------------|-----------------------------------|---------|------------------|-------------|
| Characteristic | Grouping | Yes | No | | |
| Information Source | Other* | 4 (25) | 12 (75) | 0.82 (0.23-2.95) | 0.765 |
| | Health Worker | 14 (22) | 51 (78) | | |
| DM Educator Available | Yes | 4 (7) | 50 (93) | 0.07 0.02-0.26) | <0.001 |
| | No | 14 (52) | 13 (43) | | |

The greatest predictor of development of diabetes related foot complications interaction with a diabetes educator at JOOTRH according to the Wald criterion. Respondents who said they had not been taught by a diabetic educator were

twice as likely to suffer from foot complications compared to their counterparts who were had interacted with a diabetic educator at JOOTRH. Summary of findings on Table 7.

Table 7: Predictors of Foot Complication

| Predictor variable | B | Wald | Sig. | EXP (B) | 95% C.I. for EXP(B) | |
|----------------------------|--------|-------|------|---------|---------------------|---------|
| | | | | | Lower | Upper |
| Education (1) | -1.247 | 2.773 | .096 | .287 | .066 | 1.247 |
| Diabetes educator | -2.066 | 6.838 | .009 | .127 | .027 | .596 |
| Satisfaction with teaching | -2.851 | 3.596 | .058 | .058 | .003 | 1.101 |
| Footcare (1) | 1.829 | 1.273 | .259 | 6.229 | .260 | 149.529 |
| Use Special Foot ware (1) | -.578 | .396 | .529 | .561 | .093 | 3.389 |

Discussion

The objective of the study was to assess the determinants of foot related complications among diabetic patients. The study established that 18 (22.2%) of the respondents had experienced a diabetic foot related complication. Out of this 72.2% were not knowledgeable on diabetes self-management. Age, gender, marital status, level of education, years with diabetes, type of treatment, family history of diabetes, do not significantly influence development of foot related complications. Use of special foot wear (OR: 1.2; 95% CI 0.04-0.38, 'P<.001'), daily foot care OR: 0.12; 95% CI 0.04-0.42, ('P<.001') and satisfaction with diabetes self-management teaching at JOOTRH (OR: 0.11; 95% CI 0.03-0.37, 'P<.001') significantly influence development of foot complications. According to Abu-Qamar (2014) ^[1] diabetes self-management education was a key strategy in the prevention of foot ulceration, which was one of the most common causes for hospitalization for patients with Type 2 diabetes. Respondents who were satisfied with the diabetes self-management teaching at JOOTRH appeared to be more knowledgeable and better motivated than their counterparts who were not satisfied with the teaching. According to Jalilian, Motlagh, Solhi, & Gharibnavaz (2014), self-management participation is vital to success in the treatment of diabetes, which demands "motivation, knowledge and compliance to a difficult and complex lifetime regimen". Seventy-eight percent of the respondents that had foot complications did not check their feet daily. Gale *et al.*, (2009) noted that how people with diabetes know and actually care for their feet is largely unknown. Several studies concluded that most patients have insufficient knowledge about how to reduce the risk of ulceration. The supposition has generally been, therefore, that increasing the amount of advice and health education would lead to improved self-care, although there is little empirical support for this approach (Kartel *et al.*, 2010). A few surveys have concluded that most diabetic patients have insufficient knowledge about how to reduce the risk of foot ulceration (Kartel *et al.*, 2010). Systematic reviews of educational interventions for improved preventive foot self-care have found short-term effects (Gael *et al.*, 2008). This study therefore concurs with these studies that indeed insufficient knowledge on self-care significantly influences development of foot complications.

Conclusion & Recommendation

The study established that development of foot complications was associated with the patients' knowledge on self-care. The study further established that there are diabetic educators at JOOTRH though they do not always engage the patients in self-management education. The study recommends more intensive foot care education with subsequent follow up either through telephone call or home visit as most patients who developed foot complications reported examining their feet only at the clinic. In addition, the study also recommends that the government of Kenya through Ministry of Health should ensure adequate capacity building and training of diabetes specialists. This will increase knowledge of patients and subsequently reduce number of foot complications.

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