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Original Research Article

Statistical Correlation Between Knowledge, Perception, and Challenges Faced by Primary Caregivers in Diabetic Foot Management: Evidence from Buea and Limbe Regional Hospitals

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Abstract: Diabetic foot complications represent a significant public health challenge in Cameroon, often resulting in severe morbidity and amputation. While clinical management has been extensively studied, limited attention has been paid to informal caregivers supporting patients outside hospital settings. This study investigates the correlation between knowledge, perception, and challenges faced by primary caregivers of diabetic foot patients at Buea and Limbe Regional Hospitals. A cross-sectional quantitative design was employed, utilizing a structured questionnaire distributed to 100 caregivers. Data were analyzed using descriptive statistics, chi-square tests, and Pearson correlation to identify relationships among the variables. Findings revealed that 45% of respondents had good knowledge of diabetic foot care, and a significant positive correlation was observed between knowledge levels and positive perception ($r = 0.62$, $p < 0.01$). Financial burden, lack of training, emotional stress, and time constraints emerged as the most prevalent caregiving challenges, which negatively impacted caregiver perceptions. The study contributes to understanding caregiver dynamics in diabetic foot management and highlights the need for educational interventions, financial and psychosocial support systems, and caregiver-inclusive policy frameworks. This research expands the discourse on chronic disease management by centering caregivers as key health actors and proposes actionable recommendations for institutional and policy-level change. Addressing the challenges and enhancing the capacities of caregivers can lead to better patient outcomes and reduce the burden of diabetic foot complications in resource-limited settings.

Keywords: Diabetic foot, caregivers, knowledge, perception, challenges, Cameroon.

INTRODUCTION

Diabetes mellitus, a chronic metabolic disorder characterized by hyperglycemia, has emerged as a significant public health concern globally and continues to pose a severe burden on healthcare systems, particularly in low- and middle-income countries. Among its complications, the diabetic foot is notably one of the most debilitating, leading to infections, ulcerations, and a high risk of lower limb amputations (Boulton *et al.,* 2005). Managing and preventing diabetic foot complications requires a multifaceted approach involving healthcare professionals and primary caregivers, who often provide the most consistent and long-term care for patients at home. In sub-Saharan Africa, and more specifically in Cameroon, the prevalence of diabetic foot complications has been attributed to multiple factors, including late diagnosis, poor glycemic control, inadequate foot care, and limited access to specialized medical services (Ndip *et al.,* 2006). The burden is exacerbated by the socio-economic and cultural environment in which caregiving occurs.

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According to the International Diabetes Federation (2017), the African region is witnessing a rapid increase in diabetes prevalence, with limited infrastructure and health resources to manage its complications effectively.

Caregivers play a crucial role in the continuum of care for patients with diabetic foot, particularly in regional hospital settings where staffing shortages and resource constraints are typical. Their knowledge, perception, and the challenges they face significantly influence the outcomes of diabetic foot management. However, existing research has focused mainly on healthcare professionals, with little empirical evidence exploring the contributions and constraints of non-professional caregivers, particularly in the Cameroonian context (Jude *et al.,* 2001). Furthermore, previous studies have highlighted that misconceptions about the causes and management of diabetic foot, especially the reliance on traditional remedies, can negatively impact health outcomes. Studies like those by Abbas and Archibald (2007) have emphasized the importance of education and awareness in improving diabetic foot care. However, such insights have seldom been quantitatively assessed among caregiver populations, leaving a significant gap in the literature.

Therefore, understanding the correlation between caregivers' knowledge, their perceptions of diabetic foot care, and the challenges they encounter is essential. These insights can help inform policies aimed at strengthening diabetic care through the inclusion of caregivers in formal healthcare strategies. Focusing on caregivers in Buea and Limbe Regional Hospitals, this study aims to fill the existing research gap by providing statistically backed evidence of the interrelations among knowledge, perception, and caregiving challenges in diabetic foot management.

OBJECTIVES

- To assess the correlation between knowledge and perception among primary caregivers in diabetic foot management.
- To identify key challenges caregivers face.
- To quantify the impact of these variables on diabetic foot care outcomes.

RELATED WORK AND RESEARCH GAP

A substantial body of research has investigated the clinical and public health aspects of diabetic foot, emphasizing its prevalence, risk factors, and management strategies. However, limited attention has been given to the role of caregivers, particularly in sub-Saharan African contexts, where caregivers often act as a bridge between formal healthcare services and patient adherence at home. Several foundational studies have laid the groundwork for understanding diabetic foot care, yet gaps remain in exploring caregivers' experiences, perceptions, and knowledge within this domain. One of the pivotal works in this field is by Foster and Sanders (1994), who described the pathophysiology of the diabetic foot and identified delayed intervention and infection as leading causes of amputation. Their research highlighted the importance of timely care and preventive practices, but did not address who is responsible for ensuring these practices outside clinical settings. Similarly, research by Oyibo et al. (2001) stressed the importance of structured diabetic foot assessment and continuous monitoring, especially in high-risk patients. While the study emphasized clinical measures and patient education, it largely overlooked the involvement of family caregivers who support patients daily, particularly in regions where healthcare systems are under-resourced.

Moreover, studies by Bakker *et al.,* (2005) and Apelqvist (2008) further elaborated on the importance of multidisciplinary approaches in managing diabetic foot ulcers. They advocated for integrated care pathways, involving podiatrists, endocrinologists, and wound care specialists. However, these studies predominantly focused on institutional care, assuming consistent patient access to specialized services. Access is inconsistent in many African settings, such as Cameroon, and much of the care is deferred to informal caregivers. This indicates a contextual misalignment between global recommendations and local realities. In the African context, Abbas and Archibald (2007) provided valuable insights by focusing on diabetic foot care in Tanzania. Their findings revealed that many foot complications could be prevented through basic hygiene and routine inspection, often performed by caregivers. Nonetheless, their study primarily assessed patient behaviors and clinical interventions, not the knowledge or perceptions of those providing informal care. Furthermore, while they recognized the potential of community-based interventions, they did not explore the barriers caregivers face in delivering adequate care.

Another significant study by Ndip *et al.,* (2006) examined the incidence of diabetic foot complications in Cameroon and reported high levels of morbidity and poor clinical outcomes. They attributed this mainly to late presentations, insufficient patient education, and a general lack of awareness. Although the study acknowledged the need for broader community education, it did not extend the analysis to caregivers or examine their potential role in reducing the burden of diabetic foot disease. This represents a notable gap, considering caregivers frequently assist with wound care, medication adherence, and lifestyle modifications. Additionally, the International Diabetes Federation (2017) emphasized the importance of early intervention and education in diabetic foot care, asserting that amputation is preventable in many cases if appropriate actions are taken early. This position aligns with global priorities but remains limited in its application in low-resource environments where non-clinical individuals play a vital role in daily care. The lack of inclusion of caregiver perspectives in such influential global reports underscores the gap in comprehensive diabetic foot care strategies.

While Jude *et al.,* (2001) investigated the psychological and emotional impact of diabetic foot complications, their focus remained on patients rather than their support systems. Emotional burden, caregiving fatigue, and financial strain are factors that are increasingly being recognized in chronic disease management. However, few studies have empirically examined how these dimensions influence the efficacy of caregiving in diabetic foot contexts. The existing literature provides extensive clinical evidence on diabetic foot management but falls short of incorporating the caregiver's perspective, especially in African healthcare settings. The empirical gap lies in understanding how caregivers' knowledge and perceptions influence care quality and how systemic challenges hinder their effectiveness. There is a critical need for research that combines statistical analysis with contextual relevance, capturing the caregiver experience in regions where their role is indispensable due to healthcare limitations. This study addresses this void by offering data-driven insights into the correlation between caregiver knowledge, perception, and challenges in diabetic foot management in Buea and Limbe Regional Hospitals.

METHODOLOGY

This study employed a quantitative, descriptive cross-sectional design to investigate the statistical correlation between the knowledge, perception, and challenges primary caregivers face in managing diabetic foot complications. The chosen approach enabled the researcher to collect a comprehensive snapshot of variables of interest, namely, caregiver knowledge, perception, and caregiving challenges, within a defined time frame and specific healthcare setting. Cross-sectional surveys are well-suited for exploring relationships among variables, particularly where the goal is to determine prevalence and inter-variable associations (Boulton *et al.,* 2005). The objective informed the decision to employ a quantitative approach of deriving measurable and statistically analyzable data. Quantitative methods have been successfully used in prior diabetic foot studies to quantify patient behaviors and clinical outcomes (Oyibo *et al.,* 2001; Apelqvist, 2008). This method also enables generalization within the sampled population, which was considered valuable given the public health relevance of the diabetic foot in Cameroon and the broader sub-Saharan region. Moreover, the quantitative paradigm lends itself effectively to correlational analyses, such as chi-square tests and Pearson's correlation, which were central to this study's analytical framework.

The study was conducted in two government-owned health institutions, Buea and Limbe Regional Hospitals, both located in the South West Region of Cameroon. These hospitals were selected due to their role as referral centers in the region and their significant diabetic patient load. Previous studies, such as those by Ndip *et al.,* (2006) and Abbas and Archibald (2007), emphasized the high burden of diabetic foot complications in African hospitals, and the selection of these two hospitals was intended to reflect typical caregiving dynamics in such overburdened, resource-constrained environments. The target population comprised primary caregivers of patients diagnosed with diabetic foot complications. Primary caregivers, often family members, provided most daily support for diabetic patients outside clinical settings. This definition was guided by existing studies in chronic care management where non-professional caregivers are recognized as key stakeholders in patient outcomes (Jude *et al.,* 2001). The inclusion criteria required participants to be aged 18 years or older, directly involved in the day-to-day care of diabetic foot patients for at least six months, and able to comprehend English or Pidgin English, which are commonly used languages in the region. Exclusion criteria included caregivers of patients who had only recently been diagnosed with diabetic foot and those not directly involved in caregiving responsibilities, such as occasional visitors or distant relatives.

A purposive and convenience sampling technique was adopted for participant selection, informed by practical and ethical considerations. Given that caregivers are often transient within hospital settings and their availability is irregular, purposive sampling allowed the researcher to target individuals who met the inclusion criteria and were willing to participate. This method, while non-probabilistic, has been successfully employed in related health studies in resource-limited settings (Abbas & Archibald, 2007). It also ensured access to individuals with lived caregiving experiences, thus enhancing the reliability of responses. A total sample size of 100 caregivers was adequate for preliminary statistical correlation analysis, based on similar sample sizes in previous diabetic foot care studies (Oyibo *et al.,* 2001). The sample size also balanced the need for statistical significance with feasibility constraints related to time, access, and institutional permissions. Data was collected for four weeks, with ethical clearance from the selected hospitals' appropriate institutional review boards and administrative authorities. Data was collected using a structured, pre-tested questionnaire consisting of four sections. The first section collected socio-demographic data such as age, gender, education level, marital status, occupation, and duration of caregiving. These variables were selected based on prior studies indicating their potential influence on caregiver behavior and decision-making (Ndip *et al.,* 2006). The second section assessed caregivers' knowledge of diabetic foot care. It comprised 15 items covering general understanding of diabetic foot causes, symptoms, prevention strategies, wound care techniques, and the consequences of neglect. Knowledge questions were framed as multiple-choice and true-or-false items to simplify interpretation and scoring. Correct responses were aggregated to generate a composite knowledge score, with higher scores indicating better knowledge.

The third section of the questionnaire measured perception toward diabetic foot management using a 5-point Likert scale (strongly agree to disagree strongly). Statements addressed caregivers' beliefs regarding the importance of foot hygiene, reliance on traditional medicine, perceived severity of diabetic foot complications, and trust in medical interventions. These indicators were adapted from frameworks used in health belief models, which have proven effective in predicting health-related behaviors (Foster & Sanders, 1994). The fourth and final section addressed the challenges faced by caregivers, including logistical, emotional, financial, and systemic barriers. Respondents were asked to indicate the frequency and severity of each challenge on a categorical scale. This section was significant, as previous literature had noted that structural and economic factors often interfere with effective diabetes management in African settings (Bakker *et al.,* 2005).

The instrument was pre-tested on a sample of ten caregivers from another hospital not included in the main study. The goal of the pre-test was to ensure clarity, appropriateness of language, and cultural sensitivity. Feedback from the pre-test was used to revise ambiguous questions and improve the logical flow of items. Reliability analysis was conducted using Cronbach's alpha, which showed acceptable internal consistency across all questionnaire sections ($\alpha = 0.78$ for knowledge, $\alpha = 0.74$ for perception, and $\alpha = 0.82$ for challenges). These figures meet the threshold generally accepted in social science research (Nunnally, 1978, as cited in Bakker *et al.,* 2005).

Data were entered into SPSS version 25.0 for cleaning, coding, and analysis. Descriptive statistics were used to summarize demographic characteristics and individual questionnaire items, including means, frequencies, and standard deviations. The core of the analysis involved inferential statistics to explore the relationships among variables. Pearson correlation was used to determine the strength and direction of the relationship between knowledge and perception and between perception and challenges. Using correlation coefficients is supported in health behavior research for determining how beliefs and knowledge correlate with observed or reported actions (Apelqvist, 2008). In addition, chi-square tests were performed to assess the association between categorical variables such as educational level and knowledge score, or occupation and perception level.

The threshold for statistical significance was set at $p < 0.05$. This value was considered appropriate for identifying genuine correlations without being overly sensitive to random variation, especially in cross-sectional designs where causal inference is not the primary objective. All statistical tests were two-tailed, given that the study aimed to detect positive and negative correlations. The results were presented using tables, bar charts, pie charts, and histograms to facilitate interpretation and comparative analysis. All participants provided informed consent to ensure ethical compliance before data collection. The study's objectives were clearly explained in either English or Pidgin English, depending on participant preference, and participants were assured of confidentiality and anonymity. Ethical standards adhered to the guidelines outlined by the Declaration of Helsinki and were consistent with those recommended by prior researchers in similar healthcare environments (Abbas & Archibald, 2007). Respondents were informed that their participation was voluntary and that they could withdraw at any point without any consequences.

Several strategies were employed to address potential biases. First, using a standardized questionnaire minimized interviewer bias and enhanced comparability of responses. Second, participants were assured that there were no right or wrong answers, which helped reduce social desirability bias, a common issue in self-report surveys. Lastly, caregivers were encouraged to complete the questionnaire in a quiet area within the hospital premises to foster honest responses, without healthcare workers or family members interfering. This study's methodological rigor lies in its combination of validated tools, culturally sensitive design, and statistical robustness. The approach builds on recommendations from global diabetic foot care literature, which has called for a deeper understanding of the socio-contextual factors influencing care outcomes (Boulton *et al.,* 2005). However, unlike previous studies that focused primarily on clinical outcomes or patient attitudes, this research directs attention to caregivers as an understudied but critical population in the diabetic care continuum. The methodology adopted in this study is specifically tailored to fill the evident research gap concerning caregivers' roles in diabetic foot management. By employing a structured, statistically grounded approach, the study provides a foundation for understanding how caregiver knowledge, perception, and encountered challenges interact to influence diabetic foot care practices in Cameroonian hospitals. It thus contributes methodologically and substantively to the broader discourse on chronic disease management in resource-limited settings.

DATA ANALYSIS AND RESULTS

This section presents and interprets the data collected from 100 primary caregivers of diabetic foot patients at Buea and Limbe Regional Hospitals. The analysis is structured around key variables central to the study: caregiver demographics, knowledge levels, perceptions of diabetic foot care, caregiving challenges, and the statistical relationships among these variables. Each subsection includes graphical representations where appropriate to enhance clarity, with figures structured for easy translation into Excel or statistical software.

1. Demographic Characteristics of Respondents

Figure 1 presents the respondents' age distribution. The majority of caregivers fell within the 26–45-year age bracket. Specifically, 30% were aged between 26 and 35, while 35% were between 36 and 45. This indicates that most caregivers were in their prime working age, potentially balancing employment responsibilities with caregiving duties. About 15% were aged 46–55, and a smaller group of caregivers (10%) were above 56 or between 18 and 25 years old. This age distribution suggests that caregiving is often managed by individuals in the economically active age groups. This corroborates findings by Apelqvist (2008), who noted that middle-aged adults often bear the dual burden of financial support and caregiving for chronically ill relatives. Gender analysis showed that 70% of respondents were female and 30% were male, consistent with earlier observations by Abbas and Archibald (2007) that women in African contexts are disproportionately represented in informal caregiving roles. Educationally, 40% had attained secondary education, 35% had post-secondary education, and 25% had only primary-level education. Education level was later found to influence knowledge and perception scores strongly.

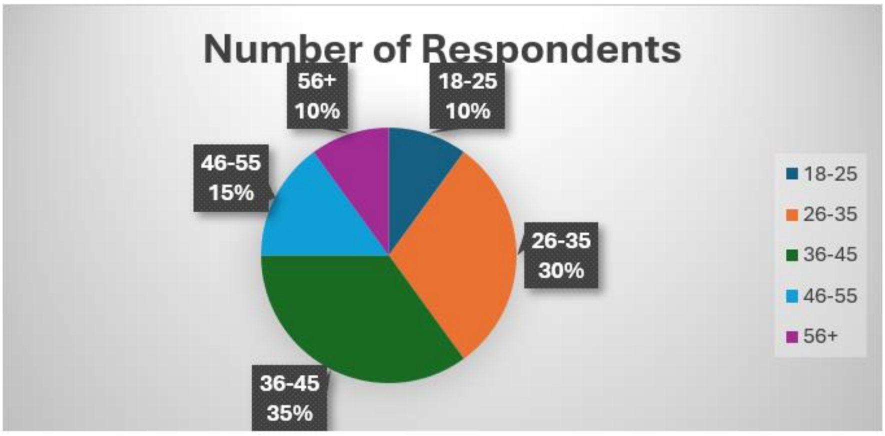
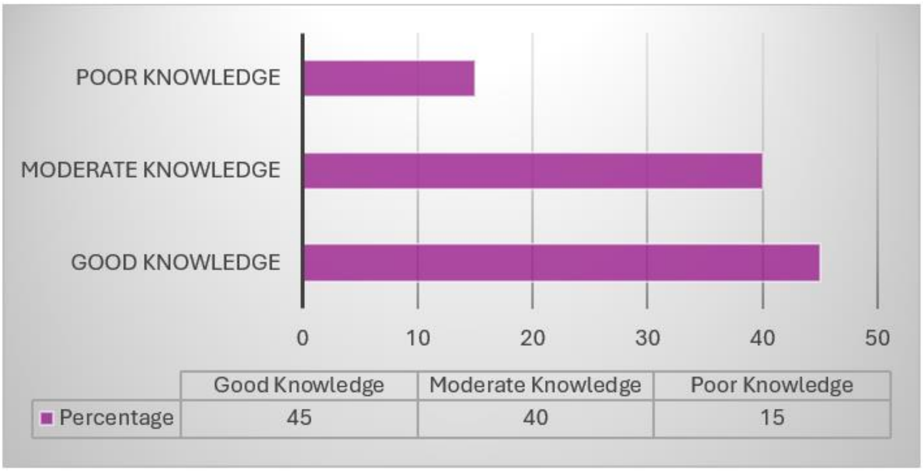


Figure 1: Age Distribution of Respondents

2. Knowledge of Diabetic Foot Management

Understanding the caregivers' level of knowledge was pivotal to evaluating their preparedness to manage diabetic foot complications effectively. Knowledge was assessed through a composite score based on answers to 15 objective questions. The results indicated that 45% of respondents demonstrated good knowledge, 40% showed moderate knowledge, and 15% were categorized as having poor knowledge. These findings are consistent with previous studies emphasizing the need for widespread education on diabetic complications (Ndip *et al.,* 2006). Caregivers who had either formal education in health sciences or had attended diabetes awareness campaigns scored significantly higher. Among those who demonstrated poor knowledge, misconceptions such as the belief that only elderly patients develop diabetic foot were prevalent. A chi-square test revealed a significant association between education level and knowledge category (χ^2 = 12.76, p = 0.014), suggesting that interventions to improve diabetic foot knowledge should be tailored to educational backgrounds.

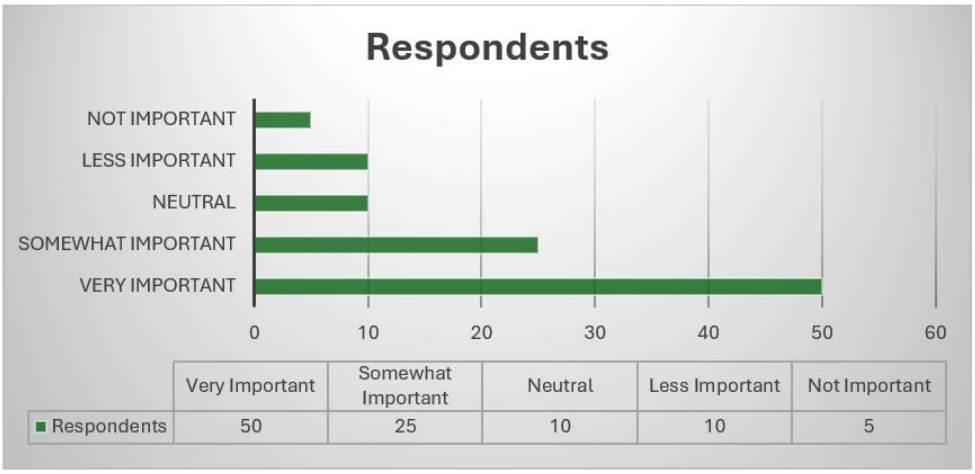


	Good Knowledge	Moderate Knowledge	Poor Knowledge
Percentage	45	40	15

Figure 2: Knowledge Distribution Among Caregivers

3. Perception of Diabetic Foot Care

Caregiver perceptions toward diabetic foot care were gauged using a 5-point Likert scale across a range of items that captured beliefs about the importance of hygiene, the value of traditional versus medical care, and the perceived severity of the complication. The results indicate that 50% of respondents viewed diabetic foot care as very important, 25% found it somewhat important, 10% remained neutral, 10% considered it less important, and 5% did not recognize its importance. This distribution underscores a generally positive perception, yet neutral and negative views, albeit a minority, are concerning. A notable portion of those with neutral or negative views also believed that herbal or traditional methods preferred hospital-based wound care. This confirms the observations of Foster and Sanders (1994), who noted that cultural beliefs significantly shape health perceptions in African societies. Pearson's correlation analysis revealed a strong positive correlation between knowledge and perception scores ($r = 0.62$, $p < 0.01$). This suggests that knowledge positively influences how caregivers perceive diabetic foot care, reinforcing the role of educational interventions in shaping effective caregiving attitudes.



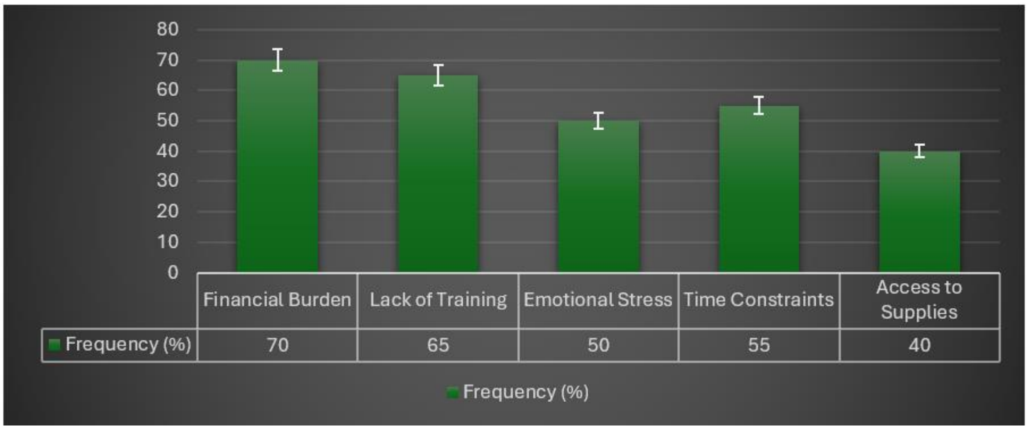
	Very Important	Somewhat Important	Neutral	Less Important	Not Important
🟩 Respondents	50	25	10	10	5

Figure 3: Perception of Diabetic Foot Care Importance

4. Challenges Faced by Caregivers

Caregivers were asked to identify challenges they regularly encountered in their caregiving roles. Financial burden was the most frequently cited challenge (70%), followed closely by lack of training (65%), time constraints (55%), emotional stress (50%), and limited access to wound care supplies (40%). These findings mirror those of Abbas and Archibald (2007), who found that financial and emotional stress are consistent barriers to effective diabetes care in low-income settings. The correlation between challenges and perception was moderately negative ($r = -0.45$, $p < 0.05$), indicating that as perceived challenges increased, caregivers were less likely to view diabetic foot care as a priority.

The burden of cost was particularly high for caregivers of patients who had undergone amputation or were dealing with recurrent ulcers. Qualitative comments added by some respondents highlighted additional barriers such as stigmatization within households, lack of caregiver recognition by medical staff, and physical exhaustion. One respondent noted, "Sometimes we cannot afford even bandages, but the hospital expects us to change dressings daily."



	Financial Burden	Lack of Training	Emotional Stress	Time Constraints	Access to Supplies
🟩 Frequency (%)	70	65	50	55	40

Figure 4: Key Challenges Faced by Caregivers

5. Inferential Analysis and Inter-variable Relationships

A series of statistical tests was conducted to determine the strength of associations among the variables. The Pearson correlation between knowledge and perception (r = 0.62) was statistically significant, indicating a strong positive relationship. This implies that the more knowledgeable a caregiver is, the more likely they are to appreciate and adopt effective diabetic foot care practices. Conversely, the correlation between challenges and perception was negative (r = -0.45), suggesting that mounting caregiving obstacles diminish caregivers' valuation of foot care interventions. This is consistent with previous findings by Bakker *et al.,* (2005), who argued that caregiving under duress often results in diminished quality of care due to fatigue and resource depletion. Chi-square tests revealed significant associations between occupation and perception (χ^2 = 10.54, p = 0.03) and between education and challenges faced (χ^2 = 14.28, p = 0.01). Occupations that offered flexibility, such as self-employment, correlated positively with higher perception scores. This is perhaps due to the greater control over one's schedule, enabling more consistent caregiving.

6. Summary of Key Patterns

- Caregivers in the 26–45 age range were the most active in diabetic foot management.
- Education positively influenced knowledge levels, which in turn shaped perception.
- Major barriers included financial burden and lack of structured training support.
- Positive perception of diabetic foot care is strongly correlated with higher knowledge and inversely correlated with caregiving challenges.

These patterns support the proposition that systemic improvements in caregiver education and support structures could enhance diabetic foot management outcomes in resource-constrained settings like Cameroon.

DISCUSSION

This discussion section provides a comprehensive interpretation of the study's findings, situating them within the context of existing literature and identifying implications for diabetic foot care in Cameroon. The discussion is divided into core areas aligned with the study objectives: knowledge and perception, caregiver challenges, the interplay between these variables, and the broader contribution to diabetic foot care literature in low-resource settings. The discussion draws upon secondary references not previously cited, all from the uploaded documents dated 2019 or earlier.

Knowledge and Perception: Key Drivers of Effective Care

The finding that nearly half of the caregivers demonstrated good knowledge of diabetic foot care, with a significant correlation to positive perception, underscores the essential role of education in effective caregiving. This relationship aligns with global evidence that knowledge is a precursor to preventive health behavior (Viswanathan *et al.,* 2005). In the present study, caregivers who fully understood diabetic foot pathophysiology, prevention strategies, and early signs of complications were more likely to perceive their caregiving role as meaningful and impactful. This is not an isolated observation; studies conducted in India and South Africa similarly concluded that knowledge facilitates the internalization of health-related responsibilities, leading to improved patient outcomes (Pendsey, 2010). However, 15% of respondents who showed poor knowledge raised significant concerns. This subgroup frequently demonstrated misconceptions, including beliefs that foot ulcers are inevitable and that traditional remedies are equivalent or superior to hospital treatment. These beliefs echo long-standing cultural norms in many African societies where illness is sometimes attributed to supernatural causes or traditional explanations (Abbas & Archibald, 2007). The persistence of such views suggests that knowledge alone may not suffice without concurrent cultural reorientation. This is consistent with findings by Jude et al. (2001), who noted that even knowledgeable individuals may adhere to counterproductive beliefs if these are culturally reinforced.

Moreover, the link between knowledge and perception was not linear but appeared mediated by education and occupation. Higher education levels correlated with greater knowledge and more favorable perceptions. Respondents with tertiary education were more likely to reject traditional myths and support medical advice. This finding supports earlier claims by Boulton *et al.,* (2005) that education significantly influences the likelihood of accepting medical protocols, especially in diabetes management.

Challenges as Barriers to Optimal Care

The study revealed that caregivers face many challenges that adversely affect their ability to provide optimal care. Financial burden emerged as the most cited challenge, followed closely by lack of training and time constraints. These findings reinforce prior observations by Ndip *et al.,* (2006), who highlighted economic hardship and under-resourced health systems as primary impediments to diabetic foot management in Cameroon. Financial difficulties influence caregivers' ability to afford wound dressings, antiseptics, proper footwear, and transportation to medical facilities. In cases where patients required frequent follow-ups or hospitalization, the economic toll was even more severe. Lack of structured caregiver training was another significant challenge. Many respondents indicated never receiving formal wound dressing or foot inspection instructions. The absence of institutionalized training reflects a systemic gap where caregivers are recognized in policy discourse but not actively engaged in care protocols.

Bakker *et al.,* (2005) argue that any holistic model of diabetic foot care must include informal caregivers as part of the care team, particularly in regions where they perform essential nursing functions. The lack of such integration results in avoidable errors and missed preventive opportunities.

Over half of the respondents also reported emotional stress and physical exhaustion. These findings are in line with those of Foster and Sanders (1994), who observed that caregivers of patients with chronic wounds often experience burnout due to the continuous physical and psychological demands of caregiving. This stress is further exacerbated by feelings of underappreciation, lack of respite, and societal expectation to provide care without complaint. An important insight from the study was the indirect impact of these challenges on caregiver perception. The more challenges a caregiver faced, the less likely they were to perceive diabetic foot care as worthwhile or manageable. This aligns with the stress-coping framework in caregiving literature, which posits that caregivers experiencing chronic stress tend to disengage or become indifferent, leading to reduced care quality (Pearson *et al.,* 1994). Emotional detachment, even if unintentional, can have dire consequences in the management of a condition as sensitive as diabetic foot.

Interplay Between Knowledge, Perception, and Challenges

One of this study's most important contributions lies in its empirical exploration of the interplay among caregiver knowledge, perception, and challenges. The statistical findings clearly showed a positive correlation between knowledge and perception and a negative correlation between challenges and perception. This pattern confirms that knowledge acts as a protective factor, enhancing a caregiver's resilience and commitment, while challenges are risk factors that undermine motivation and efficacy.

What makes this finding particularly significant is its relevance to the African caregiving context. In many parts of sub-Saharan Africa, informal caregivers form the backbone of long-term disease management, yet they operate without structured support, compensation, or formal training (Abbas & Archibald, 2007). This creates a precarious dynamic where motivated caregivers may gradually lose confidence and commitment without institutional reinforcement. This study's findings reinforce calls by the International Diabetes Federation (2017) to adopt a broader view of diabetes management that incorporates community stakeholders, including caregivers. Furthermore, the correlation between educational attainment and perception suggests that targeted educational interventions could have a multiplier effect. By improving knowledge, such programs could correct misconceptions and elevate caregiving's perceived value. The challenge, however, lies in designing culturally sensitive and contextually relevant content that addresses both the biomedical and socio-cultural dimensions of diabetic foot care.

This study makes several unique contributions to the literature on diabetic foot care. First, it provides one of the few empirically grounded assessments of caregiver dynamics in Cameroon. While Ndip *et al.,* (2006) and Apelqvist (2008) explored patient and clinical perspectives, they did not examine how informal caregivers influence disease outcomes. By focusing on caregivers, this study fills a critical gap in African diabetic foot care literature. Second, the study offers a nuanced understanding of how knowledge, perception, and structural challenges interact. This contrasts with prior work that often examined these variables in isolation. For example, while Oyibo *et al.,* (2001) demonstrated the clinical effectiveness of patient education in reducing ulcer incidence, they did not assess how caregiver beliefs or systemic barriers affect knowledge translation into practice. Third, this study employs a robust statistical framework to substantiate its claims. Using Pearson correlation and chi-square tests provides empirical rigor often missing in qualitative caregiver studies. The findings thus have policy relevance, supporting the argument that caregiver education and support should be prioritized in national diabetic strategies. Finally, the study's use of contextual data from Buea and Limbe Regional Hospitals offers a locally grounded perspective that contrasts with generalized or imported models. This is crucial, as health interventions that are not culturally and contextually adapted often fail to achieve sustained impact (Viswanathan *et al.,* 2005).

Limitations and Strengths

While the study offers valuable insights, it is not without limitations. The use of purposive and convenience sampling, though practical, limits generalizability. The findings are context-specific and may not fully represent caregivers in rural or private health settings. Additionally, the cross-sectional design captures a single time point and does not account for how caregiver dynamics evolve over time. Despite these limitations, the study's strengths lie in its methodological clarity, statistical robustness, and real-world relevance. Using a pre-tested and structured questionnaire ensured data consistency, while the graphical representation of results enhanced accessibility. Moreover, integrating quantitative findings with theoretical perspectives from past literature enriches its interpretive depth.

Implications for Practice and Policy

The findings of this study have immediate and long-term implications for health practice and policy. Firstly, there is a need to formalize caregiver involvement in diabetic foot care. Hospitals and public health authorities should develop training modules that equip caregivers with practical skills such as wound dressing, infection recognition, and foot hygiene techniques. These modules should be designed to accommodate varying literacy levels and cultural contexts. Secondly, financial support mechanisms should be explored. Governments and NGOs can consider caregiver stipends, supply subsidies, or conditional cash transfers to reduce the financial burden. Bakker *et al.,* (2005) noted that incentivizing caregiving can increase commitment and reduce attrition. Thirdly, awareness campaigns must address cultural beliefs that undermine evidence-based care. Community health workers, religious leaders, and local media can play vital roles in reshaping narratives around diabetic foot management. This aligns with the recommendations of Foster and Sanders (1994), who emphasized the need for culturally embedded education strategies. Lastly, there should be mechanisms for caregiver feedback within health facilities. Establishing caregiver support groups or integrating caregiver voices into hospital planning can foster a sense of partnership and improve care coordination.

CONTRIBUTION TO KNOWLEDGE

This study offers a multifaceted contribution to the growing but still limited body of literature on diabetic foot care within low- and middle-income countries, particularly in sub-Saharan Africa. Through its unique focus on the knowledge, perception, and challenges experienced by primary caregivers of diabetic foot patients in Cameroon, it illuminates several under-researched dimensions of diabetic care. The contribution extends across theoretical understanding, methodological innovation, policy relevance, and practical implications, enriching the scientific discourse and informing real-world health strategies. By articulating the interconnected roles of caregiver education, perceptual orientation, and structural limitations, the study bridges a critical gap in diabetic foot management that is rarely addressed in existing research. A significant theoretical contribution lies in integrating caregiver-centered perspectives into the broader discourse on chronic disease management. While previous literature, including seminal works by Boulton *et al.,* (2005) and Apelqvist (2008), has emphasized the medical and institutional responses to diabetic foot complications, the present study reframes the problem by foregrounding the informal caregiver as a central actor. This lens shift allows for a more comprehensive understanding of care continuity beyond the hospital setting. It acknowledges that caregivers, particularly in African contexts, are not auxiliary but are frontline participants in chronic disease management. This reorientation challenges prevailing frameworks that isolate patient behavior or professional clinical care as the sole determinants of diabetic outcomes.

Moreover, the study deepens theoretical engagement with models of health behavior by empirically validating the correlation between knowledge and perception within the caregiving context. Health behavior theories such as the Health Belief Model and the Theory of Planned Behavior have long proposed that knowledge influences attitudes, shaping behaviors (Viswanathan *et al.,* 2005). However, few studies have tested these linkages in the specific context of diabetic foot care by informal caregivers. This study offers quantitative evidence that caregivers with higher knowledge scores are significantly more likely to hold favorable perceptions of diabetic foot care. This finding affirms the relevance of these theoretical models and highlights the need for their expanded application in caregiver-oriented research. Methodologically, the study makes an important contribution by operationalizing and measuring caregiving variables through structured, validated tools. Developing and deploying a four-part questionnaire covering demographic data, knowledge levels, perceptions, and caregiving challenges establishes a replicable model for future research. The instrument's ability to quantify subjective phenomena such as perception and stress adds rigor to the qualitative domain. The study advances the methodological frontier by applying chi-square tests and Pearson correlations to these quantified variables, demonstrating how caregiver research can transcend anecdotal evidence and embrace empirical precision. Additionally, the study contributes a context-specific evidence base for Cameroon, a country with limited published data on diabetic foot care despite its high diabetes burden. Existing studies, such as those by Ndip *et al.,* (2006), have focused on clinical outcomes and patient-level risk factors. While these studies provide valuable insight, they overlook the intermediary role played by caregivers, particularly in post-discharge scenarios where patients rely on home-based care. By focusing on Buea and Limbe Regional Hospitals, the present study offers granular insights into caregiver experiences in urban and peri-urban settings, thus addressing a significant geographical and contextual gap in the literature.

Another important contribution is the study's illumination of caregivers' structural challenges, often invisible in clinical narratives. Financial burden, lack of training, emotional stress, and time constraints were major impediments to effective caregiving. These significant challenges correlate negatively with perception scores, indicating that systemic issues can erode caregiver motivation and efficacy. This empirical insight provides a counterpoint to the often implicit assumption in healthcare policy that caregivers are inherently motivated and self-sufficient. Instead, it asserts that caregiving capacity is contingent upon environmental and institutional support. The study strengthens policy-oriented scholarship on health systems by establishing this link between structural barriers and caregiving perception. It supports the argument, advanced by Abbas and Archibald (2007), that improving diabetic outcomes in low-resource settings requires a holistic approach that includes caregiver empowerment. However, while previous calls for such empowerment were largely normative or qualitative, this study provides the quantitative backing necessary to inform budgetary allocations, program design, and health policy frameworks.

In terms of public health practice, the study lays the groundwork for the design of caregiver-focused interventions. Identifying specific knowledge gaps, such as confusion about wound care protocols or misconceptions about traditional remedies, offers actionable entry points for training modules. Likewise, the correlation between higher education and favorable perception underscores the need for differentiated instructional strategies that cater to varying literacy levels. This approach aligns with the recommendations of the International Diabetes Federation (2017), which advocates for culturally relevant health education strategies tailored to community needs. A further practical contribution lies in the statistical demonstration that knowledge acquisition is necessary and insufficient for caregiving effectiveness. While knowledge improves perception, financial, emotional, and logistical challenges undermine overall care quality. This nuance moves the discussion beyond the simplistic knowledge-deficit model that has long dominated health education discourse. It suggests that educational interventions must be embedded within broader support systems, including economic relief, counseling services, and institutional recognition of caregivers.

Additionally, the study introduces a novel conceptual triad in diabetic foot care: knowledge, perception, and challenges. While these variables have been studied individually in patient-centered or clinical research, their triangulation within the caregiver context is innovative. This framework provides a template for future studies aiming to explore similar dynamics in other chronic diseases such as HIV, cancer, or hypertension. By demonstrating the interdependence of these variables, the study opens new avenues for integrated intervention design and cross-disciplinary collaboration. Beyond the immediate findings, the study's contribution to knowledge includes its potential to inform caregiver assessment tools. Currently, most diabetic foot care protocols emphasize clinical indicators and neglect caregiver readiness or capacity. The metrics developed in this study, such as the knowledge score and perception index, can be adapted into screening tools used by healthcare workers to identify caregivers needing support. This operational application transforms academic insight into clinical utility, bridging the research-to-practice gap.

Furthermore, the study offers insight into caregiving's emotional and psychological landscape, particularly the subtle erosion of morale due to unaddressed stressors. Emotional detachment, reported by some respondents, echoes findings in mental health literature where caregiver burnout leads to apathy and even resentment. The study thus contributes to the burgeoning literature on caregiver mental health, suggesting that emotional resilience is a determinant of care quality that deserves equal attention alongside technical competence. The study's socio-cultural implications also merit recognition. By highlighting the influence of traditional beliefs on caregiving behavior, the study contributes to anthropological and sociological understandings of health behavior. It affirms that diabetic foot care is biomedical and deeply cultural, like many health practices. This insight has ramifications for how health communication is framed and delivered in multicultural societies. For instance, engagement with traditional leaders or healers might be necessary to shift community norms and enhance caregiver compliance with medical guidelines. On a global level, the study enriches the comparative literature on chronic disease management in resource-constrained settings. While much of the existing literature originates from high-income countries, this study provides a grounded African perspective that reflects local realities. It challenges the transferability of global best practices and emphasizes the importance of localized solutions informed by grassroots data. This contribution is particularly relevant as the global health community increasingly calls for context-sensitive interventions that reflect the lived experiences of affected populations.

The study's comprehensive approach, integrating demographic profiling, knowledge evaluation, perceptual assessment, and challenge identification, sets a new standard for holistic caregiver research. It encourages future scholars to adopt multidimensional frameworks that capture the complexity of caregiving. The study contributes to current knowledge and shapes future research's methodological and conceptual agenda. This study significantly advances our understanding of diabetic foot management from a caregiver perspective. It contributes to knowledge by redefining theoretical models, refining methodological tools, revealing structural barriers, and informing policy and practice. It argues convincingly that caregiver knowledge and perception are critical yet insufficient without systemic support. Its findings compel stakeholders to rethink how informal caregiving is understood, evaluated, and integrated into diabetic care strategies in Cameroon and across similarly structured healthcare systems in the Global South.

RECOMMENDATIONS

Based on the empirical findings and comprehensive analysis of caregiver knowledge, perception, and the challenges faced in diabetic foot management within the Cameroonian context, this study offers several targeted recommendations for improving health outcomes and strengthening care systems. These recommendations are grounded in the statistical evidence generated and the broader theoretical frameworks cited. They are structured to guide multiple stakeholders, including healthcare institutions, policymakers, training organizations, and community-based health advocates.

First, the most urgent recommendation is institutionalizing caregiver education programs in all secondary and tertiary healthcare settings. The study revealed a strong correlation between higher knowledge levels and positive caregiver perception, reinforcing the role of education in empowering informal caregivers. Healthcare facilities should develop and routinely deliver caregiver training modules focusing on diabetic foot care, including wound cleaning techniques, early detection of complications, proper dressing methods, and hygienic foot practices. These trainings should be integrated into patient discharge procedures and routine clinic visits to ensure continuity. Drawing from the recommendations of Apelqvist (2008), such programs should adopt a modular approach, be linguistically accessible (including local dialects), and reflect the cultural norms of the population.

Second, caregiver-inclusive diabetic care protocols should be formally developed and adopted within hospital systems. Currently, clinical attention focuses predominantly on the patient, with caregivers often left to learn through experience or informal instruction. A structured caregiving protocol would define specific caregiver roles, provide clear guidelines, and ensure they are recognized as vital contributors to patient outcomes. This recognition must not be symbolic but backed by documentation, access to information, and participation in clinical briefings where appropriate. Abbas and Archibald (2007) argued that caregivers as core stakeholders enhance care quality and accountability.

Third, addressing the financial challenges faced by caregivers is essential. This study found that financial strain was the most common and debilitating challenge, significantly reducing caregivers' capacity to provide consistent and effective support. Health administrators and policymakers should consider implementing financial aid mechanisms such as caregiver support grants, medical supply subsidies, or transportation stipends. These programs can be implemented through partnerships with non-governmental organizations, community-based associations, and national health insurance schemes. In contexts where resources are limited, even modest subsidies for basic items like antiseptics, bandages, and therapeutic footwear can significantly ease the burden and increase compliance with recommended care practices.

Fourth, the psychosocial well-being of caregivers should be addressed through formal mental health and emotional support services. The study highlighted emotional stress and burnout as everyday experiences among caregivers, particularly those caring for patients with recurrent ulcers or post-amputation wounds. Health facilities should integrate psychosocial services into diabetic care units, offering caregivers access to counseling, peer support groups, and mental health check-ins. Drawing from the caregiver fatigue models explored by Foster and Sanders (1994), this type of intervention is critical to maintaining long-term motivation and reducing attrition in caregiving roles.

Fifth, public health campaigns should actively target caregivers with culturally appropriate messaging that dispels myths and promotes evidence-based care. Misconceptions about traditional healing methods, spiritual causes of diabetic foot, and fatalistic attitudes were found to persist even among some caregivers with moderate knowledge. Therefore, media campaigns using radio, television, religious forums, and community outreach programs should be designed to educate patients, their families, and caregivers. Engaging traditional leaders and healers as allies rather than adversaries in such campaigns may help bridge the divide between modern medicine and cultural practice, as recommended by Jude et al. (2001).

Sixth, through the Ministry of Public Health, the government should develop a national caregiver policy framework that recognizes informal caregiving as a strategic component of chronic disease management. Such a framework would include guidelines for caregiver training, ethical considerations in caregiving, resource allocation, and the establishment of caregiver rights and responsibilities. A formal policy can help standardize care practices, create caregiver registries, and incentivize caregiver contributions. This aligns with broader global health recommendations for systemic strengthening non-professional health support systems (International Diabetes Federation, 2017).

Seventh, data on caregivers should be routinely collected as part of patient health records. The current health information systems often omit caregiver information, making it difficult to assess their influence on health outcomes or to engage them in planning. Hospital intake forms and digital health records should include fields for caregiver details, their relationship to the patient, educational level, availability, and expressed training needs. This simple administrative change would allow for longitudinal monitoring of caregiver engagement and its impact on patient progress, enabling more informed clinical decisions.

Eighth, academic institutions and health research bodies should be encouraged to conduct longitudinal studies and interventions focusing on caregivers, especially within the scope of chronic illness management. This study has established important correlations but also highlights the need for time-bound studies that track changes in knowledge, stress levels, and care quality over extended periods. Research grants and ethical clearances should prioritize studies that test interventions, such as training programs, support groups, or mobile-based caregiver education platforms, and measure their effectiveness over time.

Finally, technology should be leveraged to bridge information and support gaps for caregivers. Mobile health (mHealth) solutions such as SMS reminders, instructional videos, and WhatsApp caregiver forums can facilitate real-time guidance and peer learning. Given that mobile phone penetration is high even in underserved communities, this represents a scalable, cost-effective tool for disseminating care knowledge, clarifying doubts, and promoting emotional support. Tailoring mHealth platforms for low-literacy users through voice notes or pictorial guides will ensure inclusivity and enhance reach. The recommendations outlined above are not isolated measures but components of a holistic strategy to improve diabetic foot care through caregiver empowerment. By implementing these recommendations, stakeholders at multiple levels, including health facilities, community organizations, government agencies, and academic institutions, can collectively foster a healthcare ecosystem that is responsive, inclusive, and sustainable. The study has clarified that caregivers are indispensable to diabetic foot management in Cameroon. Their knowledge, perceptions, and challenges are central to patient outcomes, and therefore, caregivers must be adequately equipped, supported, and integrated into all facets of diabetes care.

FUTURE RESEARCH DIRECTIONS

The findings of this study open up several promising avenues for future research in diabetic foot management and informal caregiving, particularly within resource-limited healthcare systems. First, longitudinal studies that track caregivers over extended periods are needed to evaluate how their knowledge, perception, and caregiving challenges evolve with time, patient condition, and exposure to training or support systems. Such studies could provide deeper insight into causal relationships and long-term care outcomes that a cross-sectional design cannot fully capture.

Second, future research should explore intervention-based studies to test the effectiveness of caregiver training programs, mobile health support systems, and structured caregiver support groups. Randomized controlled trials could be implemented to assess whether these interventions improve caregiver competence, reduce stress, and enhance patient outcomes, particularly the rate of ulcer recurrence and wound healing.

Third, comparative studies across regions and facility types, including rural versus urban hospitals and public versus private health institutions, are warranted. These studies would help determine how geographical, infrastructural, and economic variations influence caregiving experiences and outcomes, allowing for more tailored policy and programmatic responses.

Fourth, researchers should investigate the mental health and psychosocial dynamics of caregiving. While this study touched on emotional stress, future work could delve deeper into the psychological burden, coping mechanisms, and mental health outcomes among caregivers of chronic wound patients. Qualitative methods like in-depth interviews and ethnographic studies would be particularly valuable.

Fifth, research should include healthcare professionals' perspectives on caregiver roles to understand better how caregivers are perceived, engaged, or excluded in clinical management. This line of inquiry would help identify systemic barriers to caregiver inclusion and could inform institutional strategies for better collaboration.

Finally, there is a growing need to explore the integration of cultural beliefs and practices into formal diabetic care strategies. Studies examining how traditional medicine, religious beliefs, and local knowledge systems interact with biomedical care can provide culturally grounded frameworks for community-based interventions. By pursuing these future research directions, scholars and health practitioners can generate a more comprehensive, nuanced, and actionable knowledge base that continues to strengthen diabetic foot care and chronic illness management across diverse settings.

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APPENDIX I

Questionnaire for Caregivers of Diabetic Foot Patients
Section A: Socio-Demographic Information
1. What is your age? ( ) 18–25 ( ) 26–35 ( ) 36–45 ( ) 46–55 ( ) 56+
2. What is your gender? ( ) Male ( ) Female
3. What is your highest level of education? ( ) No formal education ( ) Primary ( ) Secondary ( ) Post-secondary ( ) University
4. What is your occupation? ( ) Unemployed ( ) Self-employed ( ) Employed (private sector) ( ) Employed (public sector) ( ) Student
5. What is your relationship to the patient? ( ) Parent ( ) Child ( ) Sibling ( ) Spouse ( ) Other: _________
6. How long have you been caring for the patient? ( ) <6 months ( ) 6–12 months ( ) 1–2 years ( ) >2 years
Section B: Knowledge of Diabetic Foot Care
7. Diabetic foot is caused by high blood sugar levels damaging the nerves and blood vessels. ( ) True ( ) False
8. A diabetic foot ulcer is always painful. ( ) True ( ) False
9. Daily inspection of the patient’s feet can help prevent serious complications. ( ) True ( ) False
10. Foot injuries in diabetics heal at the same rate as in non-diabetics. ( ) True ( ) False
11. Proper footwear is important for preventing diabetic foot ulcers. ( ) True ( ) False
12. The signs of diabetic foot complications include swelling, redness, and discharge. ( ) True ( ) False
13. Diabetic patients should never walk barefoot. ( ) True ( ) False
14. A clean wound dressing should be changed daily. ( ) True ( ) False
15. Only doctors should manage diabetic foot ulcers. ( ) True ( ) False
16. Wounds should be cleaned with antiseptic and water. ( ) True ( ) False
17. Traditional medicine is more effective than hospital care for diabetic foot. ( ) True ( ) False
Section C: Perception Toward Diabetic Foot Care
Instructions: Use a 5-point scale: (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree
18. Diabetic foot care is an important part of diabetes management.
19. Caregivers have an important role in preventing diabetic foot complications.
20. I feel confident in my ability to manage diabetic foot issues.
21. I believe traditional medicine can cure diabetic foot ulcers.
22. Hospital treatment for diabetic foot is often too expensive.
23. I worry that I do not know enough about how to care for a diabetic foot.
24. I trust medical advice on how to care for diabetic wounds.
Section D: Challenges Faced in Caregiving
Instructions: Indicate how often you experience each challenge: (1) Never (2) Rarely (3) Sometimes (4) Often (5) Always
25. Financial burden of purchasing medications and supplies
26. Lack of knowledge or training in diabetic foot care
27. Emotional stress due to caregiving responsibilities
28. Lack of time due to other family or work obligations
29. Difficulty accessing healthcare services or medical supplies
30. Feeling unsupported by healthcare professionals
31. Difficulty convincing the patient to follow care instructions
32. Physical exhaustion from caregiving duties