

Coping, Burden, and Health Outcomes Among Informal Caregivers of Hospitalized Patients with Diabetes Mellitus in Southwest Nigeria

Ayodeji Oluwaseun Ogungbemi

ayodeji.ogungbemi@uniosun.edu.ng

Osun State University

Atilola Atilade Adeleke

Mersey and West Lancashire Teaching Hospitals Trust

Olanrewaju Adewole Adediran

University of South Africa

Olanrewaju Oladimeji

Sefako Makgatho Health Sciences University

Research Article

Keywords: Caregiver burden, Maladaptive coping, Depression, Coping strategies, Informal caregiving, Diabetes mellitus

Posted Date: April 24th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-9083728/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Informal caregivers play a central role in the care of hospitalized patients with diabetes mellitus, particularly in low- and middle-income countries where health systems rely heavily on family support. The demands of caregiving may result in substantial caregiver burden, maladaptive coping, and adverse health outcomes, including depression, poor sleep, and unhealthy weight status. Evidence on these interrelationships among caregivers of hospitalized patients with diabetes in Nigeria remains limited. This study assessed caregiver burden, coping strategies, and associated health outcomes among informal caregivers of diabetic inpatients in Southwest Nigeria.

Methods

This hospital-based cross-sectional study was conducted among informal caregivers of adult patients admitted with diabetes to a tertiary teaching hospital in Southwest Nigeria between March 2024 and February 2025. A census of all eligible caregivers was undertaken, yielding 207 participants. Data were collected using interviewer-administered questionnaires and validated instruments: the Zarit Burden Interview-12 to assess caregiver burden, the Brief-COPE to evaluate coping strategies, the Beck Depression Inventory for depressive symptoms, and the Sleep Condition Indicator for sleep quality. Anthropometric measurements were used to calculate body mass index. Descriptive statistics, bivariate analyses, and logistic regression models were applied to examine associations between caregiver characteristics, coping patterns, burden, and depression.

Results

More than half of caregivers experienced high caregiver burden (58.9%) and depression (50.7%), while 13.5% reported insomnia. Maladaptive coping strategies were commonly used, with over half of caregivers exhibiting medium to high maladaptive coping. Depression was significantly associated with high caregiver burden, maladaptive coping, insomnia, obesity, and lack of prior caregiving experience ($P < 0.05$). In multivariable regression analyses, high caregiver burden (OR 3.81), higher adaptive coping (OR 2.99), higher maladaptive coping (OR 2.69), and poor sleep quality independently predicted caregiver depression.

Conclusion

Caregiver burden, maladaptive coping, and sleep disturbances are highly prevalent among informal caregivers of hospitalized patients with diabetes and are strongly associated with depressive symptoms.

Maladaptive coping emerged as a key driver of poor mental health outcomes, mediated by burden and sleep quality.

Recommendation:

Routine screening for caregiver burden, coping styles, and sleep problems should be integrated into diabetes care. Culturally appropriate, low-cost psychosocial interventions aimed at promoting adaptive coping and improving sleep are recommended to enhance caregiver well-being and support sustainable diabetes care in resource-limited settings.

INTRODUCTION

Informal caregiving for individuals with chronic conditions such as diabetes mellitus places significant psychological, emotional, and physical demands on caregivers.¹ This study assesses the coping strategies, caregiver burden, and associated health outcomes among informal caregivers of hospitalized patients with diabetes in Southwest Nigeria.

Diabetes mellitus remains a leading chronic disease globally, with Nigeria experiencing a rising prevalence estimated at 5.8% among adults aged 20–69 years,² though recent data show regional variations.³ This surge increases demand for informal caregiving, further straining Nigeria's health system.^{4,5}

Caregivers often manage complex responsibilities, including medication supervision, dietary support, and glucose monitoring.^{6–8} These tasks contribute to caregiver burden, defined as multidimensional physical, emotional, social, and financial strain.^{9,10} Coping strategies—cognitive and behavioral efforts to manage stressors¹¹—are central in shaping caregiver outcomes. While prior research describes diverse approaches (problem-focused, emotion-focused, support-seeking, and avoidance), their effectiveness varies across cultural settings.^{12–15}

In Nigeria, caregiving is influenced by cultural expectations, socioeconomic limitations, and fragile health infrastructure.^{5,16} Stigma surrounding chronic illness may further heighten isolation and stress.⁴ Despite recognition of caregiver burden as a public health issue, evidence on caregivers of hospitalized patients with diabetes in Nigeria is sparse. Caregiver outcomes of interest include depressive symptoms, sleep quality, and body mass index, given prior links between caregiving, depression, and poor sleep.^{17,18,19} This study employs the Brief-COPE, a 28-item tool assessing 14 subscales of adaptive and maladaptive coping.²⁰ Depression will be assessed using the Beck Depression Inventory (BDI),²¹ sleep quality via the Sleep Condition Indicator (SCI)²² while burden will be assessed using Zarit Burden Interview (ZBI).²³

By mapping coping patterns, quantifying burden, and examining health correlates, this study seeks to generate evidence to guide culturally appropriate interventions for caregivers of hospitalized patients

with diabetes in Nigeria.

The study aimed to assess caregiver burden, coping strategies, and health impacts among caregivers of diabetic inpatients in a tertiary hospital in southwest Nigeria. A secondary objective was to examine associations between caregiver characteristics, coping mechanisms, and levels of burden.

METHODS

Study design and setting

This hospital-based cross-sectional study of informal caregivers of hospitalized adult patients with diabetes was conducted in the adult medical wards of the Department of Internal Medicine, UNIOSUN Teaching Hospital, Osogbo, Nigeria. This tertiary referral centre serves Osun State and adjoining states (Kwara, Ogun, Ekiti, Ondo, Oyo) with 24-bed male and 21-bed female wards for endocrine disorders, including diabetes.

Study population, sample size and sampling technique

Eligibility: Caregivers were eligible if aged ≥ 18 years, primarily responsible for the patient, communicative, available during data collection, and provided consent. First-time caregivers for the patient were excluded.

Sample Size: The minimum sample was estimated with Cochran's formula for descriptive cross-sectional studies.^{24,25} $n = Z^2 pq / d^2$ where $Z = 1.96$ at 95% CI, $p = 0.59$ (prevalence of depression in informal caregiver from a previous study),²⁶ $q = 1 - p$, and $d = 0.05$. Substitution yielded ≈ 372 . With a finite population correction ($N = 106$ adult diabetic admissions in the prior year), the adjusted sample was ≈ 83 .

Recruitment: In line with hospital policy, each admitted patient had ≥ 1 caregiver, creating a direct sampling frame. All eligible and consenting caregivers during the study period were recruited, yielding 207 participants—well above the minimum, thereby increasing statistical precision, regression power, and generalizability.

Design and Sampling

We conducted a census of all eligible caregivers of adult diabetic in-patients admitted to the medical wards of UNIOSUN Teaching Hospital from March 2024 to February 2025. The hospital mandates a caregiver for each admission; thus, the sampling frame comprised all such individuals during the study window. Caregivers were screened daily and recruited consecutively. When patients had multiple caregivers, all were enrolled, and analyses accounted for clustering at the patient level.

Data collection

Data were collected using an interviewer-administered questionnaire supplemented with patient record review.

Measurement and Scoring Systems

The study utilized previously developed and validated instruments that have been widely used in the literature. Depression was assessed with the Beck Depression Inventory (21 items), scored 0–63, with cutoffs of 0–13 for minimal, 14–19 for mild, 20–28 for moderate, and 29–63 for severe depression.^{21,27,28} Caregiver burden was measured using the Zarit Burden Interview–Short Form (12 items), range 0–48, where 0–10 indicated none to mild, 10–20 mild to moderate, and >20 high burden.^{23,29,30} Coping strategies were evaluated with the Brief-COPE (28 items, 14 subscales), each subscale scored 2–8 with no total score.^{20,31,32} Sleep quality was measured by the Sleep Condition Indicator (8 items), with scores from 0 to 32 (higher scores indicating better quality) and rescalable to a 0–10 metric.^{22,33,34} Sociodemographic and patient data were obtained from a structured questionnaire and medical records, including caregiver age, sex, education, income, type and duration of caregiving, religion, and ethnicity, as well as patient age, sex, diabetes duration, and length of hospital stay.

Anthropometrics

Weight and height were measured with calibrated instruments; BMI was calculated (kg/m²) and classified using WHO criteria: <18.5 underweight, 18.5–24.9 normal, 25.0–29.9 pre-obesity, 30.0–34.9 class I, 35.0–39.9 class II, ≥40 class III obesity.²⁵

RESULTS

Caregivers were predominantly aged 30–49 years, male, and family members, with most earning ≤\$100,000 monthly. Index patients were largely aged ≥60 years, slightly more often female, and over half had tertiary education (Table 1).

Table 1. Characteristics of caregivers (N=207) and index patients (N=83)

Variable	N	%
Caregivers (N=207)		
Age (years)		
19–29	32	15.5
30–49	97	46.9
50–69	73	35.3
≥70	5	2.4
Sex		
Male	108	52.2
Female	99	47.8
Marital status		
Married	100	48.3
Widowed	30	14.5
Divorced/Separated	17	8.2
Unmarried/Single	60	29.0
Education		
No formal	3	1.4
Primary	29	14.0
Secondary	66	31.9
Tertiary	109	52.7
Type of caregiver		
Family/relative (informal)	136	65.7
Paid (formal)	71	34.3
Living arrangement		
Lives with patient	125	60.4
Lives separately	82	39.6
Monthly income (₦)		
≤100,000	130	62.8
100,001–200,000	31	15.0

200,001–300,000	18	8.7
300,001–400,000	5	2.4
>400,000	2	1.0
No income	21	10.1
Duration as caregiver		
<12 months	163	78.7
12–23 months	13	6.3
24–35 months	18	8.7
≥36 months	12	5.8
Prior caregiving experience		
Yes	78	37.7
No	129	62.3
Index patients (N=83)		
Age (years)		
18–39	7	8.4
40–59	18	21.7
60–79	33	39.8
≥80	25	30.1
Sex		
Male	39	47.0
Female	44	53.0
Education		
No formal	5	6.0
Primary	8	9.6
Secondary	25	30.1
Tertiary	45	54.2
Years since diabetes diagnosis		
≤5 years	53	63.9
6–10 years	20	24.1

11–15 years	8	9.6
>15 years	2	2.4
Duration of current admission		
≤3 months	8	9.6
4–6 months	10	12.0
7–9 months	12	14.5
10–12 months	16	19.3
>12 months	37	44.6

Footnote: Percentages calculated from N=207 for caregivers and N=83 for index patients. ₦ = Nigerian Naira.

Religion, ethnicity, caregiver chronic disease, and education summary were omitted for brevity as they were not discussed in the manuscript.

High caregiver burden (59%) and depression (51%) were common, while 14% of caregivers reported insomnia. Approximately one-third were overweight or obese (Table 2).

Table 2. Caregiver outcomes: burden, depression, sleep, coping, and BMI (N=207)

Measure	Category	n (%)
Caregiver burden (ZBI-12)	Low (0–20)	85 (41.1)
	High (>20)	122 (58.9)
Depression (BDI)	No depression (0–13)	102 (49.3)
	Depression (14–63)	105 (50.7)
Sleep (SCI)	Insomnia disorder	28 (13.5)
	Normal sleep	179 (86.5)
Coping – Problem-focused	Low	93 (44.9)
	High	114 (55.1)
Coping – Emotion-focused	Low	88 (42.5)
	High	119 (57.5)
Coping – Avoidant	Low	110 (53.1)
	High	97 (46.9)
Adaptive coping (outcome)	Low	79 (38.2)
	Medium	115 (55.6)
	High	13 (6.3)
Maladaptive coping (outcome)	Low	92 (44.4)
	Medium	105 (50.7)
	High	10 (4.8)
Body mass index (BMI)	Underweight (<18.5)	31 (15.0)
	Normal (18.5–24.9)	106 (51.2)
	Overweight (25.0–29.9)	43 (20.8)
	Obesity ($\geq$ 30.0)	27 (13.0)

ZBI-12 = 12-item Zarit Burden Interview; BDI = Beck Depression Inventory; SCI = Sleep Condition Indicator; Brief-COPE used for coping profiles.

Depression was significantly associated with high caregiver burden, insomnia, maladaptive coping, and obesity (all $p < 0.05$). Prior caregiving experience was protective. High caregiver burden was more frequent among younger and less educated caregivers, those caring for patients with longer hospital admissions, and varied by ethnicity ($p < 0.05$) (Table 3).

Table 3. Selected bivariate associations with caregiver depression (N=207)

Variable	Category	No depression n (%)	Depression n (%)	χ^2 /Wald	P value
Caregiver burden	Low	58 (68.2)	27 (31.8)	20.742	<0.001
	High	44 (36.1)	78 (63.9)		
Insomnia (SCI)	Present	6 (21.4)	22 (78.6)	10.046	<0.001
	Absent	96 (53.6)	83 (46.4)		
Problem-focused coping	Low	67 (72.0)	26 (28.0)	35.020	<0.001
	High	35 (30.7)	79 (69.3)		
Emotion-focused coping	Low	63 (71.6)	25 (28.4)	30.498	<0.001
	High	39 (32.8)	80 (67.2)		
Avoidant coping	Low	73 (66.4)	37 (33.6)	27.425	<0.001
	High	29 (29.9)	68 (70.1)		
Adaptive coping (outcome)	Low	60 (75.9)	19 (24.1)	38.126	<0.001
	Medium	40 (34.8)	75 (65.2)		
	High	2 (15.4)	11 (84.6)		
Maladaptive coping (outcome)	Low	65 (70.7)	27 (29.3)	34.812	<0.001
	Medium	37 (35.2)	68 (64.8)		
	High	0 (0.0)	10 (100.0)		
Admission time	≤3 months	6 (28.6)	15 (71.4)	6.130	0.190
	4–6 months	13 (59.1)	9 (40.9)		
	7–9 months	14 (48.3)	15 (51.7)		
	10–12 months	18 (45.0)	22 (55.0)		
	>12 months	50 (55.6)	40 (44.4)		
Average income	≤100,000	69 (53.1)	61 (46.9)	7.798	0.099
	100,001–200,000	16 (51.6)	15 (48.4)		
	200,001–300,000	5 (27.8)	13 (72.2)		
	300,001–400,000	0 (0.0)	2 (100.0)		
	No Income	0 (0.0)	0 (0.0)		

Caregiver experience	Yes	47 (60.3)	31 (39.7)	6.038	0.014
	No	55 (42.6)	74 (57.4)		
BMI	Underweight	19 (61.3)	12 (38.7)	8.007	0.046
	Normal	53 (50.0)	53 (50.0)		
	Overweight	23 (53.5)	20 (46.5)		
	Obesity	7 (25.9)	20 (74.1)		

P values from χ^2 tests where shown; values reported as <0.001 when $p \approx 0.00$ in the source. SCI = Sleep Condition Indicator.

Caregiver burden was significantly higher among female caregivers, those with lower educational attainment, and Yoruba caregivers. Burden also varied by duration of admission, with longer hospital stays associated with greater burden ($p=0.015$). Other sociodemographic factors, including caregiver type, living arrangement, and most age categories, were not significantly associated with caregiver burden (Table 4).

Table 4. Selected bivariate associations with caregiver burden (N=207)

Variable	Category	Low burden n (%)	High burden n (%)	χ^2	P value
Age	19–29	2 (28.6)	4 (57.1)	8.435	0.038
	30–49	10 (52.6)	4 (21.1)		
	50–69	85 (50.6)	24 (14.3)		
	≥70	5 (38.5)	4 (30.8)		
Gender	Male	49 (45.4)	59 (54.6)	1.731	0.188
	Female	36 (36.4)	63 (63.6)		
Education	Low education	8 (25.0)	24 (75.0)	4.035	0.045
	High education	77 (44.0)	98 (56.0)		
Type of caregiver	Family/relative	53 (39.0)	83 (61.0)	0.717	0.397
	Paid	32 (45.1)	39 (54.9)		
Living arrangement	Lives with patient	49 (39.2)	76 (60.8)	0.452	0.501
	Lives separately	36 (43.9)	46 (56.1)		
Times on admission	≤3 months	7 (33.3)	14 (66.7)	12.331	0.015
	4–6 months	14 (63.6)	8 (36.4)		
	7–9 months	15 (51.7)	14 (48.3)		
	10–12 months	9 (22.5)	31 (77.5)		
	>12 months	39 (43.3)	51 (56.7)		
Tribe	Hausa	0 (0.0)	7 (100.0)	8.939	0.03
	Igbo	11 (57.9)	8 (42.1)		
	Yoruba	71 (42.3)	97 (57.7)		

χ^2 tests reported. Categories shown (percent).

In logistic regression analyses, high caregiver burden (OR 3.81, 95% CI 2.11–6.86), higher adaptive coping (OR 2.99, 95% CI 1.52–5.88), and higher maladaptive coping (OR 2.69, 95% CI 1.36–5.30) were independently associated with caregiver depression. Normal sleep was associated with lower odds of depression compared with insomnia (OR 0.24, 95% CI 0.09–0.61) (Table 5).

Table 5. Logistic regression models predicting caregiver depression (selected predictors)

Predictor	B	SE	OR (95% CI)	P value	Model
High caregiver burden (vs low)	1.337	0.300	3.81 (2.11–6.86)	<0.001	Burden-only model
Adaptive coping (higher vs lower)	1.094	0.346	2.99 (1.52–5.88)	0.002	Coping-only model
Maladaptive coping (higher vs lower)	0.989	0.346	2.69 (1.36–5.30)	0.004	Coping-only model
Sleep condition (normal vs insomnia)	-1.445	0.484	0.24 (0.09–0.61)	0.003	Sleep-only model

OR = odds ratio; CI = confidence interval. ORs and 95% CIs computed from reported regression coefficients (B) and SEs in the source analyses.

DISCUSSION

This study delves into the multifaceted dynamics of caregiver burden among informal caregivers of hospitalized patients with diabetes in Southwest Nigeria. Key findings indicated a high prevalence of burden (58.9%), depressive symptoms (50.7%), insomnia (13.5%), and maladaptive coping (55.5% medium/high), with moderate to high use of problem-focused (55.1%) and emotion-focused (57.5%) strategies. These findings provide valuable insights into the dominance of maladaptive approaches amid cultural and socioeconomic pressures in resource-limited settings. Bivariate analyses revealed significant associations between depression and high burden, maladaptive coping, low adaptive coping, insomnia, obesity, and low caregiving experience. Logistic regression confirmed maladaptive coping as the strongest predictor of depression, followed by burden and poor sleep, with sociodemographic factors exerting indirect effects. Furthermore, burden and sleep were identified as mediators in the relationship between coping and depression, emphasizing the intricate psychosocial toll on caregivers.

Our results align with growing evidence on caregiver distress in chronic disease management, particularly diabetes, while contributing unique insights from an understudied LMIC population. The elevated burden and depression rates echo prior Nigerian studies on caregivers of type 2 diabetes patients, where socioeconomic limitations and health system fragilities amplify emotional strain.^{4,35} Maladaptive coping's pivotal role in driving depression is consistent with findings from cancer caregivers, and dementia caregivers, where dysfunctional strategies like avoidance heightened psychological morbidity,^{9,36} and from parents of children with type 1 diabetes, where similar patterns correlated with poor sleep and depressive symptoms.^{37,38}

A recent systematic review of family caregivers for older adults with chronic illnesses, including diabetes, likewise identified maladaptive coping as a key mediator of burden and mental health decline

in low-resource settings.³⁹ The borderline protective effect of adaptive coping mirrors observations in chronic illness caregivers, where problem-solving strategies mitigate stress but are less effective under sustained demands without support.^{40,41,42} Sleep quality's independent association with depression reinforces meta-analyses linking caregiver insomnia to increased distress,^{43,44} with effects more pronounced in LMIC's due to limited respite.⁴⁵ Obesity's link to depression supports emerging research on metabolic consequences of caregiving stress, potentially via disrupted self-care and neuroendocrine pathways.^{46,47,48} Sociodemographic indirect effects, such as low income exacerbating maladaptive coping, align with global patterns in sub-Saharan Africa, where stigma and economic hardship compound isolation.^{49,50,51} Overall, our study extends these findings by demonstrating coping's central mediating role in a diabetes-specific, hospital-based cohort, highlighting disparities compared to high-income contexts with better support infrastructure.⁵²

Strengths and Limitations

Key strengths include the use of validated, culturally adapted instruments (e.g., Brief-COPE, BDI, SCI) in a robust sample exceeding minimum size requirements, enhancing precision and power for regression analyses. The integration of sociodemographic, behavioural, and physiological domains provides a comprehensive model, novel for Nigerian diabetes caregivers, with clustering adjustments minimizing bias from multiple caregivers per patient. However, the cross-sectional nature limits causality inference, potentially missing dynamic interactions over time. Self-report measures may introduce bias from recall or cultural reticence around mental health. Hospital recruitment restricts generalizability to community or rural settings, and excluding first-time caregivers may underestimate initial burdens. Future work should address unmeasured factors like social networks or comorbidities.

Future Research

Longitudinal studies are crucial to trace causal pathways among burden, coping, sleep, and depression, incorporating repeated measures to identify intervention points. Qualitative methods could explore cultural influences on coping, such as familial obligations in Nigerian societies, to refine context-specific models. Comparative research across LMICs versus high-income countries would elucidate moderators like healthcare access, while randomized controlled trials of digital or community-based interventions (e.g., app-delivered CBT) are needed to test efficacy in diabetes caregiving. Objective assessments, including actigraphy for sleep or biomarkers for stress, could validate self-reports. Policy-oriented evaluations of integrated caregiver support in national diabetes programs would inform scalable strategies for reducing disparities.

Implications for Clinical Practice and Policy

Family medicine practitioners should prioritize routine screening for coping styles, burden, and sleep in caregiver assessments during diabetes care, using concise tools to enable early referral.⁵³ Evidence-based interventions like CBT, mindfulness training, and sleep hygiene could substantially reduce

depression, as demonstrated in recent trials among chronic illness caregivers.^{54,55} In LMIC's like Nigeria, low-cost adaptations—such as group counselling or mobile health platforms—offer feasible ways to promote adaptive coping and alleviate burden.^{56,57} Policymakers must incorporate caregiver mental health into diabetes guidelines, advocating for respite services, financial aid, and multidisciplinary teams to address socioeconomic mediators.^{58,59} This holistic approach will not only enhances caregiver well-being but also improves patient outcomes through better adherence and family stability, aligning with patient-centred models in primary care.

Conclusion

Maladaptive coping emerges as the primary driver of depression among these caregivers, mediated by burden and poor sleep, with adaptive strategies and sociodemographic as modifiers. Targeted, culturally sensitive interventions are essential to foster resilience, optimizing caregiver and patient health in resource-constrained settings.

Abbreviations

- BDI: Beck Depression Inventory
- BMI: Body Mass Index
- Brief-COPE: Brief Coping Orientation to Problems Experienced
- CBT: Cognitive Behavioral Therapy.
- CI: Confidence Interval
- LMIC: Low- and Middle-Income Country
- OR: Odds Ratio
- SCI: Sleep Condition Indicator
- UNIOSUN: Osun state University
- WHO: World Health Organization
- ZBI: Zarit Burden Interview
- ZBI-12: Zarit Burden Interview–Short Form (12 items)

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. Approval was obtained from the UNIOSUN Teaching Hospital Ethics Committee (UTH/REC/2024/02/13/892). All participants provided written informed consent before taking part.

Consent for publication

All authors give their permission for publication in the journal

Availability of data and materials

In line with the journal's commitment to transparency and data sharing, the data supporting the findings of this study are available from the corresponding author upon reasonable request. Data are not publicly deposited due to the sensitive nature of the underlying information and the need to protect participant confidentiality.

Competing Interests

The authors declare that they have no competing interests.

Funding

This research received no specific grant from any funding agency in the public, commercial, or non-for-profit sectors.

Authors' contributions

AOO – Ayodeji Oluwaseun Ogungbemi

OAA – Olanrewaju Adewole Adediran

AAA – Atilola Atilade Adeleke

OO – Olanrewaju Oladimeji

AOO: Conceptualization; Methodology; Data collection; Formal analysis; Writing of the original manuscript draft.

OAA: Validation; Writing of manuscript- review and editing.

AAA: Methodology; Validation; Writing – review and editing, Project administration

OO: Supervision; Validation; Writing – review and editing.

Acknowledgements

The authors thank the staff of the Department of Internal Medicine, particularly the Endocrinology Unit, UNIOSUN Teaching Hospital, Osogbo, for their support during data collection. We also acknowledge the research assistants who facilitated participant interviews and data entry. Most importantly, we are grateful to the informal caregivers who generously shared their time and experiences for this study.

References

1. Rodríguez-González AM, Rodríguez-Míguez E, Claveria A. Determinants of caregiving burden among informal caregivers of adult care recipients with chronic illness. *Journal of Clinical Nursing*. 2021 May;30(9-10):1335-46. doi.org/10.1111/jocn.15683
2. Uloko AE, Musa BM, Ramalan MA, Gezawa ID, Puepet FH, Uloko AT, Borodo MM, Sada KB. Prevalence and risk factors for diabetes mellitus in Nigeria: a systematic review and meta-analysis. *Diabetes Therapy*. 2018 Jun;9(3):1307-16. doi.org/10.1007/s13300-018-0441-1
3. International Diabetes Federation. *IDF Diabetes Atlas*. 11th ed. Brussels: IDF; 2025. Available from: <https://diabetesatlas.org/>
4. Jane OA, Olatunji A, Bamiso MA, Kola OJ, Ayodele OJ, Ideraoluwa BO. Burden of care and psychological distress in primary caregivers of patients with type-2 diabetes mellitus in a tertiary hospital in Nigeria. *Ethiopian journal of health sciences*. 2019;29(6). doi: 10.4314/ejhs.v29i6.6
5. Chukwu N, Agwu P, Ajibo H, Aronu N. Challenges faced by informal caregivers of patients in a Nigerian hospital and implications for social work. *Journal of Social Work*. 2022 Sep;22(5):1189-206. doi.org/10.1177/14680173221077371
6. Carcone AI, Ellis DA, Naar-King S. Linking caregiver strain to diabetes illness management and health outcomes in a sample of adolescents in chronically poor metabolic control. *Journal of Developmental & Behavioral Pediatrics*. 2012 May 1;33(4):343-51. doi: 10.1097/dbp.0b013e31824eaac8
7. Seng JJ, Gwee MF, Yong MH, Kwan YH, Thumboo J, Low LL. Role of caregivers in remote management of patients with type 2 diabetes mellitus: systematic review of literature. *Journal of Medical Internet Research*. 2023 Sep 11;25:e46988. doi:10.2196/46988
8. Mphasha MH, Mothiba TM, Skaal L. Family support in the management of diabetes patients' perspectives from Limpopo province in South Africa. *BMC Public Health*. 2022 Dec 23;22(1):2421. doi.org/10.1186/s12889-022-14903-1
9. Özönder Ünal I, Ordu C. Decoding caregiver burden in cancer: role of emotional health, rumination, and coping mechanisms. *InHealthcare* 2023 Oct 9 (Vol. 11, No. 19, p. 2700). MDPI. doi.org/10.3390/healthcare11192700
10. Kazemi A, Azimian J, Mafi M, Allen KA, Motalebi SA. Caregiver burden and coping strategies in caregivers of older patients with stroke. *BMC psychology*. 2021 Apr 1;9(1):51. doi.org/10.1186/s40359-021-00556-z
11. Algorani EB, Gupta V. Coping mechanisms. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2024. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK559031/>
12. Akpan-Idiok PA, Ehiemere IO, Asuquo EF, Chabo JA, Osuchukwu EC. Assessment of burden and coping strategies among caregivers of cancer patients in sub-Saharan Africa. *World journal of clinical oncology*. 2020 Dec 24;11(12):1045. doi: 10.5306/wjco.v11.i12.1045
13. Owokuhaisa J, Kamoga R, Musinguzi P, Muwanguzi M, Natukunda S, Mubangizi V, Asiime K, Rukundo GZ. Burden of care and coping strategies among informal caregivers of people with

- behavioral and psychological symptoms of dementia in rural south-western Uganda. *BMC geriatrics*. 2023 Aug 8;23(1):475. doi.org/10.1186/s12877-023-04129-0
14. Bondarchuk O, Balakhtar V, Pinchuk N, Pustovalov I, Pavlenok K. Coping with stressfull situations using coping strategies and their impact on mental health. *Multidisciplinary Reviews*. 2024 Jun 10;7. <https://10.31893/multirev.2024spe034>
 15. Stephenson E, DeLongis A. Coping strategies. *The Wiley encyclopedia of health psychology*. 2020 Sep 2:55-60. doi.org/10.1002/9781119057840.ch50
 16. Ofuoma AP, Ncama B. The Impact of Socioeconomic and Cultural Factors on Family Caregiver Burden in Cancer Patients: A Study in Ogbomoso, Nigeria. *Asian Pacific Journal of Cancer Care*. 2024 Jun 24;9(2):257-6. doi 10.31557/apjcc.2024.9.2.257-256
 17. da Costa Monteiro BC, Dos Santos TT, Nogueira MM, Dourado MC. The relationship between burden and caregiver's sleep disturbances in dementia: a systematic review. *Dementia & Neuropsychologia*. 2023 Dec 15;17:e20230030. doi: 10.1590/1980-5764-DN-2023-0030
 18. Baysal ŞG, Çorabay S. Caregiver burden and depression in parents of children with chronic diseases. *Turkish Archives of Pediatrics*. 2024 Jan 1;59(1):70. doi: 10.5152/TurkArchPediatri.2024.23126
 19. Isac C, Lee P, Arulappan J. Older adults with chronic illness–caregiver burden in the Asian context: a systematic review. *Patient Education and Counseling*. 2021 Dec 1;104(12):2912-21. doi.org/10.1016/j.pec.2021.04.021
 20. Carver CS. You want to measure coping but your protocol's too long: consider the brief COPE. *Int J Behav Med*. 1997;4(1):92-100. doi:10.1207/s15327558ijbm0401_6
 21. Ibrahim AW, Wakil MA, Jidda MS, Omeiza BA, Pindar SK, Rabbebe IB, Yusuph H. Predictors of depression and psychometric evaluation of the beck depression inventory-II (BDI-II) among adults on highly active antiretroviral therapy in Maiduguri, North-Eastern Nigeria. *Borno Medical Journal*. 2014;11(1):1-6.
 22. Espie CA, Kyle SD, Hames P, Gardani M, Fleming L, Cape J. The Sleep Condition Indicator: a clinical screening tool to evaluate insomnia disorder. *BMJ open*. 2014 Mar 1;4(3):e004183.
 23. Ojifinni OO, Uchendu OC. Validation and reliability of the 12-item Zarit Burden Interview among informal caregivers of elderly persons in Nigeria. *Archives of basic and applied medicine*. 2018 Feb 5;6(1):45.
 24. Adhikari GP. Calculating the sample size in quantitative studies. *Scholars' Journal*. 2021 Dec 31:14-29. doi.org/10.3126/scholars.v4i1.42458
 25. Araoye MO. (2003). Subjects selection. In: Araoye MO, ed. *Research Methodology with Statistics for Health and Social Sciences*. 1 st ed. Ilorin, Nathadex publishers, 115 – 129.
 26. FMC FM PC, FMCP SK, FMCR SO, FMC FM VI. Care burden correlates with depression among informal caregivers of stroke patients: a cross sectional study in Lagos, Nigeria. *International Journal of Caring Sciences*. 2020 May 1;13(2):1402-10.
 27. Umeh GC, Cleenwerck de Kiev L, Mamza J, Atiku A, Mohammed S, Hananiya DS, Onoh M, Yahaya HB, Adeoti B, Musa RT, Adegbite M. Symptoms of depression among outpatients with suspected COVID-

- 19 in metropolitan Local Government Areas of Kaduna State, Nigeria. *Plos one*. 2024 May 16;19(5):e0288567.
28. Musa ZA, Soh KL, Mukhtar F, Soh KY, Oladele TO, Soh KG. Impact of mindfulness-based cognitive therapy on depressive symptoms reduction among depressed patients in Nigeria: a randomized controlled trial. *Issues in mental health nursing*. 2021 Jul 3;42(7):667-75.
 29. Onuorah CC, Oriji SO, Aina FO, Omoaregba JO. Burden of care and quality of life of caregivers of persons with schizophrenia in a Nigerian tertiary hospital: A cross-sectional study. *Journal of the Nigerian Academy of Medicine*. 2023 Jan 1;2(1):25-32.
 30. Ojifinni OO, Uchendu OC. Experience of burden of care among adult caregivers of elderly persons in Oyo State, Nigeria: a cross-sectional study. *Pan African Medical Journal*. 2022;42(1).
 31. Odulate-Ogunubi B, Adelayo A, Coker A. Perceived stress and coping strategies among undergraduate students in lagos, Nigeria. *J Psychiatry Res Rep*. 2024;1(1):1-4.
 32. Ahmed A, Osinubi MO, Fasiku MM, Uthman MM, Soyannwo T, Jimoh OS. Coping strategies among patients attending HIV clinics in a North-central State of Nigeria. *Nigerian Journal of Clinical Practice*. 2021 Jan 1;24(1):104-9.
 33. Akanni O, Olashore A, Koleoso O. Validation of the Sleep Quality Questionnaire among senior students in Benin City, Nigeria. *South African Journal of Psychiatry*. 2022 Dec 14;28:1875.
 34. McLaren DM, Evans J, Baylan S, Harvey M, Montgomery MC, Gardani M. Assessing insomnia after stroke: a diagnostic validation of the Sleep Condition Indicator in self-reported stroke survivors. *BMJ Neurology Open*. 2024 Oct 31;6(2):e000768.
 35. Odetunde NA, Oyegbade OO, Odetunde MO, Bello IS, Abioye-Kuteyi EA. The Influence of Socio-Demographic Characteristics on Caregivers' Burden and Quality Of Life of Elderly Diabetics Attending a Nigerian Tertiary Hospital. *Nigerian Medical Journal: Journal of the Nigeria Medical Association*. 2022 Sep 10;63(1):43. doi: 10.60787/NMJ-63-1-117
 36. Deli D, Tsouvelas G, Roukas D, Mentis M. A systematic review of depressive and anxiety symptoms in caregivers of dementia patients. <https://doi.org/10.22365/jpsych.2024.023> / *Psychiatriki* 2025, 36:72–80
 37. Cho MK, Kim MY. Factors affecting depression and its relation to sleep quality among parents of type 1 diabetes patients. *InHealthcare* 2023 Mar 30 (Vol. 11, No. 7, p. 992). MDPI. doi.org/10.3390/healthcare11070992
 38. Azimi T, Johnson J, Campbell SM, Montesanti S. Caregiver burden among parents of children with type 1 diabetes: A qualitative scoping review. *Heliyon*. 2024 Mar 30;10(6).
 39. Choi JY, Lee SH, Yu S. Exploring factors influencing caregiver burden: a systematic review of family caregivers of older adults with chronic illness in local communities. *InHealthcare* 2024 May 13 (Vol. 12, No. 10, p. 1002). MDPI. doi: 10.3390/healthcare12101002
 40. McGuigan K, Laurente G, Christie A, Carswell C, Moran C, Yaqoob MM, Bolton S, Mullan R, Rej S, Gilbert P, McKeaveney C. Effectiveness of interventions for informal caregivers of people with end-

- stage chronic illness: a systematic review. *Systematic Reviews*. 2024 Sep 28;13(1):245. doi.org/10.1186/s13643-024-02641-x
41. Sheth MS, Castle DJ, Wang W, Lee A, Jenkins ZM, Hawke LD. Changes to coping and its relationship to improved wellbeing in the optimal health program for chronic disease. *SSM-Mental Health*. 2023 Dec 1;3:100190. doi.org/10.1016/j.ssmmh.2023.100190
 42. Waugh CE, Leslie-Miller CJ, Shing EZ, Furr RM, Nightingale CL, McLean TW. Adaptive and maladaptive forms of disengagement coping in caregivers of children with chronic illnesses. *Stress and Health*. 2021 Apr;37(2):213-22. doi.org/10.1002/smi.2985
 43. Jiménez-Gonzalo L, Márquez-González M, Vara-García C, Romero-Moreno R, Olazarán J, von Känel R, Mausbach BT, Losada-Baltar A. Bidirectional Relationship Between Insomnia and Depressive Symptoms in Family Caregivers of People with Dementia: A Longitudinal Study. *Behavioral Sciences*. 2025 Jul 10;15(7):936. doi: 10.3390/bs15070936
 44. Monteiro BC, Santos TT, Nogueira MM, Dourado MC. A relação entre sobrecarga e sono do cuidador na demência: um estudo de revisão sistemática. *Dementia & Neuropsychologia*. 2023 Dec 15;17:e20230030. doi.org/10.1590/1980-5764-DN-2023-0030
 45. Koyanagi A, DeVlyder JE, Stubbs B, Carvalho AF, Veronese N, Haro JM, Santini ZI. Depression, sleep problems, and perceived stress among informal caregivers in 58 low-, middle-, and high-income countries: a cross-sectional analysis of community-based surveys. *Journal of psychiatric research*. 2018 Jan 1;96:115-23. doi.org/10.1016/j.jpsychires.2017.10.001
 46. Alreshidi SM. Correlation between symptoms of depression and obesity in caregivers of patients with chronic illness: a gender difference analysis. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*. 2023 Dec;60:00469580231219590. doi: 10.1177/00469580231219590
 47. King A, Ringel JB, Safford MM, Riffin C, Adelman R, Roth DL, Sterling MR. Association between caregiver strain and self-care among caregivers with diabetes. *JAMA network open*. 2021 Feb 1;4(2):e2036676-. doi:10.1001/jamanetworkopen.2020.36676
 48. Ouakinin SR, Barreira DP, Gois CJ. Depression and obesity: Integrating the role of stress, neuroendocrine dysfunction and inflammatory pathways. *Frontiers in endocrinology*. 2018 Jul 31;9:431. doi: 10.3389/fendo.2018.00431
 49. Kisangala E, Mbivnjo EL, Webb EJ, Barrett B, Rukundo GZ, Namisango E, Heslin M. Health and economic impact of caregiving on informal caregivers of people with chronic diseases in sub-Saharan Africa: A systematic review. *PLOS Global Public Health*. 2024 Dec 31;4(12):e0004061. doi: 10.1371/journal.pgph.0004061
 50. Ainamani HE, Alele PE, Rukundo GZ, Maling S, Wakida EK, Obua C, Tsai AC. Caring for people with dementia in rural Uganda: qualitative study of caregiving burden experienced by informal and formal caregivers. *Journal of global health reports*. 2020 Jun 16;4:e2020038. doi.org/10.29392/001c.12848
 51. Tilahun D, Hanlon C, Fekadu A, Tekola B, Baheretibeb Y, Hoekstra RA. Stigma, explanatory models and unmet needs of caregivers of children with developmental disorders in a low-income African

- country: a cross-sectional facility-based survey. *BMC health services research*. 2016 Apr 27;16(1):152. doi.org/10.1186/s12913-016-1383-9
52. Meyrowitsch DW, Nielsen J, Bygbjerg IC, Søndergaard J, Thi DK, Huyen DB, Gammeltoft T, Duc TN. Unmet needs for informal care among people with type 2 diabetes in rural communities in Vietnam. *Public Health in Practice*. 2023 Jun 1;5:100364. doi: 10.1016/j.puhip.2023.100364
 53. Macdonald GC, Campbell LV. Comment on Young-Hyman et al. Psychosocial Care for People With Diabetes: A Position Statement of the American Diabetes Association. *Diabetes Care* 2016; 39: 2126–2140. *Diabetes care*. 2017 Sep 1;40(9):e129-30. doi.org/10.2337/dc16-2053
 54. Whitebird RR, Kreitzer M, Crain AL, Lewis BA, Hanson LR, Enstad CJ. Mindfulness-based stress reduction for family caregivers: a randomized controlled trial. *The gerontologist*. 2013 Aug 1;53(4):676-86. doi:10.1093/geront/gns126
 55. Erdoğan Yüce G, Döner A, Bilgin A, Muz G. The effect of mindfulness-based interventions on caregiver burden, quality of life and psychological distress in caregivers of adults with chronic diseases: Systematic review and meta-analysis of randomized controlled trials. *Worldviews on Evidence-Based Nursing*. 2024 Oct;21(5):528-41. doi.org/10.1111/wvn.12736
 56. He C, Evans N, Graham H, Milner K. Group-based caregiver support interventions for children living with disabilities in low-and-middle-income countries: Narrative review and analysis of content, outcomes, and implementation factors. *Journal of Global Health*. 2024 Apr 12;14:04055. doi: 10.7189/jogh.14.04055
 57. Makanjuola OJ, Ngcobo WB. Developing and pilot testing an intervention model to manage the burden of family caregivers of older adults with schizophrenia. *BMC nursing*. 2025 Sep 1;24(1):1133. doi.org/10.1186/s12912-025-03777-4
 58. Carcone AI, Ellis DA, Naar-King S. Linking caregiver strain to diabetes illness management and health outcomes in a sample of adolescents in chronically poor metabolic control. *Journal of Developmental & Behavioral Pediatrics*. 2012 May 1;33(4):343-51. doi: 10.1097/DBP.0b013e31824eaac8
 59. Kavva C, Narula N, Longkumer T, Padiri RA, Vincent K. Caregiver Burden in Diabetes Care and Psychosocial Interventions: A Review. *Mind and Society*. 2024;13(3):8-21. doi: 10.56011/mind-mri-133-20242