BMC Psychiatry

RESEARCH Open Access

Family system disruptions, probable depression and stress levels among caregivers of children aged 0–17 years in Uganda: evidence from baseline data of a cluster randomized controlled trial

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Abstract

Background Probable depression and stress significantly burden Ugandan caregivers, with prevalence rates up to 30%. Stress triggers harsh discipline, while depression leads to neglect. Guided by Family Systems Theory (FST), this study used Parenting for Respectability (PfR) programme data to examine how family system disruptions especially past exposure to violence, household size and partner status affect caregiver mental health outcomes to inform context-specific parenting interventions.

Methods Baseline data from 2,314 caregivers in the PfR cRCT (2021–2022) were analysed. Data on demographics, probable depression and Stress were collected using structured questionnaires. Mixed-effects regression models, adjusting for clustering, examined the associations between family system disruptions and probable depression and stress using STATA 16.0.

Results Among 2,314 caregivers, 53.4% were female, with a mean age of 37.9 ± 11.9 years. Nearly half reported depressive symptoms (47.4%, 95% CI: 45.3%–49.4%), and the mean parental stress score was 36.5 ± 15.9. Family system disruptions were significant predictors of poor mental health: past exposure to violence showed a strong, consistent association with both depression (β range: 0.28–0.36) and stress (β range: 0.38–0.49). We report adjusted beta coefficients β (95% CI). Regarding household structure, being a single mother 1.48 (0.21, 2.71), residing in a large household 1.53 (0.86, 2.20), and caregiver disability 1.58 (0.11, 3.05) were significantly linked to increased symptoms. Conversely, having a partner was strongly protective against both probable depression − 4.41 (− 5.87, − 2.96) and stress − 2.87 (− 4.01, − 1.73). Compared with caregivers aged 18–30, those aged 31–40 and 41–50 had higher probable depression: 1.96 (0.95–2.97), 2.59 (1.44–3.73), and stress: 2.28 (1.50–3.07), 2.98 (2.10–3.87) respectively. Those > 50

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reported highest stress: 3.55 (2.58–4.52). Female caregivers had higher depression and stress, while social support and equitable gender norms reduced distress.

Conclusion Family system disruptions influence caregiver mental health. Stress and depressive symptoms were higher among caregivers aged 31–50 compared to those aged 18–30. Targeted interventions should focus on violence-exposed, middle-aged, and female caregivers by strengthening social support and providing skills to identify and manage early mental health symptoms.

Keywords Probable depression, Stress, DASS-21, Parenting stress scale, Caregiver, LMICs

Background

Globally, depression remains a prevalent mental health disorder affecting a staggering 264 million individuals, as reported by the World Health Organization (WHO) [1]. Women are disproportionately affected, experiencing a higher prevalence of depression compared to men, with low- and middle-income countries (LMICs) bearing the impact of this burden [2]. In Uganda, the recent reviews have showed that pooled prevalence of depression ranges between 20.8% – 30.2% the general population [3, 4]. It is further shown that vulnerable groups show higher rates, including refugees (67.6%), war victims (36%), people living with HIV (28.2%), pregnant/postpartum women (26.9%), university students (26.9%), and children/adolescents (23.6%) [3–5]. Parental stress and depression are significant concerns globally, with various studies indicating increasing prevalence and associated factors [6, 7]. Over the past decade, parents have consistently reported higher levels of stress compared to other adults [8]. This heightened stress can negatively impact parental mental health, leading to poorer psychological and physical well-being, and can also adversely affect their children's developmental and health outcomes [9]. For instance, distressed parents may not engage effectively in stimulating interactions with their children, thereby elevating the risk of maltreatment and adverse childhood experiences [9].

In this study, we distinguish between probable depression and stress as two distinct yet interacting pathways that influence caregiving [10]. While stress represents the immediate psychological strain resulting from the daily demands of caregiving often manifesting as irritability or overwhelm, depression refers to a more persistent state of low mood and withdrawal [11]. Within the conceptual framework of the Parenting for Respectability (PfR) program, these constructs are critical because they impair different parenting dimensions: stress often leads to reactive, harsh discipline [12], while depression is more closely linked to parental neglect, lack of emotional warmth, and disengagement [13, 14]. Understanding the unique predictors of each is essential for tailoring the PfR intervention to ensure that caregivers possess the emotional regulation necessary for positive parenting [14].

Systematic reviews in LMICs have generally linked depression and stress to limited healthcare access, social norms, food insecurity and IPV [15, 16]. Factors contributing to parental depression worldwide include socioeconomic challenges, limited social support, and exposure to adverse life events [16].Additionally, cultural beliefs, conflict, and prevalent infectious diseases like HIV/AIDS significantly impact parental mental health within African communities [17].

While the global and regional burden of depression and stress is well documented, the specific mechanisms through which social, economic, and caregiving pressures shape parental mental health remain insufficiently understood, signalling a critical knowledge gap. Although previous studies [18–20] emphasise an escalating trend of mental health disorders across the SSA these studies largely emphasise general population trends, offering limited insight into the lived experiences of caregivers within diverse family and cultural contexts. In addition, data that looks at both female and male caregivers is often less reported. In SSA and Uganda in particular, uptake of mental health interventions encounters daunting challenges including stigma, resource inadequacies, gender norms and restricted access [21].

Therefore studying depression and stress among caregivers of children aged 0–17 years is essential to identify contributing factors and suggest preventive, tailored and context specific family strengthening interventions [22, 23]. Guided by Family Systems Theory (FST), this study conceptualizes caregiver mental health as an outcome of interconnected dynamics where individual history and household environment act as mutually reinforcing systems. Under this framework [Family Systems Theory], we hypothesized that disruptions to the family system, specifically past exposure to violence and unstable household structures, would significantly increase the risk of both depression and stress, as these system shocks diminish the caregiver's capacity to maintain family equilibrium. Accordingly, the study aimed at explaining to what extent past exposure to violence is associated with caregiver depression and stress among caregivers of children aged 0–17 years in Uganda, and what role does family structure and other contextual factors play in this relationship. The results of this study aim at informing interventions

that strengthen family functioning and caregiver mental health.

Methods and materials

Study design

This is a cross-sectional study analysing baseline data of a cluster randomised controlled trial of Parenting for Respectability (PfR) which was aimed at testing the intervention effectiveness in reducing child maltreatment and gender-based violence in Uganda. The trial was registered on ClinicalTrials.gov on November 3, 2021 (ClinicalTrials.gov ID NCT05105373). The methods and detailed description of the trial, including the intervention components are described elsewhere [24].

Study area and population

The study was conducted in two districts in Uganda, Wakiso (Central Uganda) and Amuru (Northern Uganda) between August 2021 and December 2022. The PfR trial comprised of participants allocated to the Intervention and Control arms with participating clusters defined as villages or wards, depending on population size and geographical proximity. The study population comprised primary caregivers aged 18 years or older who were responsible for a child aged 0–17 years. All participants provided written informed consent and agreed to participate in the PfR program if assigned to the intervention arm.

Sample size

We analysed baseline data involving 2,314 participants across 54 clusters. The prevalence of depressive symptoms was 47.4% (95% CI: 45.3%–49.4%), and the mean parenting stress score was 36.5 (SD = 15.9), both estimated with high precision (5%). Adjusting for clustering using a design effect of 1.84 (assuming ICC = 0.02), the effective sample size for the current study was approximately 1,257. This sample size provided over 80% power to detect moderate associations (e.g., relative ratio of 1.5) between risk factors and depressive symptoms at a 5% significance level. Therefore, the study was well-powered for the reported baseline estimates and associations, even after accounting for the cluster design.

Data collection tools and procedures

Trained and supervised research assistants conducted informed consent procedures and collected demographic, household, psychosocial, parental probable depression and parental stress data using paper-based questionnaires administered orally in local languages to account for low-literacy rates in the study areas. Data was collected electronically using in open data kit (ODK) software database. Collected data was then exported to Stata 16.0 for further management.

Data quality control

Data quality was ensured using a standardized, validated questionnaire, a pretest on 10% of the sample, and thorough training of data collectors on ODK data collection. The pretest informed minor modifications to the wording and sequencing of selected items to improve clarity, comprehension, and contextual relevance. Completed questionnaires were reviewed for completeness before uploading to the ODK server, and all submitted files were checked for accuracy and consistency on a daily basis.

Measurement of the study variables

Parental depression

We used the DASS questionnaire that was created by Lovibond and Lovibond to measure the main indicators of probable depression [25]. It has also been used to gauge how well patients are responding to treatment. It has been established that the questionnaire possesses sufficient psychometric qualities and is comparable to other reliable measures. The short form of the DASS is the DASS-21, and research results confirm that it is a valid and validated tool for assessing negative mental states in adults, including stress, anxiety, and depression (both patients and non-patients). The three self-reported scores that make up the 21 items on the questionnaire are intended to evaluate DASS. The DASS-21 scale has been validated elsewhere in similar populations and our reliability test gave a Cronbach alpha coefficient of 0.89; 95%CI 0.877–0.897. On a Likert scale ranging from 0 to 3, the seven items on the scales are rated (0: "Applied to me to some extent," 1: "Did not apply to me at all." "Applied to me to some degree or some of the time," 2: "Applied to me to a considerable degree or a good part of the time," and 3: "Applied to me very much or most of the time"). Depression, anxiety, and stress scores are measured by summarizing the scores of the related items. Because the DASS-21 is a shorter version of the 42-item original DASS, the score for each subscale was multiplied by 2 to calculate the final score. According to the Lovibond manual for the Depression Anxiety Stress Scales [26], the resulting ratings then are classified as: "normal (0/9), mild (10/13), moderate (14/20), severe (21/27), or extremely severe (28+) " [26–28]. For this study only the Depression component under DASS-21 was used.

Parental stress

To assess the parenting stress the study considered a 10-item reduced version of the Parenting Stress Scale (PSS), which has been widely used in LMICs like Pakistan [29] and with non-parent caregivers such as grandparents [30]. Studies on the validity and reliability of PSS tools have indicated good internal consistency, construct validity, convergent validity, and test–retest reliability [31, 32]. Notably, for this study, Cronbach's alpha

coefficient for the internal consistency of the items in the PSS was 0.88. Caregivers reported current and negative attitudes towards their children (e.g., "I feel overwhelmed by the responsibility of being a parent") related to parenting stress based on a five-point Likert scale (1 = Strongly disagree; 5 = Strongly agree). Caregivers rated their stress on a five-point Likert scale, with item scores summed to generate a total parenting stress score. The higher scores indicated higher parenting stress while a lower score indicated a low parenting stress. The overall possible scores on the scale ranged from 10 to 50.

Independent variables

Baseline sociodemographic and household characteristics were used to operationalize the independent variables in this analysis. Age was categorized into four groups (25–30, 31–40, 41–50, above 50 years). Education was classified as no schooling or some schooling, while literacy was based on reading ability (cannot read, read with difficulty, read with little difficulty, read easily). Sex/gender was recorded as male or female, and religion was grouped as Catholic, Anglican, Muslim, Pentecostal, or other. Marital/partnered status included single, married, in a relationship, or divorced, and household composition was captured through family structure (both parents, single mother, single father, or no biological parent) and number of children (0–4, 5+). Area of residence was categorized as rural or peri-urban, and caregiver disability status as Yes/No for those who reported to have any form of disability (Yes) and (No) otherwise. Additional psychosocial variables included past exposure to violence, gender socialisation (continuous score) and presence of another caregiver other the primary caregiver in the household as an indicator of social support.

Data management and statistical analysis

Data from the trial database were exported to STATA 16.0 (StataCorp, College Station, TX, USA) for management and analysis. The DASS-21, Parenting Stress Scale (PSS-10), and sociodemographic datasets were merged and cleaned, with new composite scores generated for analysis. Caregiver characteristics were summarized using means and standard deviations (SD) for continuous variables and frequencies with percentages for categorical data. A theory-driven causal framework [33] guided the analysis, prioritizing structural relevance over statistical significance for variable selection. Past exposure to violence was specified a priori as the primary exposure of interest for both probable depression and parental stress. To preserve statistical precision and distributional information, all modelling utilized continuous scores for probable depression and stress rather than categorical classifications. A sketch of the Directed Acyclic Graph (DAG) has been provided (Fig. 1). To account for the hierarchical nature of the data, we employed mixed-effects linear regression models with random intercepts at both the district and cluster levels. This approach enabled us to examine the extent to which past exposure to violence

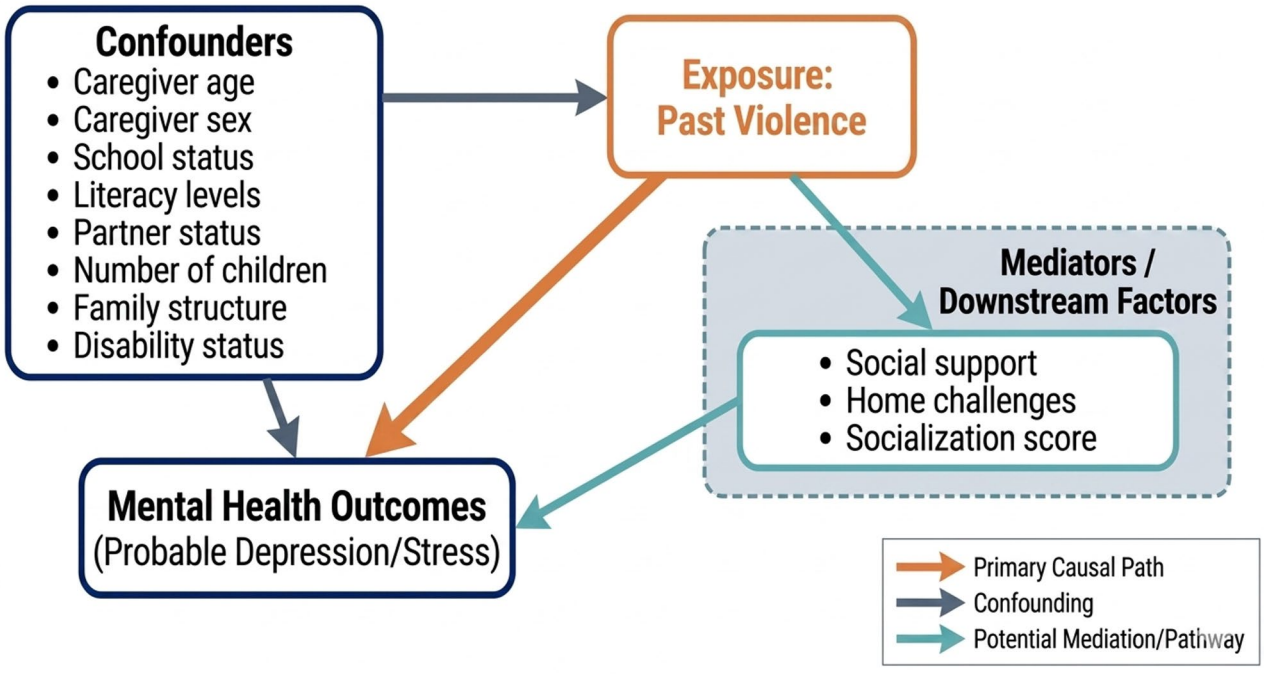

Fig. 1 Directed Acyclic Graph (DAG)

is associated with depression and stress among caregivers of children aged 0–17 years in Uganda, as well as the role played by family structure and other contextual factors in this relationship. It accounts for intra-cluster correlation and geographic nesting. In contrast to stepwise or p-value-driven selection methods, we utilized a domain-specific modelling strategy to test the robustness of the primary exposure across different ecological systems: the Sociodemographic Model, Household Structure Model, and Psychosocial Model [34, 35].

A final sensitivity model (full model) integrating all domains was conducted to observe potential reduction of the primary exposure's effect. Multicollinearity was assessed using Variance Inflation Factors (VIF); marital status was excluded due to collinearity with partnership status. All other predictors exhibited no multicollinearity (mean VIF = 1.14; all VIFs < 5) [36], indicating that the estimated effects are stable and not biased by correlations among independent variables (Table 1). Finally, statistical significance for the primary exposure was set at $p < 0.05$, with the stability of its coefficients across the different models used to infer the causal impact of past violence on caregiver mental health (probable depression and stress).

Sensitivity analysis

In order to address the problem of missing data on particular covariates, we performed sensitivity analyses. Multivariate imputation using chained equations technique was used to impute data for participants who had missing values on several covariates [37]. Based on the distribution of the remaining covariates in the adjusted model, a sample of missing values was generated. We performed ten rounds of multiple imputations, assuming that the data were missing at random. After imputation, we pooled the final data for analysis using Rubin's approach [38]. The outcomes of the imputed model and the full case analysis were compared.

Table 1 Collinearity diagnostics for predictor variables in the caregiver stress and probable depression models ($N = 2,314$)

Variable Description	VIF	√VIF	Tolerance	R^2
Past violence exposure score	1.03	1.02	0.97	0.03
Caregiver age	1.14	1.07	0.87	0.13
Caregiver sex	1.18	1.09	0.85	0.15
Child currently in school	1.3	1.14	0.77	0.23
Caregiver literacy level	1.33	1.15	0.75	0.25
Caregiver partnered status	1.23	1.11	0.81	0.19
Caregiver has disability	1.02	1.01	0.98	0.02
Family structure	1.13	1.06	0.88	0.12
Social support	1.05	1.03	0.95	0.05
Household challenges	1.04	1.02	0.96	0.04
Socialisation score	1.05	1.03	0.95	0.05
Mean VIF	**1.14**			

VIF=Variance Inflation Factor

Results

Of the 2374 that were randomized,60 records excluded from this analysis for missing data on one or more variables (Fig. 2). A total of 2,314 caregivers were included in the analysis, of whom 53.4% were female, with a mean age of 37.9 years (SD = 11.9). Overall, 47.4% of participants exhibited depressive symptoms (mild/moderate or severe/extremely severe). Depressive symptoms were significantly associated with caregiver age ($p < 0.001$), with higher proportions observed among older caregivers, and with gender ($p < 0.001$), as females had a higher prevalence (53.4%) compared to males (40.4%).

Literacy level, marital/relationship status, partnered status, disability, household size, family structure, challenges at home, social support, past exposure to violence, and gender social norms were all significantly associated with depressive symptoms (all $p < 0.001$), whereas religious affiliation and residence type were not ($p = 0.064$ and $p = 0.506$, respectively). Details Table 2.

Overall, parenting stress was significantly higher among caregivers with fewer supports, single-parent households, and those exposed to home challenges or violence ($p < 0.001$). The analysis revealed statistically significant differences in scores across family structures for both outcome measures: probable depression (F-statistic = 25.3, $p < 0.001$) and parental stress (F-statistic = 9.53, $p < 0.001$). Detail Fig. 3.

Baseline characteristics

The adjusted mixed-effects models show consistent and strong associations between past violence exposure and caregiver mental health outcomes across all domain-specific models. In the sociodemographic model, higher exposure to past violence was significantly associated with increased caregiver probable depression (β = 0.36, 95% CI: 0.24–0.48) and stress (β = 0.49, 95% CI: 0.39–0.58). Similarly, in the household structure model, the association remained significant for both probable depression (β = 0.32, 95% CI: 0.19–0.44) and stress (β = 0.46, 95% CI: 0.36–0.55), while in the psychosocial model, past violence exposure also remained a strong predictor of both probable depression (β = 0.28, 95% CI: 0.15–0.41) and stress (β = 0.38, 95% CI: 0.29–0.48). This consistency across models underscores the robust relationship between violence exposure and caregiver psychological distress.

Across sociodemographic characteristics, caregiver age showed a clear increase, with caregivers aged 31–40 years reporting higher probable depression (β = 1.96, 95% CI: 0.95–2.97) and stress (β = 2.28, 95% CI: 1.50–3.07), while those aged 41–50 years also had elevated probable depression (β = 2.59, 95% CI: 1.44–3.73) and stress (β = 2.98, 95% CI: 2.10–3.87), for caregivers aged above 50 years reported elevated stress (β = 3.55, 95% CI:2.58–4.52)

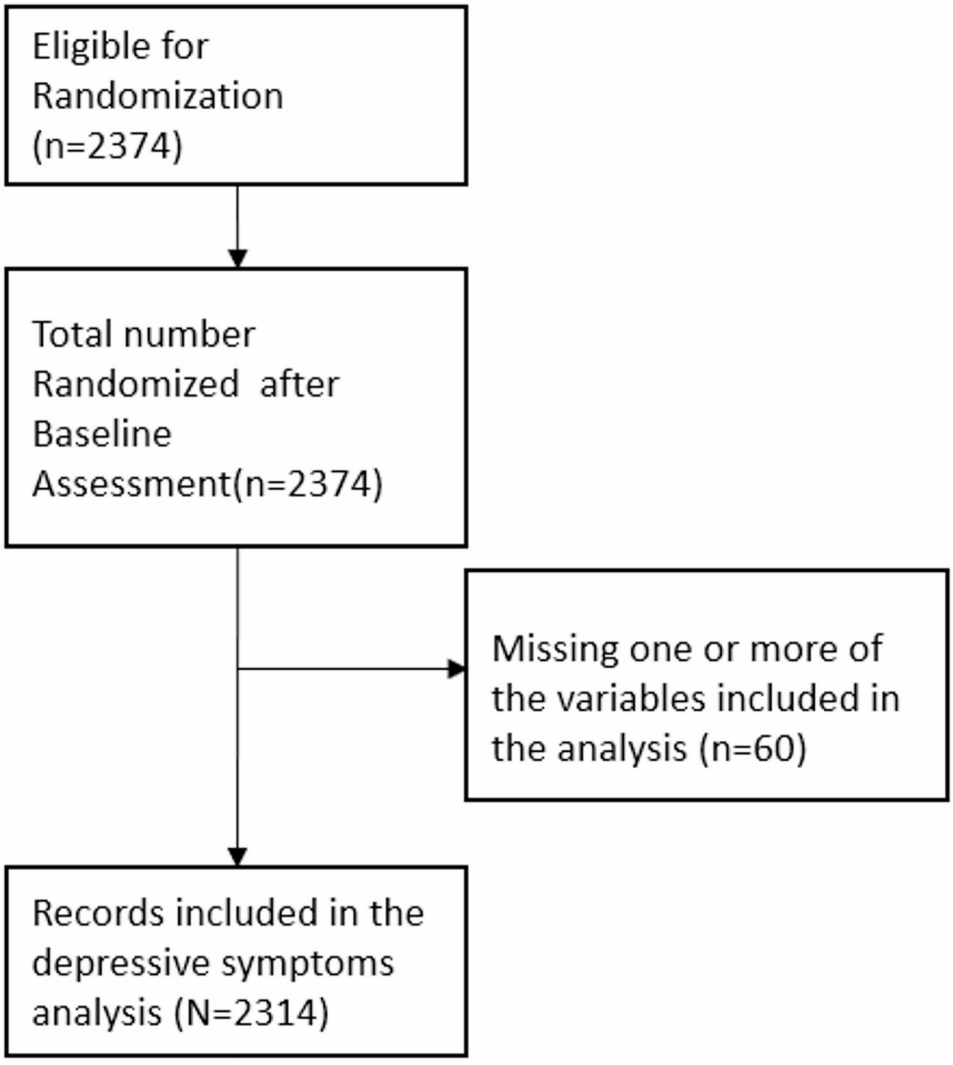

Fig. 2 Screening profile of study participants

compared to those aged 18–30 years. Female caregivers consistently reported higher levels of probable depression (β = 3.10, 95% CI: 2.26–3.94) and stress (β = 2.39, 95% CI: 1.74–3.04) compared to males. With regards to literacy, caregivers who reported being able to read easily had substantially lower levels of depression (β = −2.81, 95% CI: −4.22 to − 1.40) and stress (β = −1.55, 95% CI: −2.60 to − 0.50), while those with some reading difficulty also demonstrated reduced stress (β = −1.68, 95% CI: −2.84 to − 0.53) compared to those who couldn't read at all. However, this association should be interpreted cautiously, as literacy likely reflects broader underlying socioeconomic advantage, including access to information, resources, and enhanced coping capacity, rather than a direct causal effect.

Within household structure characteristics, being in a partnered relationship was strongly protective against both probable depression (β = −4.41, 95% CI: −5.87 to − 2.96) and stress (β = −2.87, 95% CI: −4.01 to − 1.73). Conversely, having five or more children was associated with increased probable depression (β = 0.94, 95% CI: 0.08–1.80) and stress (β = 1.53, 95% CI: 0.86–2.20). Caregivers in single-mother households reported higher probable depression (β = 3.31, 95% CI: 1.73–4.90) and stress (β = 1.48, 95% CI: 0.24–2.71), while caregivers with disabilities also experienced significantly worse outcomes for both probable depression (β = 3.98, 95% CI: 2.10–5.86) and stress (β = 1.58, 95% CI: 0.11–3.05). In contrast, being in a household without a biological parent was associated with lower probable depression (β = −1.41, 95% CI: −2.44 to − 0.38), though not significantly related to stress.

In the psychosocial domain, higher social support was associated with reduced probable depression (β = −2.76, 95% CI: −3.62 to − 1.91), although it showed a small positive association with stress (β = 0.67, 95% CI: 0.03–1.31). Household challenges were strongly associated with

Table 2 Participant baseline socio-demographic characteristics

Variable (Categories)	Probable depression				
	Overall *n* (col%)	Normal *n* (row %)	Mild/Moderate *n* (row %)	Severe/Extremely severe *n* (row %)	χ2 *P*-value, F(*p*)
All Participants	2314	1218 (52.6)	729 (31.5)	367 (15.7)	
Mean Age (SD)	37.9 (11.9)	37.3 (12.4)	38.8 (11.7)	38.3 (10.8)	0.028
Age group (years)					< 0.001
18–30	762 (32.9)	449 (58.9)	209 (27.4)	104 (13.7)	
31–40	710 (30.7)	353 (49.7)	232 (32.7)	125 (17.6)	
41–50	473 (20.4)	217 (45.9)	167 (35.3)	89 (18.8)	
Above 50	369 (16.0)	199 (53.9)	121 (32.8)	49 (13.3)	
Gender					< 0.001
Male	1,079 (46.6)	643 (59.6)	313 (29.0)	123 (11.4)	
Female	1,235 (53.4)	575 (46.6)	416 (33.7)	244 (19.8)	
Religion					0.064
Catholic	1,231 (53.2)	659 (53.5)	379 (30.8)	193 (15.7)	
Anglican	461 (19.9)	221 (47.9)	172 (37.3)	68 (14.8)	
Muslim	175 (7.6)	88 (50.3)	59 (33.7)	28 (16.0)	
Pentecostal	339 (14.7)	195 (57.5)	88 (26.0)	56 (16.5)	
Others[ρ]	108 (4.7)	55 (50.9)	31 (28.7)	22 (20.4)	
Schooling					< 0.001
No	255 (11.0)	108 (42.4)	74 (29.0)	73 (28.6)	
Yes	2,059 (89.0)	1,110 (53.9)	655 (31.8)	294 (14.3)	
Marital/Relationship Status					< 0.001
Single	159 (6.9)	53 (33.3)	61 (38.4)	45 (28.3)	
Married	1,751 (75.7)	983 (56.1)	523 (29.9)	245 (14.0)	
In a relationship	284 (12.3)	142 (50.0)	108 (38.0)	34 (12.0)	
Divorced	120 (5.2)	40 (33.3)	37 (30.8)	43 (35.8)	
Literacy level					< 0.001
Cannot read	478 (20.7)	198 (41.4)	174 (36.4)	106 (22.2)	
Read with difficulty	510 (22.0)	261 (51.2)	162 (31.8)	87 (17.1)	
Read with little difficulty	435 (18.8)	253 (58.2)	127 (29.2)	55 (12.6)	
Read easily	891 (38.5)	506 (56.8)	266 (29.9)	119 (13.4)	
Residence type					0.506
Peri-urban	891 (38.5)	460 (51.6)	280 (31.4)	151 (17.0)	
Rural	1,423 (61.5)	758 (53.3)	449 (31.6)	216 (15.2)	
Partnered status					< 0.001
No	279 (12.1)	93 (33.3)	98 (35.1)	88 (31.5)	
Yes	2,035 (87.9)	1,125 (55.3)	631 (31.0)	279 (13.7)	
Household members					0.001
Mean ± SD	2.7 (1.4)	2.6 (1.3)	2.8 (1.7)	2.6 (1.4)	
Children					0.159
0–4	1,549 (66.9)	837 (54.0)	474 (30.6)	238 (15.4)	
5 or more	765 (33.1)	381 (49.8)	255 (33.3)	129 (16.9)	
Disability status					< 0.001
No	2,202 (95.2)	1,180 (53.6)	686 (31.2)	336 (15.3)	
Yes	112 (4.8)	38 (33.9)	43 (38.4)	31 (27.7)	
Family structure					< 0.001
Both parents	1,461 (63.1)	802 (54.9)	452 (30.9)	207 (14.2)	
Single mother	227 (9.8)	73 (32.2)	81 (35.7)	73 (32.2)	
Single father	107 (4.6)	47 (43.9)	35 (32.7)	25 (23.4)	
No biological parent	519 (22.4)	296 (57.0)	161 (31.0)	62 (12.0)	
Challenges at home[η]					< 0.001
No	832 (36.0)	491 (59.0)	233 (28.0)	108 (13.0)	
Yes	1,482 (64.0)	727 (49.1)	496 (33.5)	259 (17.5)	

Table 2 (continued)

Variable (Categories)	Probable depression				
	Overall *n* (col%)	Normal *n* (row %)	Mild/Moderate *n* (row %)	Severe/Extremely severe *n* (row %)	χ2 *P*-value, F(*p*)
Social support [Other caregiver present]					< 0.001
No	1,022 (44.2)	472 (46.2)	356 (34.8)	194 (19.0)	
Yes	1,292 (55.8)	746 (57.7)	373 (28.9)	173 (13.4)	
Past exposure to violence score					< 0.001
Mean ± SD	5.6 (3.3)	5.4 (3.2)	5.6 (3.2)	6.3 (3.5)	
Gender Social norms					0.003
Mean ± SD	17.5 (4.2)	17.8 (4.2)	17.3 (4.0)	17.0 (4.2)	

Significance level **P < 0.001 *P < 0.05; N = 2314; ρ = The include Seventh-day Adventists, Baptists etc.; χ2 = Chi-Square; η = These include sick, drunk, hunger, fights, drugs

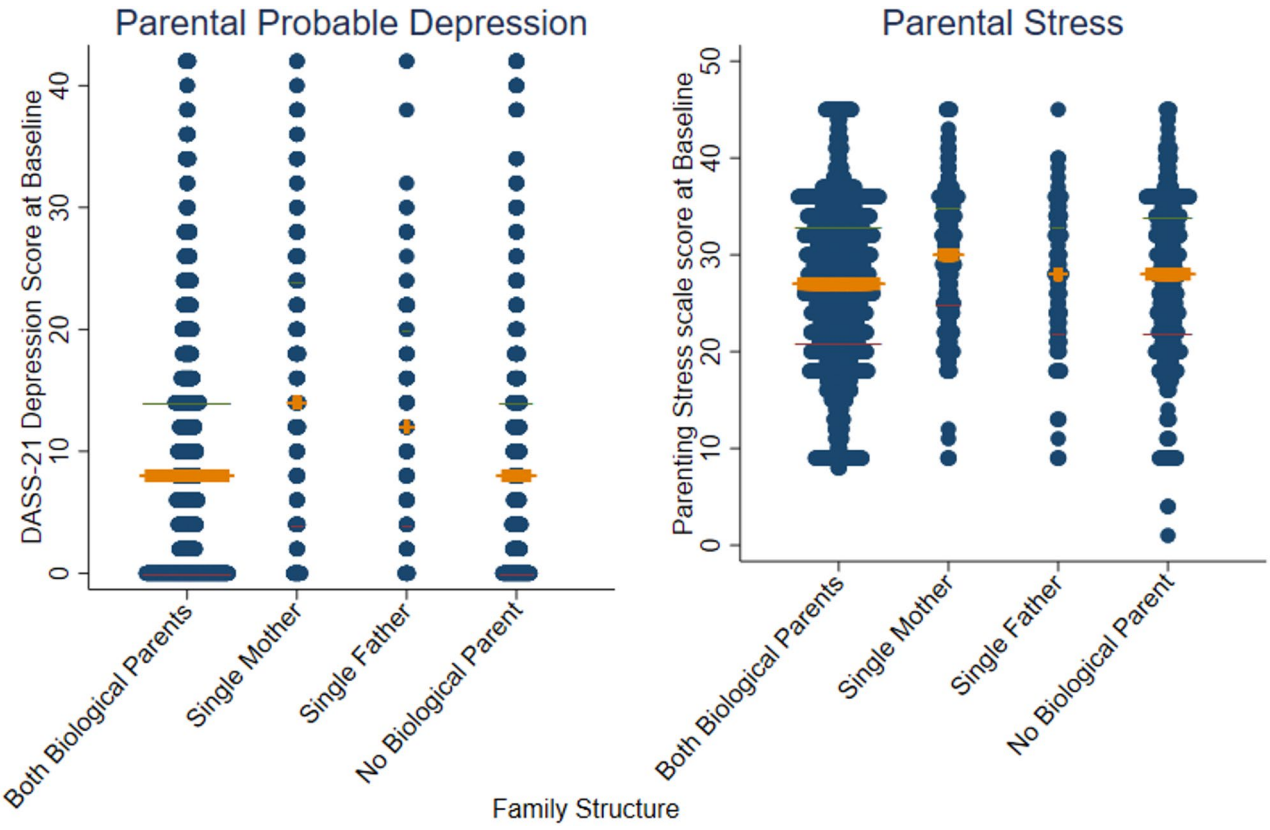

Fig. 3 Distribution of mean DASS-21 probable depression score and Parental stress score by Family structure

increased probable depression (β = 2.28, 95% CI: 1.43–3.14) and stress (β = 2.01, 95% CI: 1.35–2.66). In addition, higher scores on the gender socialisation scale reflected that more equitable gender norms were associated with lower levels of both probable depression (β = −0.12, 95% CI: −0.22 to −0.02) and stress (β = −0.31, 95% CI: −0.38 to −0.23). This indicates that more equitable gender attitudes may play a protective role in caregiver mental health. Details in Table 3.

Assumptions for regression that were assessed include linearity by a scatter plot of the residuals against the fitted values, and it depicted no significant outlier; normality of distribution checked by a histogram, and well fitted the normal distribution curve (Fig. 4). We estimated predictive margins for the interaction between family structure and caregiver age to assess their joint influence on the outcome. This allowed comparison of expected scores across age groups within different family structures. Single mothers consistently had higher predicted outcomes than caregivers in two-parent families, reaching 29.7 (95% CI: 28.2–31.1) for those above 50 years, while single fathers and caregivers with no biological parent available had intermediate values. These results indicate that both

Table 3 Multivariable mixed-effects models for caregiver mental health (probable depression and stress) among caregivers of children aged 0–17 years in Uganda

Domain / Variable	Parental Probable depression			Parental Stress		
	β (95% CI)	Std. Error	*P*-value	β (95% CI)	Std. Error	*P*-value
Sociodemographic characteristics						
Past violence exposure	0.36 (0.24–0.48)	0.06	< 0.001	0.49 (0.39–0.58)	0.05	< 0.001
Caregiver age group (Ref: 18–30)						
31–40	1.96 (0.95–2.97)	0.52	< 0.001	2.28 (1.50–3.07)	0.4	< 0.001
41–50	2.59 (1.44–3.73)	0.58	< 0.001	2.98 (2.10–3.87)	0.45	< 0.001
Above 50	0.67 (-0.60–1.93)	0.65	0.299	3.55 (2.58–4.52)	0.50	< 0.001
Caregiver sex (Female vs. Male)	3.10 (2.26–3.94)	0.43	< 0.001	2.39 (1.74–3.04)	0.33	< 0.001
Child currently in school (Yes vs. No)	-1.39 (-2.99–0.21)	0.82	0.088	0.24 (-1.00–1.48)	0.63	0.705
Literacy level (Ref: Cannot read at all)						
Can read with a lot of difficulty	-1.16 (-2.60–0.28)	0.74	0.114	-0.24 (-1.35–0.87)	0.57	0.671
Can read with little difficulty	-2.97 (-4.49 – -1.46)	0.77	< 0.001	-1.68 (-2.84 – -0.53)	0.59	0.004
Can read easily	-2.81 (-4.22 – -1.40)	0.72	< 0.001	-1.55 (-2.60 – -0.50)	0.54	0.004
Household structure characteristics						
Past violence exposure	0.32 (0.19–0.44)	0.06	< 0.001	0.46 (0.36–0.55)	0.05	< 0.001
Partnered status (Yes vs. No)	-4.41 (-5.87 – -2.96)	0.74	< 0.001	-2.87 (-4.01 – -1.73)	0.58	< 0.001
Number of children (≥ 5 vs. < 5)	0.94 (0.08–1.80)	0.44	0.031	1.53 (0.86–2.20)	0.34	< 0.001
Family structure (Ref: Both parents)						
Single mother	3.31 (1.73–4.90)	0.81	< 0.001	1.48 (0.24–2.71)	0.63	0.019
Single father	0.81 (-1.18–2.79)	1.01	0.427	-0.61 (-2.17–0.94)	0.79	0.44
No biological parent	-1.41 (-2.44 – -0.38)	0.53	0.007	-0.07 (-0.88–0.73)	0.41	0.86
Caregiver disability (Yes vs. No)	3.98 (2.10–5.86)	0.96	< 0.001	1.58 (0.11–3.05)	0.75	0.035
Psychosocial characteristics						
Past violence exposure	0.28 (0.15–0.41)	0.06	< 0.001	0.38 (0.29–0.48)	0.05	< 0.001
Social support (Yes vs. No)	-2.76 (-3.62 – -1.91)	0.44	< 0.001	0.67 (0.03–1.31)	0.33	0.042
Household challenges (Yes vs. No)	2.28 (1.43–3.14)	0.44	< 0.001	2.01 (1.35–2.66)	0.33	< 0.001
Socialisation score	-0.12 (-0.22 – -0.02)	0.05	0.017	-0.31 (-0.38 – -0.23)	0.04	< 0.001

β = adjusted beta coefficient; CI = confidence interval

family structure and caregiver age are associated with meaningful differences in caregiver outcomes.

Sensitivity analysis results

A sensitivity analysis was conducted where missing data for certain covariates from 60 participants were imputed, yielding results similar to those obtained when these participants were excluded from the analysis. The distribution of the residuals depicted no non-normality as indicated in Fig. 4.

Discussion

We report on the prevalence and factors associated with parental probable depression and stress among caregivers of children aged 0–17 years in Uganda. The findings of our study reveal that the prevalence of parental depressive symptoms (47.4%) is higher compared to other recent studies in the region that reported prevalence of probable depression between 13.7% and 36% [39, 40]. This variation in prevalence could be explained by the differences in the populations studied [41]. For instance, our study included caregivers of children up to 17 years old, whereas other studies have focused on specific age ranges or contexts, such as caregivers of children with disruptive behavior disorders or adolescents in refugee settings [42, 43]. Studies in other sub-Saharan settings reported lower prevalence of probable depression. For example, studies on parental depression in low- and middle-income countries have identified rates ranging from 11.1% to 19.5% [44]. The elevated prevalence observed in our study may also be attributed to the broad inclusion criteria encompassing diverse adverse psychosocial conditions prevalent in Uganda, such as chronic war trauma, poverty, HIV infection, and child maltreatment, which are established risk factors for mental health disorders among caregivers and children [45, 46]. This broader scope, including various forms of adversity, likely captures a more comprehensive representation of depression prevalence than investigations confined to narrower populations [3]. Furthermore, the complex interaction of these mixed adversities within the Ugandan context may worsen parental stress and depression, highlighting the need for comprehensive mental health interventions that address the systemic determinants of caregiver well-being [42].

In a study carried out among parents of children with Cancer in Ethiopia [47], the prevalence of depressive

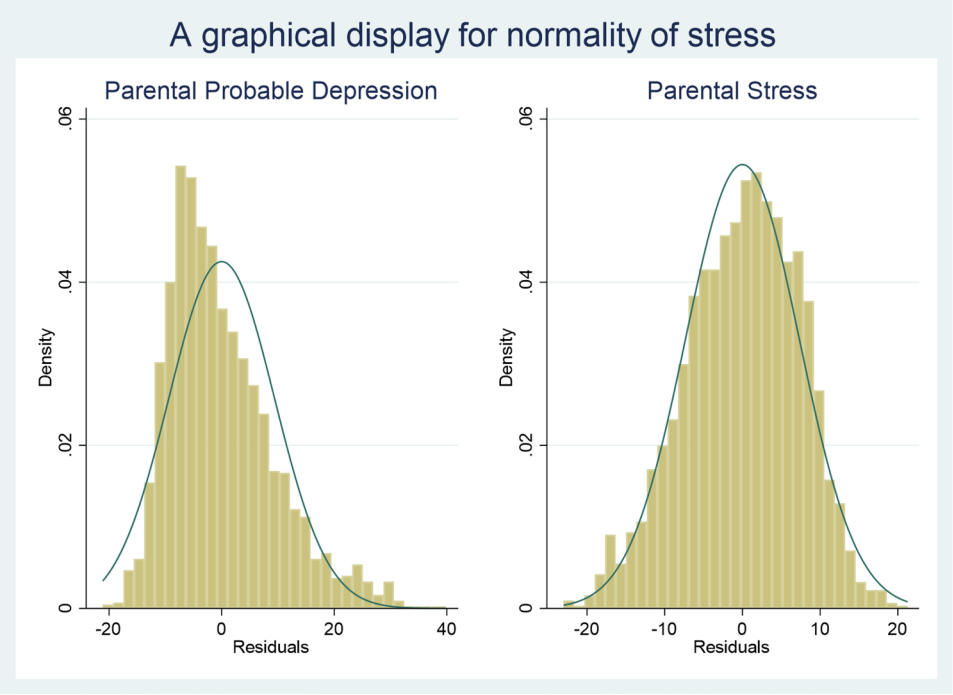

Fig. 4 Normal distribution curves for the regression residual of parental probable depression and stress

symptoms was 60.7% and this is higher than the reported prevalence in our study. The observed disparity in prevalence rates could be attributed to variations in methodological approaches, cultural contexts, or the specific assessment instruments employed across different studies [48]. Other studies showed extremely higher prevalences of probable depression in Uganda and Ethiopia [49, 50] at 80.7% and 57.6% respectively as compared to our findings. These differences are explained by the kind of populations that were studied, much as our study was carried among the caregivers of children 0–17, the study in Ethiopia was among parents of children with cancer this could explain the higher prevalence while the study in Uganda was among university students using DASS-21 tool.

We found that older caregivers, particularly those in the 41–50 age bracket, exhibited significantly higher levels of depressive and stress symptoms compared to younger caregivers. While these findings align with observations in other middle-to-low-income settings such as Lesotho, where caregivers reported elevated psychological distress, depression, and anxiety [51, 52], our study further explains this vulnerability by age cohort. Specifically, this age stratification reveals that middle-aged caregivers, despite potentially possessing greater resilience or resources than younger counterparts, experience heightened psychological burden [53]. This observation highlights the different nature of caregiving strain, suggesting that age, in conjunction with other sociodemographic factors, profoundly influences mental health outcomes.

In Uganda, caregivers in mid-to-late adulthood often face a unique dual burden: they at the level of parenting teenagers, they are culturally expected to provide intensive care for their own aging parents while simultaneously supporting their own dependent children and, frequently, orphaned relatives within the extended family network [54]. This double-burden of caregiving, occurring during a period of life where physical resilience may begin to decline, creates a high-pressure environment that exacerbates psychological distress. This is further compounded by the limited availability of formal health and social support services within many sub-Saharan African contexts, including Uganda, intensifying the personal cost associated with this essential service [55].

Regarding caregiver gender, our study found that female caregivers were at a significantly higher risk of experiencing depressive symptoms compared to their male counterparts. These findings align with previous research conducted in Ethiopia and other sub-Saharan African contexts, which highlight a disproportionate mental health burden on women [50, 52]. In the Ugandan context, this gender disparity may be attributed to the traditional division of labor and the 'double burden' of responsibility. Female caregivers in Uganda often manage intensive subsistence farming or informal trade alongside primary domestic duties and childcare, frequently with limited access to resources or support systems [56].

Furthermore, cultural norms in many Ugandan societies designate women as the primary emotional anchors of the family, which may lead to higher levels of internalizing stress and subsequent depressive symptoms when faced with family caregiving responsibilities, poverty and instability [57].

Conversely, some studies have suggested that male caregivers may display higher depressive symptoms, particularly when living without a spouse [51]. While our study did not specifically disaggregate results for single versus partnered males, the presence of a partner in the Ugandan household often serves as a critical buffer against psychological distress. Additionally, our findings differ from research in other Turkey, where female caregivers scored higher on depression scales but without reaching statistical significance [58]. This discrepancy likely stems from variations in study settings and the specific psychometric tools employed; while we utilized the DASS-21 and PSS-10, the Turkish study relied on the Zarit Caregiver Burden Scale (ZCBS), which measures perceived burden rather than clinical psychological distress.

Consistent with other studies we also found that caregiver literacy levels have a significant impact on the mental health with those who can read with no major difficulty less likely to register depressive symptoms [52, 58–62]. In Chung's study, it has been shown that depressive symptoms of caregivers were predicted by their own individual characteristics including level of education [63]. This could most likely be explained by the fact that that education/literacy levels empowers caregivers to have access to information and read about the probable depression and positive living which may strengthen their abilities to cope with stress and they probably had better financial resources through employment and work.

Regarding partnership status, our findings indicate that partnered caregivers were significantly less likely to report depressive symptoms and parental stress compared to their non-partnered counterparts. This aligns with global evidence, including studies from Ethiopia and China, which consistently associate single caregiving with elevated psychological distress [64–66]. In the Ugandan context, this disparity may be attributed to the protective role of shared parental responsibilities, which buffers against the "double burden" of providing both financial stability and domestic labour. While traditional Ugandan kinship systems historically provided communal support (the "it takes a village" model), rapid urbanization and economic shifts have increasingly isolated single caregivers, leaving them to navigate financial strain and childcare without a functional support network [67]. Furthermore, non-partnered caregivers particularly women often face heightened social instability. The absence of a partner frequently necessitates a trade-off between income-generating activities and the intensive supervision required for child development, a conflict that exacerbates feelings of burnout and isolation [54]. The psychological benefit of partnership in this study likely reflects both the instrumental support (shared chores and income) and the emotional cushioning provided by a co-resident partner, which are critical in a resource-limited environment where formal social protection systems are largely absent.

Finally, the results showed that having a disability was a major predictor of depressive symptoms and stress among children's caregivers in Uganda. The current study findings are consistent a number of studies carried out in African and other parts of the world [68, 69]. This could be explained by the fact that parents or caregivers with disabilities may experience increased depressive symptoms and stress due to the added stressors and challenges associated with managing both their disability and caregiving responsibilities. Disability can impose physical limitations, financial strain, and social isolation, making it harder to meet the demands of parenting or caregiving roles [70]. This can lead to feelings of inadequacy, guilt, and frustration, contributing to higher rates of probable depression and stress.

Strengths and limitations

A major strength of this study is the large sample size ($N = 2{,}314$) and the use of validated assessment tools, namely DASS-21 for probable depression and PSS for stress, which allowed for reliable measurement of mental health outcomes. Additionally, the study incorporated a wide range of sociodemographic, household, and psychosocial factors, enabling a comprehensive analysis of variables associated with caregiver probable depression and stress.

However, the study has limitations, including the lack of data on potential confounders such as family history of mental illness or prior mental health treatment. Furthermore, the study sample was predominantly female and drawn from caregivers enrolled in the PfR programme, which may limit the representativeness of the findings. As such, the results may not be generalizable to all caregivers in Uganda, particularly those not participating in similar interventions. Lastly, the results may be subject to social desirability bias. Because the data were collected at the baseline of the "Parenting for Respectability" program, participants may have under-reported experiences of psychological distress to present themselves in a manner consistent with the program's emphasis on "respectability.

Conclusion

This study identified a high prevalence of depressive symptoms (47.4%) and elevated stress among caregivers in Uganda, driven by a complex interplay of sociodemographic factors and past violence exposure. Clinically, these findings suggest a critical need to integrate routine mental health screening and trauma-informed referral pathways into existing community-based parenting programs, such as the Parenting for Respectability (PfR) programme.

From a policy perspective, interventions must transition from general support to targeted social protection for high-risk groups, including young, non-partnered caregivers and persons with disabilities. Policy frameworks should prioritize the decentralization of mental health services to the family level, promoting social support networks and caregiver capacity-building as essential components of national early childhood development and family-strengthening agendas.

Abbreviations

CHDC	Child health and development canter
CI	Confidence interval
DASS-21	Depression anxiety stress scale (21-item version)
HIV/AIDS	Human immunodeficiency virus / acquired immunodeficiency syndrome
ICC	Intra-cluster correlation
LMICs	Low- and middle-income countries
LRT	Likelihood ratio test
ODK	Open data kit
PfR	Parenting for respectability
PSS	Parenting stress scale
SD	Standard deviation
TX	Texas
WHO	World Health Organization

Acknowledgements

I thank the Department of CHDC, Makerere University, Research assistants, Supervisors, the PfR team and study participants.

Author contributions

Conceptualization, O.K.; Review, GJ, RN, SG, JML; Formal analysis, O.K.; Funding acquisition, SG; Methodology, O.K.; Software, O.K.; Visualization, O.K. Writing [original draft] O.K.; Review and editing O.K, B.O; E.E, G.J, JML, R.N, G.S. All authors have read and agreed to the published version of the manuscript.

Funding

Not applicable.

Data availability

Data supporting the conclusions of this article can be retrieved following the data sharing policy at CHDC through the corresponding author.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki and the Uganda Data Protection and Privacy Act (2019). Ethical approvals to carry out this research were obtained from the School of Medicine Research and Ethics Committee (SOMREC) of Makerere University (#Mak-SOMREC-2023-812) and the Uganda National Council of Science and Technology (UNCST) (#HS6902ES). All eligible participants provided voluntary informed consent, which was administered by trained interviewers on the research team. Prior to analysis, all data were de-identified and numerical identifiers used during data collection were removed to ensure participant confidentiality.

Consent for publication

Not applicable since there are no images and any identifiable data.

Competing interests

The authors declare no competing interests.

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Received: 12 December 2025 / Accepted: 21 May 2026
Published online: 29 May 2026

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