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Caregiving Burden, Sleep Quality, Perceived Stress, and Resting Cardiovascular Indicators Among Family Caregivers of People with Psychotic Disorders in Faisalabad, Pakistan: An Analytical Cross-Sectional Study

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Abstract

Background: Family members caring for people with schizophrenia-spectrum disorders often experience considerable psychological and practical strain. Caregiving burden, stress, and sleep problems are frequently reported, but their relationship with resting cardiovascular functioning remains uncertain. This study examined caregiving burden, perceived stress, sleep quality, and resting cardiovascular indicators among family caregivers in Faisalabad, Pakistan. Methods: A cross-sectional analytical study was conducted with 130 unpaid family caregivers of people diagnosed with schizophrenia or schizoaffective disorder. Caregiving burden was assessed using the Zarit Burden Interview (ZBI-22), perceived stress with the Perceived Stress Scale (PSS-10), and sleep quality with the Pittsburgh Sleep Quality Index (PSQI). Resting systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) were measured under standardised conditions. Pearson correlations and multivariable linear regression were used to examine associations between the study variables.

Results: Caregivers reporting greater burden also reported higher perceived stress ($r = .407$, $p < .001$) and poorer sleep quality ($r = .389$, $p < .001$). In the unadjusted analyses, caregiving burden was also associated with higher SBP, DBP, and resting HR. These relationships became weaker after adjustment for relevant covariates. Following Benjamini–Hochberg false-discovery-rate correction, none of the nine main psychosocial–cardiovascular associations remained statistically significant. The sensitivity analyses showed a broadly similar pattern. Conclusion: The clearest findings concerned the psychological aspects of caregiving: greater burden was related to higher stress and poorer sleep. In contrast, the evidence linking psychosocial factors independently with resting cardiovascular indicators was weak after adjustment and correction for multiple testing. Routine caregiver assessment in psychiatric services may therefore benefit from including stress and sleep alongside caregiving burden.

Introduction

Schizophrenia-spectrum disorders can place long-term demands on family members who help with treatment, daily care, supervision, and emotional support. These responsibilities may affect caregivers' wellbeing, finances, social life, and family roles (Kamil & Velligan, 2019; Peng et al., 2022; Ninef et al., 2026). In Pakistan, families are often closely involved in recognising symptoms, seeking treatment, and managing care at home (Khan et al., 2023). Previous Pakistani studies have reported substantial caregiver burden, particularly when caregiving hours are longer, illness duration is greater, and patient functioning is poorer (Das et al., 2019; Siddiqui & Khalid, 2019; Saleem et al., 2024).

Caregiver burden therefore includes both the practical demands of care and the emotional strain associated with it.

A systematic review and meta-analysis by Peng et al. (2022) linked greater burden with more severe psychiatric symptoms, poorer patient functioning, and longer illness duration. Perceived stress is related but conceptually distinct: it reflects the extent to which circumstances are

experienced as unpredictable, uncontrollable, or overwhelming (Cohen et al., 1983). Among caregivers of people with schizophrenia and early psychosis, stress has been reported alongside anxiety, reduced social participation, and insomnia (Wan & Wong, 2019).

Sleep disturbance may also form part of the caregiving experience. Worry, psychological arousal, disrupted routines, and vigilance to a relative's symptoms can interfere with sleep. Smith et al. (2019) found that 60% of caregivers of people with recent first-episode psychosis scored above the conventional PSQI threshold for significant sleep difficulties, and poorer sleep was related to greater distress and more negative caregiving appraisals.

The possible cardiovascular consequences of stress and poor sleep are less consistent. A meta-analysis by Lo et al. (2018) found poor subjective sleep quality associated with higher odds of hypertension, although pooled differences in continuous SBP and DBP were not significant. Yang et al. (2021), however, reported poorer PSQI scores in association with higher blood pressure and prevalent hypertension. Broader caregiver research also suggests cardiovascular vulnerability in some groups, but findings differ across populations and outcomes (Ahn et al., 2022). Similarly, acute psychological stress can alter cardiovascular reactivity (Brindle et al., 2014), yet a recent meta-analysis found no clear overall association between PSS-measured perceived stress and resting blood pressure (Garcia-Ravelo et al., 2026).

Evidence from Pakistan has established caregiver burden, but studies examining burden, perceived stress, subjective sleep quality, and resting cardiovascular indicators within the same caregiver sample remain limited. The present analytical cross-sectional study therefore examined these variables among family caregivers of people with schizophrenia-spectrum disorders attending psychiatric services in Faisalabad, Pakistan. The study tested whether greater caregiving burden was associated with higher perceived stress and poorer sleep quality, and whether caregiving burden, perceived stress, and sleep quality were associated with resting SBP, DBP, and HR. All findings were interpreted as cross-sectional associations rather than causal or temporal effects.

Hypotheses

H1. Greater caregiving burden will be associated with higher perceived stress.
H2. Greater caregiving burden will be associated with poorer sleep quality.
H3. Greater caregiving burden, perceived stress, and poorer sleep quality will each be associated with less favourable resting cardiovascular indicators.

Methods

Study Design and Setting

An analytical cross-sectional study was conducted between March and August 2026 among family caregivers of people with schizophrenia-spectrum disorders receiving care from government and private inpatient and outpatient psychiatric services in Faisalabad, Pakistan. Psychological, caregiving, sleep, and resting cardiovascular measures were collected during one study visit. Reporting followed STROBE recommendations for cross-sectional studies.

Participants and Recruitment

Participants were unpaid family caregivers aged 18–65 years who had provided regular care for at least six months to a relative with a clinician-established diagnosis of schizophrenia or schizoaffective disorder. Parents, spouses, siblings, and adult children substantially involved in treatment or daily support were eligible. Diagnoses were confirmed by the treating psychiatrist and clinical records. Paid caregivers and individuals unable to provide informed consent or complete assessment because of acute medical instability, intoxication, major communication difficulties, or cognitive impairment were excluded. Hypertension, diabetes, sleep problems and prescribed medication were registered but were not exclusion criteria. Data were collected by consecutive sampling and written informed consent was obtained prior to data collection.

Participant Flow

Of 180 caregivers approached 15 were ineligible and 35 refused; 130 were enrolled and included in the analysis.

Sample Size

For multivariable linear regression with eight predictors, a medium effect size ($f^2 = .15$), $\alpha = .05$, and 80% power required approximately 109 participants. Allowing for incomplete data, a target of 125–130 was considered adequate.

Measures

Sociodemographic and Caregiving Information. Information collected included age, sex, marital status, education, employment, relationship to the patient, co-residence, caregiving duration, and daily caregiving hours. Health-related variables included BMI, smoking, recent caffeine/nicotine use and exercise, hypertension, antihypertensive medication, diabetes, HR-affecting medication, and assessment time. Patient information was limited to non-identifying diagnosis and illness duration.

Caregiving Burden. Burden was measured with the 22-item Zarit Burden Interview (ZBI-22; score range 0–88), with higher scores indicating greater burden. The scale has been used among caregivers of people with serious mental illness in Pakistan (Siddiqui & Khalid, 2019). Internal consistency in the present sample was high (Cronbach's α = .890).

Sleep Quality. Sleep was assessed with the Urdu Pittsburgh Sleep Quality Index (PSQI-U), which yields a global score from 0 to 21 for the previous month; higher scores indicate poorer sleep. The Urdu version was validated in Pakistan by Hashmi et al. (2014). The global score was analysed continuously.

Perceived Stress. Perceived stress was measured with the Urdu 10-item Perceived Stress Scale (PSS-10), validated for the Pakistani population by Mushtaq and Ahmed (2020). Items are scored from 0 to 4, with items 4, 5, 7, and 8 reverse scored; total scores range from 0 to 40, with higher scores indicating greater stress. Internal consistency was good (Cronbach's α = .852).

Cardiovascular Assessment. Resting SBP, DBP, and HR were measured using a validated automated upper-arm oscillometric monitor. Participants avoided caffeine, nicotine, and exercise for 30 minutes and rested seated for five minutes before assessment. Three measurements were obtained approximately one minute apart using an appropriately sized cuff with the arm supported at heart level. The mean of the second and third readings was used for analysis. Questionnaires were completed after cardiovascular assessment.

Statistical Analysis: Analyses were performed in R. Data were checked for missing or implausible values, scoring errors, distributional characteristics, and influential observations. Approximately symmetric continuous variables were summarised using mean and standard deviation, skewed variables with median and interquartile range, and categorical variables with frequencies and percentages. Pearson correlations examined bivariate associations among ZBI-22, PSS-10, PSQI, SBP, DBP, and resting HR. Tests were two-sided, with $p < .05$ initially considered statistically significant, and effect estimates were interpreted with 95% confidence intervals.

Three multivariable linear regression models were fitted for resting SBP, DBP, and HR. Each included caregiving burden, perceived stress, and sleep quality as principal predictors. SBP and DBP models were adjusted for age, sex, BMI, current smoking, and pre-existing hypertension; the HR model was adjusted for age, sex, BMI, current smoking, and HR-affecting medication. Regression assumptions, including linearity, residual behaviour, heteroscedasticity, multicollinearity, and influential observations, were examined. Unstandardised and standardised coefficients, 95% confidence intervals, p-values, R^2, and adjusted R^2 were reported using HC3 heteroscedasticity-robust standard errors.

Sensitivity analyses repeated cardiovascular models after excluding participants with blood-pressure measurement-protocol deviations and repeated SBP/DBP models after excluding participants with diagnosed hypertension or antihypertensive treatment. Because three psychosocial predictors were tested across three cardiovascular outcomes, Benjamini–Hochberg false-discovery-rate correction was applied to the nine principal regression coefficients; both p-values and adjusted q-values were reported.

This removes a large amount of repetitive/high-similarity statistical wording while preserving your actual analysis.

Results

Participant Characteristics: The 130 caregivers had a mean age of 42.1 years (SD = 12.1); 85 (65.4%) were women, 80.8% were married, and 86.2% lived with the person receiving care. Median caregiving duration was 38.5 months (IQR = 25.0–69.8), with a median of 6.9 caregiving hours per day (IQR = 5.4–9.2). Most participants cared for a relative with schizophrenia (81.5%); 18.5% cared for someone with schizoaffective disorder. Full characteristics are shown in Table 1 and descriptive statistics for the principal variables in Table 2.

Table 1. Characteristics of Family Caregivers

Characteristic	Value
Age, years	42.1 ± 12.1
Sex	
Female	85 (65.4)
Male	45 (34.6)
Marital status	
Married	105 (80.8)
Single	18 (13.8)
Widowed/separated	7 (5.4)
Education, years	10.5 ± 3.4
Employment status	

Characteristic	Value
Employed	52 (40.0)
Self-employed	15 (11.5)
Homemaker	38 (29.2)
Unemployed	20 (15.4)
Retired	5 (3.8)
Relationship to patient	
Mother	40 (30.8)
Father	17 (13.1)
Spouse	23 (17.7)
Sibling	35 (26.9)
Adult child	15 (11.5)
Co-resident with patient	112 (86.2)
Caregiving duration, months	38.5 (25.0–69.8)
Caregiving hours/day	6.9 (5.4–9.2)
Patient diagnosis	
Schizophrenia	106 (81.5)
Schizoaffective disorder	24 (18.5)
BMI, kg/m²	24.9 ± 4.0
Current smoker	7 (5.4)
Diagnosed hypertension	23 (17.7)
Antihypertensive medication use	19 (14.6)
Diabetes	8 (6.2)
HR-affecting medication use	7 (5.4)
BP measurement protocol deviation	21 (16.2)
Sleep medication use in past month	33 (25.4)

Note. Values are n (%) unless otherwise specified. Age, education, and BMI are presented as mean ± SD. Caregiving duration and caregiving hours/day are presented as median (IQR).

Table 2. Descriptive Statistics of Principal Variables

Variable	N	Mean	SD	Median	IQR	Range	α
Caregiving burden (ZBI-22)	130	40.8	15.1	40.0	29.0–51.0	7–76	.890
Perceived stress (PSS-10)	130	16.7	7.9	16.0	11.0–22.0	1–35	.852
Sleep quality (PSQI global)	130	9.1	3.9	9.0	6.0–12.0	0–17	.628†
Resting SBP, mmHg	130	121.3	11.5	121.0	113.5–128.9	92.0–155.5	—
Resting DBP, mmHg	130	76.8	6.6	77.0	71.5–81.4	61.0–94.5	—
Resting HR, bpm	130	74.0	6.4	74.3	70.5–78.0	53.0–91.0	—

Note. ZBI-22 = 22-item Zarit Burden Interview; PSS-10 = 10-item Perceived Stress Scale; PSQI = Pittsburgh Sleep Quality Index; SBP = systolic blood pressure; DBP = diastolic blood pressure; HR = heart rate; α = Cronbach's alpha. Higher ZBI-22 and PSS-10 scores indicate greater caregiving burden and perceived stress, respectively; higher PSQI scores indicate poorer sleep quality.†The PSQI comprises conceptually distinct sleep components; therefore, its internal-consistency coefficient should be interpreted cautiously.

Exploratory Bivariate Associations:

Caregiving burden correlated positively with perceived stress ($r = .407$, $p < .001$) and poorer sleep quality ($r = .389$, $p < .001$). Higher burden was also associated with resting SBP ($r = .228$, $p = .009$), DBP ($r = .355$, $p < .001$), and HR ($r = .182$, $p = .038$). Poorer sleep quality was associated with DBP ($r = .291$, $p < .001$), and perceived stress with resting HR ($r = .192$, $p = .029$). Perceived stress was not significantly related to SBP ($r = .124$, $p = .161$), and sleep quality was not related to SBP ($r < .001$, $p = .998$). Table 3 presents the complete correlation matrix.

Table 3. Exploratory Bivariate Correlations Among Principal Study Variables

Variable	1	2	3	4	5	6
1. Caregiving burden (ZBI-22)	—					
2. Perceived stress (PSS-10)	.407***	—				
3. Sleep quality (PSQI)	.389***	.408***	—			
4. Resting SBP	.228**	.124	.000	—		
5. Resting DBP	.355***	.149	.291***	.337***	—	
6. Resting HR	.182*	.192*	.168	.130	.073	—

Note. Values are Pearson correlation coefficients; N = 130. Higher PSQI scores indicate poorer sleep quality. Bivariate correlations were treated as exploratory and are presented with unadjusted two-sided p-values.
* p < .05; ** p < .01; *** p < .001.

Adjusted Associations with Cardiovascular Outcomes: After covariate adjustment, caregiving burden, perceived stress, and sleep quality were not independently associated with resting SBP. For DBP, caregiving burden was associated before multiple-testing correction (B = 0.088, β = .199, 95% CI [0.004, 0.172], p = .041), while the sleep-quality association did not reach the conventional threshold (B = 0.361, β = .210, 95% CI [−0.010, 0.732], p = .056). None of the three psychosocial predictors was independently associated with resting HR. After Benjamini–Hochberg correction across the nine principal psychosocial–cardiovascular coefficients, no association remained statistically significant. Model R^2 values were .496 for SBP, .355 for DBP, and .078 for resting HR (adjusted R^2 = .463, .312, and .017, respectively). Full coefficients are presented in Table 4.

Table 4. Table 4. Adjusted Associations of Psychosocial Variables With Resting Cardiovascular Outcomes

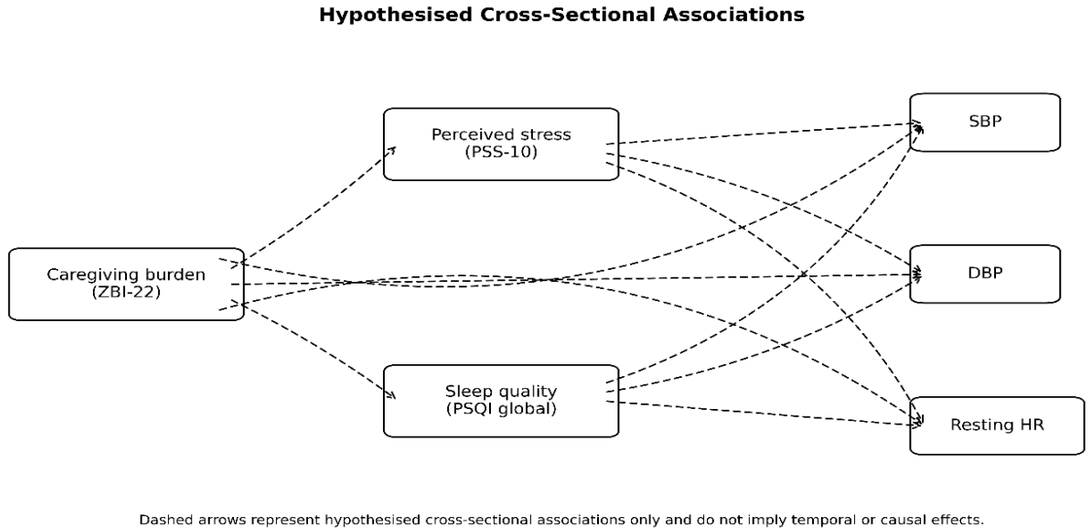
Outcome	Predictor	B	β	95% CI for B	p	BH q
SBP	Caregiving burden (ZBI-22)	0.061	.080	−0.066 to 0.188	.343	.462
	Perceived stress (PSS-10)	0.099	.068	−0.122 to 0.321	.376	.462
	Sleep quality (PSQI)	−0.362	−.121	−0.783 to 0.059	.091	.274
DBP	Caregiving burden (ZBI-22)	0.088	.199	0.004 to 0.172	.041	.253
	Perceived stress (PSS-10)	−0.054	−.065	−0.206 to 0.098	.485	.485
	Sleep quality (PSQI)	0.361	.210	−0.010 to 0.732	.056	.253
Resting HR	Caregiving burden (ZBI-22)	0.037	.087	−0.051 to 0.125	.411	.462
	Perceived stress (PSS-10)	0.100	.124	−0.073 to 0.272	.254	.462
	Sleep quality (PSQI)	0.158	.096	−0.172 to 0.489	.345	.462

Note. B = unstandardised regression coefficient; β = standardised regression coefficient; CI = confidence interval. HC3 robust standard errors were used for coefficient inference. SBP and DBP models were adjusted for age, sex, BMI, current smoking, and diagnosed hypertension. The resting-HR model was adjusted for age, sex, BMI, current smoking, and HR-affecting medication. BH q = Benjamini–Hochberg false-discovery-rate-adjusted p-value across the nine principal psychosocial–cardiovascular coefficients

Sensitivity Analyses

Among the 109 caregivers without a blood-pressure measurement-protocol deviation, burden remained associated with DBP before correction (B = 0.117, β = .264, 95% CI [0.024, 0.211], p = .014) but not after false-discovery-rate adjustment (q = .128). After excluding participants with diagnosed hypertension or antihypertensive medication use (n = 107), poorer sleep quality was associated with higher DBP before correction (B = 0.440, β = .251, 95% CI [0.023, 0.858], p = .039), but again not after correction (q = .135). These analyses did not alter the principal cardiovascular conclusion.

stress, sleep quality, and resting cardiovascular indicators.



igure 1. Hypothesised cross-sectional associations among the principal study variables. Dashed paths indicate associations tested among caregiving burden, perceived stress, sleep quality, SBP, DBP, and resting HR and do not imply temporal or causal effects.

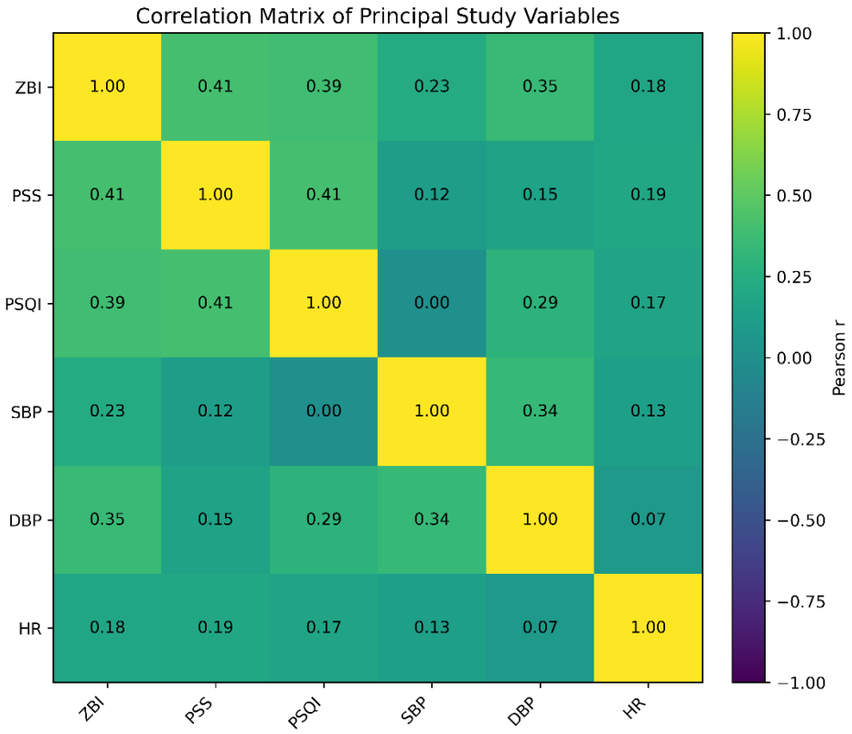


Figure 2. Pearson correlation matrix of the principal study variables (N = 130). Higher PSQI scores indicate poorer subjective sleep quality.

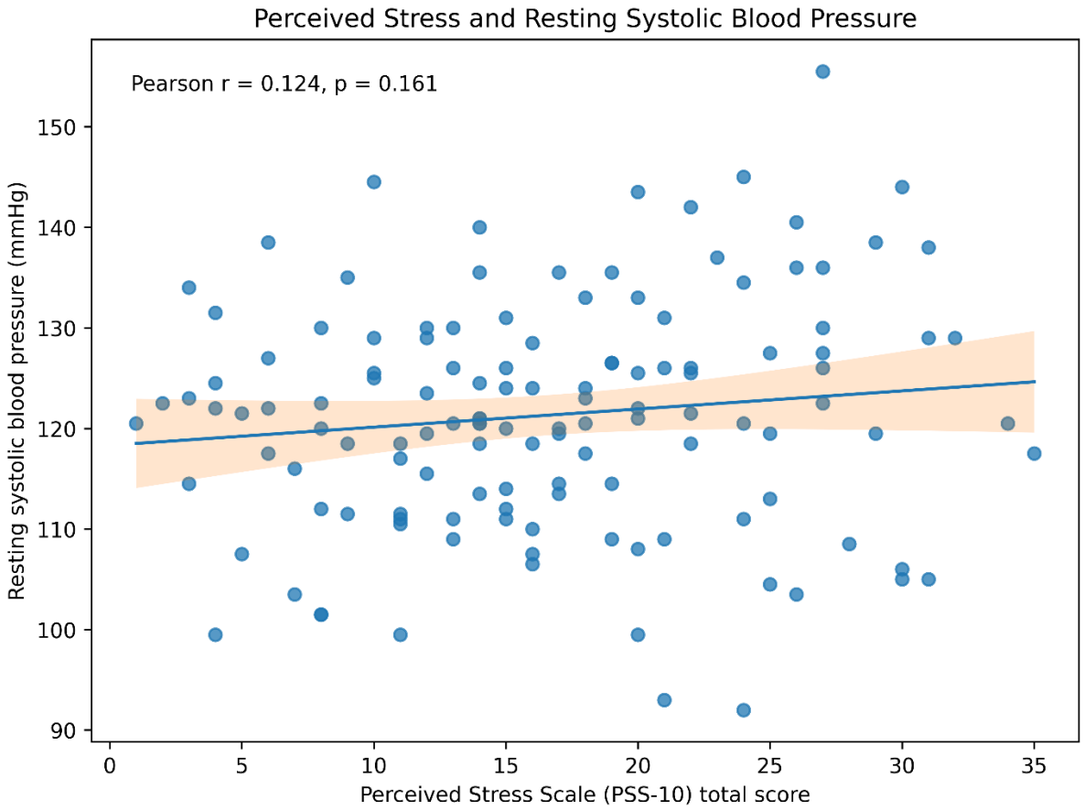


Figure 3. Unadjusted association between perceived stress and resting SBP (N = 130). The line represents the ordinary least-squares estimate and the shaded area its 95% CI (r = .124, p = .161).

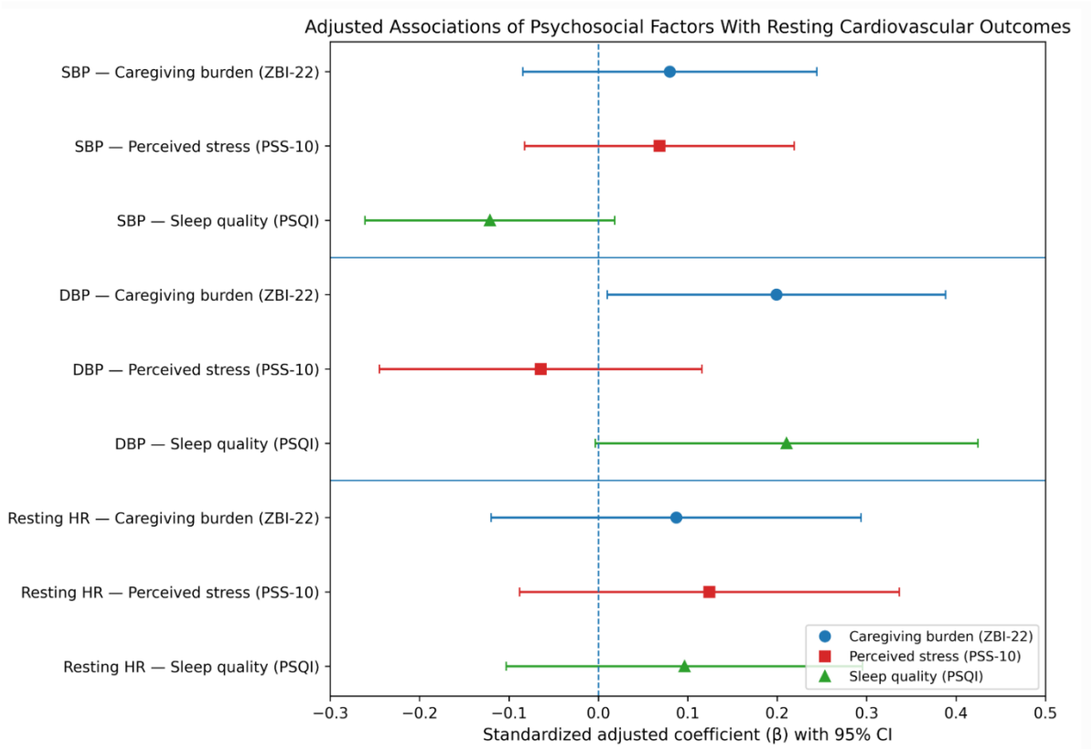


Figure 4. Adjusted associations of psychosocial variables with resting cardiovascular outcomes. Points show standardised coefficients (β) with 95% CIs. SBP and DBP models were adjusted for age, sex, BMI, smoking, and hypertension; the HR model was adjusted for age, sex, BMI, smoking, and HR-affecting medication.

Discussion

The research investigated caregiving burden, perceived stress, sleep quality, and resting cardiovascular parameters among family caregivers of people with schizophrenia-spectrum disorders. The most consistent findings were higher caregiving burden related to greater perceived stress and poorer subjective sleep quality. Burden was also bivariate associated with SBP, DBP,

and resting HR, but these relationships were attenuated after adjustment for demographic and health-related factors and none remained statistically significant after correction for multiple testing. The data thus offer clearer evidence for psychological and sleep-related correlates of caregiving than for independent relationships with resting cardiovascular measures.

The relationship between burden and stress is consistent with prior work on caregivers of people with schizophrenia . A significant amount of stress and burden was observed among caregivers of people with schizophrenia and early psychosis by Wan and Wong (2019). The independent association of caregiver burden with higher levels of perceived stress was discovered by Cheng and Feng (2025). Although related, the constructs are not identical: burden represents the practical and emotional demands of caregiving, whereas perceived stress reflects the extent to which those demands are experienced as overwhelming or difficult.

Greater caregiving burden was also linked with poorer sleep. Smith et al. (2019) found notable sleep problems among caregivers of people experiencing first-episode psychosis, with poorer sleep associated with higher distress. Fekih-Romdhane et al. (2020) similarly reported worse sleep among caregivers of people with schizophrenia-spectrum and bipolar disorders compared with non-caregivers. Ongoing worry, disrupted routines, and the demands of caring may contribute to these difficulties, although the cross-sectional design means the direction of the relationship cannot be determined.

The cardiovascular findings should be interpreted carefully. Caregiver burden was related to SBP, DBP, and resting HR in the initial analyses, but these associations became much weaker after adjustment for relevant covariates. This is broadly in line with Ahn et al. (2022), who reported inconsistent cardiovascular findings across caregiver populations. In this study, DBP showed the clearest association with burden, although it was no longer significant after false-discovery-rate correction. This suggests that factors such as age, BMI, hypertension, smoking, and medication use may explain part of the cardiovascular variation.

Sleep quality showed a similar pattern. Poorer sleep was associated with higher DBP, but the evidence was not strong enough to support a firm conclusion. Lo et al. (2018) linked poor subjective sleep with a higher risk of hypertension, whereas Yang et al. (2021) reported associations between poorer PSQI scores and higher blood pressure. In the present sample, the sleep–DBP association remained visible in sensitivity analysis but did not survive correction for multiple testing. Perceived stress also showed only limited cardiovascular relationships. It was associated with resting HR in bivariate analysis, but not with SBP, DBP, or HR after adjustment. This distinction between short-term cardiovascular responses to stress and resting cardiovascular status has also been reported previously (Brindle et al., 2014; Garcia-Ravelo et al., 2026).

From a clinical perspective, the stronger findings concerned caregiver stress and sleep rather than cardiovascular outcomes. Previous research in Pakistan has already shown that family caregivers of people with schizophrenia experience considerable burden (Siddiqui & Khalid, 2019; Saleem et al., 2024). The present findings suggest that routine caregiver assessment may also need to include stress and sleep difficulties. Caregivers with higher levels of strain could then be directed toward psychoeducation, psychological support, sleep-related advice, or further assessment. The cardiovascular findings, however, should not be taken to mean that caregiving itself causes hypertension or cardiovascular disease.

The study also has several limitations. Because the design was cross-sectional, it cannot show whether caregiving burden leads to later changes in stress, sleep, or cardiovascular functioning. Burden, stress, and sleep were assessed through self-report, while cardiovascular measures were taken during only one session. The clinic-based sample may also differ from caregivers in the wider community, and some health or lifestyle factors may not have been fully captured. In addition, the absence of a non-caregiver comparison group means that differences between caregivers and the general population could not be examined. Future longitudinal studies using repeated cardiovascular measurements and objective sleep measures would provide stronger evidence.

Overall, caregiving burden was most clearly related to higher perceived stress and poorer sleep. The cardiovascular associations were weaker after adjustment and disappeared after correction for multiple testing. The findings therefore support greater attention to caregivers' psychological wellbeing and sleep, while the evidence for an independent relationship with resting cardiovascular functioning remains limited.

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