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Caregiver Burden as a Predictor of Psychological Distress and Cognitive Fatigue Among Caregivers of Patients with Non-Communicable Diseases

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Non-Communicable Diseases (NCDs) have long-term health consequences and frequently need ongoing care and treatment which increases the demand for informal caregivers for those patients, offering both emotional and practical assistance, and due to this increasing burden, caregivers often experience a higher level of stress, impacting their psychological health and cognitive functions. This study aims to assess how the burden of caregiving affects psychological health and cognitive functions among caregivers of NCD patients. The study is based on Stress Process Model (Pearlin et al.,1990) and Cognitive Load Theory (Sweller, 1988). Data will be utilized from a purposive sample of 200 caregivers (100 males and 100 females), caring for at least six months, through a cross-sectional survey design. For the assessment, the standardized tools used are Zarit Burden Interview – 12, Kessler Psychological Distress Scale – K10, and Mental Fatigue Scale. For the analysis, IBM SPSS-27 used. The study indicated that among caregivers of patients with NCDs, caregiver burden is a robust predictor of both psychological distress and cognitive fatigue. Also, females experienced more psychological distress in response to caregiver burden as compared to males.

Key words. Non-Communicable Diseases (NCDs); Caregiver Burden; Psychological Distress; Cognitive Fatigue; Informal Caregivers; Gender Differences.

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Non-communicable Diseases (NCDs), also known as chronic diseases, originate from the interplay of behavioral, physiological, environmental, and genetic determinants and are generally of long duration (WHO, 2023). The four conditions that are responsible for the majority of deaths have been the mainstay of action in respect to preventing and controlling NCDs. The "Big Four" diabetes, cancer, chronic respiratory disease, and cardiovascular diseases (CVDs) account for 33.3 million deaths globally and present with the highest mortality rates (Paho, 2023). Approximately 75 percent of all NCD deaths (32 million) occur in low- and middle-income countries, which suffer disproportionately from their effects. NCDs affect individuals, looking at a number of factors including age, place of living or residence, and nationality.

Patients with chronic illnesses, because of various dilemmas that arise, require caregivers, or people who help or support them in their daily activities. The family acts as the caretaker to family members who are unwell, relative to society's smallest social unit (Alifudin & Ediati, 2019). When a member of the family was afflicted with a chronic illness, the entire family also became concerned because of the economic, psychological, and lifestyle impact it had on family life (Kilic & Kaptanogullari, 2017). Caregivers assist patients entrusted to their care in many ways, which include emotional, financial, medical, and physical needs. However, this responsibility often has a high cost because caregivers often suffer from significant stress and negative health outcomes (Loo et al., 2022). In

Pakistan, caregiving for people with non-communicable diseases is considered the duty of the family members rather than any formal caregiver or community-based services.

This is a cultural norm here, which exposes caregiver to ongoing social, financial and psychological burden that are frequently ignored by health systems. According to research from Pakistan, the burden of caregiving is not only the responsibilities of providing care but also financial insecurity, disruption of family relationships, few job prospects, emotional exhaustion and a decline in caregiver's own mental and physical health. In chronic diseases, these multifaceted stressors frequently coexist and intensify, making caregivers more vulnerable to psychological distress and affects their wellbeing (Saeed et al, 2024).

According to Moreels et al. (2024), providing care is strongly linked to stress, negative effects on quality of life, and mental health issues, particularly for those who provide high-intensity care. According to recent studies, informal caregivers are more likely than non-caregivers to experience psychological distress, with a risk of one in three to one in two (Wang et al., 2020). In a cross-sectional study, family caregivers reported feeling burdened, which could translate into psychological distress, as well as experiencing increased stress and emotional instability (Mirhosseini et al., 2022). According to Pakistani research, caregiver burden is a strong predictor of depression anxiety, and stress. Long-term caregiving responsibilities adversely impact the mental health of caregivers regardless of the patient's disease and the caregivers reported a high load were comparatively more likely to expose psychological distress. The authors also emphasized the need to explore the cognitive and psychological mechanisms that could explore the correlation between mental health outcomes care caregiving burden. The current study aims to fill this significant research gap (Mazhar et al., 2024).

According to a recent study conducted at Aga Khan University, the caregiver burden in Pakistan is not only related to emotional burden but also financial strains, work issues, disruptive relationships, and adverse impact on mental and physical wellbeing. The need for holistic psychosocial interventions are suggested by the caregiver's reports of exhaustion and a lack of institutional support (Saeed et al., 2024). Caregiver burden is determined by the duration of caregiving, functional dependence of patients and socioeconomic status of caregivers, according to data from Pakistan. It was found by Siddique and Khalid that the burden was greater for caregivers of patients who are functionally dependent, particularly when combined with avoidant coping mechanisms, lower education, living in remote area. Furthermore, caregiver burden is a major risk factor for poorer psychological well-being and more depressive symptoms than non-caregivers (Ehsan et al.).

Caregiving research shows that the psychological and emotional demands of prolonged caregiving are associated with cognitive fatigue, leading to slowed information processing, decreased problem-solving ability, and forgetfulness (Kostić et al., 2021). This reciprocal relationship between those variables suggests that cognitive fatigue of the caregiver must be addressed to offer them personalized caregiver support programs. Psychological distress and cognitive processing may combine to cause Cognitive Fatigue. According to study on caregivers, the psychological and emotional pressure of long-term caregiving in connected to cognitive fatigue, which causes forgetfulness, slower information processing, and a decline in problem-solving skills (Kostic et al., 2021).

More people around the world are living with non-communicable diseases (NCDs) like cancer, diabetes, cardiovascular diseases, stroke, and chronic respiratory diseases, creating new demands for long-term care. Non-communicable diseases are often cared for at home by the informal caregiver, who is frequently a family member, in many low- and middle-income countries (LMICs), including Pakistan, which lack formal caregiving choices and professional assistance. Individuals without professional training offer free health care

which is typically combined with other obligations such as paid work, child care, and home management.

It follows that a significant part of caring involves the cognitive, psychological, and emotional elements of care above and beyond providing physical care. These elements affect quality of care in negative ways and diminish the well-being of caregivers (Yu et al., 2020). Research has shown associations between caregiver workloads and negative consequences manifests as increased stress, increased misery, increased anxiety, and negatively impacting social functioning (Khan et al., 2022; Tang et al., 2019). Additionally, caring for individuals with NCDs generally involves high-load, heavy, and chronic forms of caring that include medication administration, monitoring symptoms, and emotional care and support. These forms of caring can drain the caregiver's cognitive resources, leading to cognitive fatigue that impairs memory, attention, and judgment (Xie et al., 2021). Furthermore, psychological distress (often characterized by worry, sadness, and psychological pain) is related to lower well-being and poorer physical health for caregivers (Stansfeld et al., 2015). Despite these concerns, there is very little research on caring in general, and in the context of South Asian countries, Pakistan specifically, the observation of cultural norms that suggest caregiving is a duty rather than a burden.

There may be gender differences that make the caregiving experience more challenging. Research based in Western cultures has shown that females are more likely than men to report higher levels of stress, cognitive fatigue, and caregiving burden (Carers UK, 2019) explained in part by social constructs of gender roles and unequal caregiving duties. However, the unique sociocultural and sociobiological characteristics of family life in Pakistan would either encourage or discourage caring interventions, thus those findings cannot be directly transported to Pakistan. Additionally, the lack of empirical examinations into caregiving burden, psychological distress, and cognitive fatigue in the Pakistani context leaves a significant gap in the literature.

This research is relevant and timely because it fills some important gaps. First, it expands the scope of research on caregiving in Pakistan by focusing on caregivers of patients with non-communicable diseases (NCDs) rather than simply relying on disease-specific studies (for example, dementia or cancer). Furthermore, it covers issues related to cognitive and psychological issues that are not addressed in South Asian research on caregiving. Moreover, the integrative theoretical lens based on the Stress Process Model and Cognitive Load Theory explains how caregiving burden is translated into affective and cognitive outcomes. By aiming to improve the life experiences for patients and caregivers in Pakistan, the findings can guide the development of cultural relevant policies, mental health services, and treatments. In summary, this study contributes to science and engenders change in society by acknowledging the neglected psychological aspects of caregiving in Pakistan, and hence is important in both the academic and social contexts. It aims to address the pressing need for evidence-based approaches to support NCD patients with stress, psychological distress and the cognitive burden of caring, and can improve their experiences as caregivers and health outcomes.

This study combines the Stress Process Model (SPM) and Cognitive Load Theory (CLT), which are frameworks to evaluate the direct connections between caregiver burden, psychological distress, and cognitive fatigue. The Stress Process Model (SPM) is one of the most widely used and referenced frameworks for studying the impacts of caring.

First developed by Pearlin et al. (1990), SPM explains how caregiving can have a negative effect on a caregiver’s mental health by creating multiple responsibilities, which can include financial, emotional, physical, and social obligations of caregiving. In this study, caregiver burden is the most commonly identified stressor contributing to psychological

distress and cognitive fatigue. More recently, the SPM has been supported through empirical research with caring populations. Caregivers of patients with chronic illness and non-communicable diseases have reported heightened levels of depressive symptoms, emotional strain, and cognitive impairment (Adelman et al., 2014; Yu et al., 2020). Hence, the SPM offers a conceptual basis from which caregiver burden could be related to poorer mental health outcome in this study.

Cognitive Load Theory (CLT) proposes that a person's performance will decline when the cognitive load on their working memory exceeds its available capacity (Sweller, 1988). Caregiving is characterized by multiple complex and cognitively taxing roles such as medication management, symptom surveillance, treatment decision-making, and emotional support for individuals with chronic conditions. Caregivers will be experiencing cognitive load in these different roles, whether or not they are cognitively loaded; if the caregiver's cognitive capacity is exceeded then cognitive fatigue will occur. Two recent studies using the CLT paradigm in caregiving contexts highlight the negative impacts of increased cognitive load on caregivers' ability to make reasonable decisions, resolve problems, and engage in self-care (Xie et al., 2021; Yu et al., 2020). This results in decreased caregiving quality, increasing the likelihood of cognitive fatigue. This study uses sequence scores to relate cognitive fatigue to caregiver load using CLT.

Objectives

1. To investigate the impact of caregiver burden on psychological distress among caregivers of patients with NCDs.
2. To look at the impact of caregiver burden on cognitive fatigue among caregivers of patients with NCDs.

Hypotheses

1. Caregiver burden will be positively related to the psychological distress among caregivers of patients with NCDs.
2. Caregiver burden will be positively related to the cognitive fatigue among caregivers of patients with NCDs.
3. Female caregivers will experience higher psychological distress compared to male caregivers.
4. Female caregivers will experience higher cognitive fatigue compared to male caregivers.

Method

Research Design

The study examined the "Caregiver Burden as a Predictor of Psychological Distress and Cognitive Fatigue among Caregivers of Patients with Non-Communicable Diseases" on a sample while employing a cross-sectional and purposive sampling in their methodologies. A quantitative study was selected because it allows for the objective evaluation of caregiver burden, psychological distress, and cognitive fatigue using the standardized psychometric instruments. Since data was gathered all at a single point to assess caregiver’s current experiences, a cross-sectional design was considered, making it suitable for analyzing psychosocial factors in healthcare research. A correlational design was used because the study aims to examine the correlation between caregiver burden and psychological outcomes considering psychological distress and cognitive fatigue, as well as the predictive role of caregiver burden. The study specifically targeted family caregivers of patients with NCD’s who met established inclusion criteria, purposive sampling was used to enroll participants because it enabled the selection of participants with direct caregiving experience pertinent to the study’s objective.

Sample

Purposive sampling will be used to select caregivers (N=200), males (N=100), and females (N=100) of patients diagnosed with NCDs. Caregivers must be the primary informal caregivers, giving day-to-day assistance. Structured self-report questionnaires will be used to collect the data.

Instruments

Initially, sociodemographic data was gathered using a standard demographic form in order to filter out those who didn't fit the inclusion requirements. The research includes the following measuring tools:

Zarit Burden Interview – 12-item Version (ZBI-12). This shorter version of the Zarit Burden Interview was created by Bédard et al. (2001) and is used to measure the subjective burden that caregivers are experiencing. This scale offers an accurate assessment of physical, social, and emotional stress. A 5-point Likert scale (0 = Never to 4 = Nearly Always) is used to score 12 items that measure the emotional, social, and physical stress of the caregiver. A higher score means greater caregiver burden. The ZBI-12 has greater internal consistency (α = .89) and test-retest reliability (α = .84) and has shown validity in the caregiver population (Bedard et al., 2001).

Kessler Psychological Distress Scale (K10). It is a 10-item scale, developed by Kessler et al. (2002), that measures psychological discomfort like anxiety and depression. It consists of 5-point Likert scale, in which 1 means “never” and 5 means “always.” The symptoms must be occurred during the last 30 days, necessary to ask respondents. The K10 is a strongly reliable and valid tool for assessment as well; it’s value of reliability ranges from (α = .93- α = .95).

Mental Fatigue Scale (MFS). Johansson and Ronnback (2014) developed the Mental Fatigue Scale (MFS), which consists of 15 items, used to measure mental clarity, memory, and attention in order to assess mental exhaustion and cognitive fatigue. It measures using a 4-point Likert scale, in which 0 indicates “not at all” and 3 indicates “very much.” It has shown great construct validity and excellent internal consistency (α = .92). It is frequently used to evaluate the mental fatigue aspect of caregiver fatigue in clinical and caregiver research.

Procedure

The primary caregivers of patients with non-communicable diseases (NCDs) were the study's participants. Before participating, caregivers were initially given verbal and written information of the study's objectives. Standardized self-report questionnaires on caregiver burden, psychological distress, and cognitive fatigue were given to each participant after they had filled out a demographic information form and signed an informed consent form. Data collection occurred in a convenient context for each participant, including a hospital setting, clinics/medical centers, and the participant's home as appropriate in terms of participant convenience and comfort. After completion, the participants received gratitude for their time and participation. To evaluate the proposed data were analyzed using IBM SPSS Statistics (version 27).

Ethical Considerations

The study was carried out in compliance with all ethical guidelines. The objectives of the study were explained to the participants, along with the fact that they may choose to participate willingly and that they could withdraw at any moment without facing any consequences. To prevent any possible psychological suffering, participants' sensitive information was likewise treated with care. Informed consent was given by participants in both written and verbal formats. Participants were told their identity would always be kept

confidential and that their responses would be presented anonymously Participants were reassured that the information would only be used for research purposes. The American Psychological Association's (APA, 2017) ethical requirements were followed for conducting the study.

Results

The Statistical Package for Social Sciences (IBM-SPSS, Version 27) was used to analyze the data from the primary research. Descriptive statistics were used to assess the data distribution and calculate the scales' reliability estimates. Bivariate correlation analysis was used to examine the relationships between the research variables. To assess caregiver as a predictor of psychological distress and cognitive fatigue, simple linear regression was used.

Table 1

Demographic characteristics of sample (N = 200)

Variables	*M*	*SD*	*f*	*%*
Age (Caregivers)	35.18	6.22		
Age (Patients)	63.05	8.83		
Gender				
Male			100	50.0
Female			100	50.0
Marital Status				
Single			35	17.5
Married			131	65.5
Divorced			20	10.0
Widowed			14	7.0
Education				
Secondary			21	10.5
Intermediate			55	27.5
Graduate			73	36.5
Post-graduate			51	25.5
Occupation				
Employed			108	54.0
Unemployed			31	15.5
Retired			06	3.0
Student			18	9.0
Homemaker			37	18.5
Relationship to Patient				
Spouse			53	26.5
Child			81	40.5
Sibling			66	33.0
Duration of Caregiving				
6 months – 1 year			43	21.5
1 – 2 years			52	26.0
2 – 5 years			51	25.5
More than 5 years			54	27.0
Patient’s NCD				
Diabetes			56	28.0
Stroke			24	12.0
Cancer			32	16.0
Lung Diseases			34	17.0
Heart Diseases			32	16.0
Other			22	11.0

Note. M = Mean, SD = Standard Deviation, f = Frequency, % = Percentage.

Table 1 shows that the mean age of patients was 63.05 years, whereas the mean age of caregivers (N = 200) was 35.18 years. The study's participants were evenly divided by gender, and the majority of caregivers were married and employed. The majority of caregivers were children (40.5%) or siblings (33%), followed by spouses (26.5%). More than 25% of caregivers stated they had been providing care for patients for more than five years. Diabetes was the most common NCD (28%), followed by heart disease (16%), lung disease (17%), and cancer (16%).

Table 2

Psychometric properties of the study variables (N = 200)

							Range	
Variable	*k*	*M*	*SD*	*α*	*SK*	*K*	Potential	Actual
CB	12	27.50	7.88	.96	.07	−0.44	12–60	10–47
PD	10	30.00	12.96	.97	.01	−1.28	10–50	10–50
CF	15	31.33	3.45	.83	.85	.06	0–45	24–41

Note. N = 200. CB = Caregiver Burden; PD = Psychological Distress; CF = Cognitive Fatigue; M = Mean; SD = Standard deviation; α = Cronbach's alpha; k = Number of items, SK = Skewness, K = Kurtosis.

For the study variables, Table 2 shows the mean, standard deviation, range, skewness, kurtosis, and Cronbach's alpha reliability. The data is statistically adequate as the skewness and kurtosis values are within the acceptable range of +2 to -2, as recommended by George and Mallery (2010). Additionally, Cronbach's alpha reliability estimates for mental fatigue, psychological distress, and caregiver burden fall between.83 and.97, which is deemed satisfactory by Cohen (2005) and George and Mallery (2010).

Table 3

Bivariate correlations among study variables (N=200)

Variable	1	2	3
1. CB	-	.71**	.16*
2. PD		-	.14*
3. CF			-

*Note. **p<0.01;* CB = Caregiver Burden; PD = Psychological Distress; CF = Cognitive Fatigue

Table 3 shows the correlation coefficient between study variables. Caregiver Burden has a significantly strong positive relationship with psychological distress (r = .71, p<.01) and cognitive fatigue (r = .16, p<.05).

Table 4

Mean differences in study variables by gender (N=200)

	Male		Female				*95% CI*		
Variable	*M*	*SD*	*M*	*SD*	*t(198)*	*p*	*LL*	*UL*	*d*
CB	25.30	8.04	29.69	7.12	-4.09	< .001	-6.51	-2.27	0.57
PD	24.38	12.84	35.62	10.43	-6.79	< .001	-14.50	-7.97	0.96
CF	30.47	3.33	32.18	3.37	-3.61	< .001	-2.64	-0.78	0.51

Note. CB = Caregiver Burden; PD = Psychological Distress; CF = Cognitive Fatigue; C.I = Confidence Interval; LL = Lower Limit; UL = Upper Limit.

As shown in Table 4, there are notable gender-based differences in caregiver burden, psychological distress, and mental fatigue among those who care for patients with NCDs. Compared to male caregivers, female caregivers had greater levels of caregiver burden (t = -

4.09, p < .001). When it came to psychological distress, female caregivers reported significantly greater distress than male caregivers (t = -6.79p < .001). Lastly, regarding cognitive fatigue, female caregivers reported greater fatigue than male caregivers (t = -3.61, p < .001). In terms of effect size, the difference was medium for mental fatigue (0.51) and caregiver burden (0.57), and large for psychological distress (0.96).

Table 5

Simple linear regression showing psychological distress as a predictor of caregiver burden among caregivers of patients with NCD's (N = 200)

					95% CI	
DV	*IV*	*B*	*SE*	*β*	*LL*	*UL*
PD	Constant	-2.13	2.35	--	-6.76	2.51
	CB	1.17	.08	.71	1.01	1.33
	R	.711				
	R^2	.505				
	F	202.23***				

Note. ***p<.001; **p<.01, CB = Caregiver Burden; PD = Psychological Distress; B = Unstandardized Coefficient; β = Standardized Coefficient; SE = Standard Error; C.I = Confidence Interval; LL = Lower Limit; UL = Upper Limit.

The impact of caregiver burden on psychological distress in those who care for patients with non-communicable diseases is shown in Table 7. The results showed that caregiver burden was a significant and a strong predictor of psychological distress (β =.71, p <.001), 50.5% variance.

Table 6

Simple linear regression showing cognitive fatigue as a predictor of caregiver burden among caregivers of patients with NCD's (N=200)

					95% CI	
DV	*IV*	*B*	*SE*	*β*	*LL*	*UL*
PD	Constant	29.29	.88	--	27.57	31.02
	CB	.07	.03	.17	0.01	0.13
	R	.169				
	R^2	.029				
	F	5.83*				

Note. ***p<.001; **p<.01 CB = Caregiver Burden; CF = Cognitive Fatigue; B = Unstandardized Coefficient; β = Standardized Coefficient; SE = Standard Error; C.I = Confidence Interval; LL = Lower Limit; UL = Upper Limit.

The impact of caregiver burden on cognitive fatigue in those who care for patients with non-communicable diseases is shown in Table 8. The results showed that caregiver burden was a significant and weak predictor of cognitive fatigue (β =.17, p <.001), 2.9% variance.

Discussion

The purpose of this study was to examine the complex relationships among cognitive fatigue, psychological distress, and caregiver burden among those who are caring for people with non-communicable diseases (NCDs). Non-communicable disease management is currently a global public health concern, particularly in low- and middle-income nations with underdeveloped healthcare systems (World Health Organization, 2021). South Asian nations like Pakistan and others depend on family caregivers because institutionalized care is inadequate. This family expectation can be extremely taxing and puts a heavy physical

and mental strain on the caregiver, which can result in long-term biological issues with cognition and stress-related psychiatric issues. All things considered, the results of this study provide a fresh perspective on the psychological effects of caregiving and help to comprehend the pressures related to caring in a South Asian cultural setting where providing care is a family duty.

Caregiver burden was positively correlated with each cognitive fatigue (as measured by the Mental Fatigue Scale; MFS) and psychological distress (as measured by the Kessler Psychological Distress Scale; K10). Research has shown that as caregivers suffer more stress, they have more difficulty with mental health and cognitive functioning. In other words, these outcomes lend credence to the Stress Process Model (Pearlin et al., 1990), which is based on the presumption that key Stressors, such as caring duties, may impact mental and emotional consequences. The observations corroborate what has already been reported in previous studies. For example, Adelman et al. (2019) found a strong association between caregiver load and increased psychological distress and depressive symptoms in family caregivers of patients with chronic disease. Similarly, Khan et al. (2021) reported a robust relationship between higher caring duties, more emotional strain, and lower psychological well-being within a group of caregivers of stroke survivors in Pakistan. Kim et al. (2020) study's findings can also be support of caregivers' load and cognitive fatigue after finding that habitual caring duties may lead to mental fatigue and diminished attention and focus. The relationship between caregivers' load and psychological distress has also been documented in diverse cultural contexts. For example, Li et al. (2020) conducted a national study in China of caregivers for individuals with dementia discovered that caregivers had significantly higher levels of anxiety and depression, largely due to the stress of caregiving.

Within the subject of the current study, there are several social, cultural, and structural factors that may help to justify this relationship. Due to limited access for health care treatments, Pakistan has a high caregiver burden to take care of patients with non-communicable diseases (NCDS). In several higher-paying countries, caregivers may have access to either organized support groups or respite care. Generally, other caregivers may treat NCD patients, which aligns with the notion that their tanker experience may result in stress and fatigue. Money is an important variable for the caregivers because the treatment of diabetes, heart disease, and certain cancers require long-term care. Still, the strong and evident relationship found in the study indicates that caregivers in Pakistan are without system support. Without protective factors, emotional and cognitive exhaustion generates psychological pain, especially because caregivers typically lack formal support, therapy or respite programs. However, caregiving is clearly respected and cared for generally, as family expectations are rarely questioned when caring for someone. Caregivers in Pakistan might not have enough informal social support to lessen the negative impacts of burden, in contrast to environments that consistently encourage protective characteristics. The fact that caregiver demands are not obvious in the context of healthcare policy may also be a contributing factor to the high correlation. Caregivers are frequently viewed as an integral element of a patient's therapeutic journey, sufficiently isolated from health policy considerations to avoid being viewed as individuals in need of medical attention. As the burden of care accumulates, invisibility as a need results in untreated stress, which in turn causes fatigue and distress.

The results of the current study also stated that female caregivers had far greater levels of psychological distress than male caregivers. However, there were no gender variations in cognitive fatigue as expected in hypotheses. Women's levels of cognitive fatigue were not significantly different from men's, despite the fact that they reported greater burdens and distress.

The finding that women experience more distress is consistent with the results of several studies. For instance, a systematic review conducted by del-Pino-Casado et al. (2019)

found that, in comparison to male caregivers, female caregivers experience higher levels of emotional distress, depression and anxiety in a variety of caregiver contexts. According to a previous study by Thapa and colleagues (2021), female caregivers of patients with chronic illnesses reported feeling more vulnerable psychologically, partly because they were overburdened with responsibilities and their caregiver role was not as well-recognized. These gender inequalities have a number of logical explanations. First, issues can arise because of role pressure and continuous emotional fatigue when care job is combined with a woman's many responsibilities (family, children, and around the house) (Mazurek Melnyk et al., 2020). Second, women are expected to provide care in societies with collectivist tendencies like Pakistan. Women are therefore more emotionally invested in providing care, which causes them to dwell and feel more distressed. However, the lack of a significant gender difference in cognitive fatigue calls into question a number of these ideas found in the body of current research. According to a large body of current Western research, women report higher levels of fatigue as a result of the pressures placed on them when multitasking (Vitaliano et al., 2020). Wilson et al. (2021) contend that fatigue is not as gender-specific as previously believed, as it is mostly determined by physical activity, sleep patterns, and the number of hours spent providing care at night. The latter view is often supported by our findings, which show that fatigue is a part of a larger universality in which both men and women, regardless of gender, suffer fatigue when providing care.

Other studies (e.g., Kuzuya et al., 2020) have suggested that fatigue was significantly related to duty of caregiving situations to intensity rather than caregiving gender, despite some research (e.g., López et al., 2018) showing that women had statistically significant higher levels of both psychological distress and fatigue. Therefore, there may be a context-driven relationship between gender and fatigue. For instance, males may feel just as fatigued as women do in family homes where men perform the majority of the caring duties (such as carrying patients and assisting with their mobility). While the majority of caregiving in Pakistan is assigned to women, many men concentrate on performing physically demanding chores (such as driving patients to and from hospitals, managing mobility, and supervising financial tasks). Their contributions may reduce fatigue compared to female caregivers, however because of the psychological burden of caring for others in addition to household chores, female caregivers may suffer from much greater psychological distress than males.

It provides an insightful perspective to discover that distress, but not fatigue, is gender-specific. While psychological interventions must be gender-sensitive in their objectives, it suggests that fatigue management strategies might be more gender-neutral. Given their increased likelihood of suffering, psychological programs (such as cognitive-behavioral therapy, mindfulness training, and stress reduction seminars) may wish to target women specifically. Given that both sexes are equally susceptible to fatigue, gender-sensitive fatigue management techniques don't necessarily need to be implemented.

Another level of complexity is introduced by the cultural setting. Giving care is regarded as a moral and religious duty in Pakistan, especially for women. In addition to feeling overburdened by their roles, women who provide care may also be more distressed since they may be perceived as morally deficient by society if they show signs of dissatisfaction with their caregiving. Distress from keeping quiet about emotional difficulties exacerbates it, whereas fatigue—which is more about tasks and physicality—does not. Furthermore, because men are discouraged from showing vulnerability by gender norms, male caregivers may underreport emotional discomfort. In addition, since fatigue is a more "socially acceptable" form of complaint for men, there may be more gender differences in distress than in fatigue.

Findings that represent the experiences of caregivers categorized by gender highlight the need for gender-specific treatments. Programs intended for enhancing emotional

resilience, professional therapy, and caregiver support groups are crucial for female caregivers. In order to relieve female caregivers of their disproportionate burden, institutional measures should also encourage a redistribution of caregiving duties. Programs should encourage male caregivers to open up to men about the emotional parts of caregiving without stigmatizing them, and they should train men as needed for necessary, hands-on caregiving tasks. Respite services, family-shared caregiving, and healthcare access and provisioning are all systemic responses to fatigue, which affects caregivers of both genders.

Examining the differences in caregiver outcomes based the duration of caregiving was another significant objective of this study. According to the literature, there are components of the caregiving setting define the well-being of caregivers and have an impact on coping strategies, resilience, and resources (Adelman et al., 2019). Long-term caregiving can enter caregivers into a "perpetual obligation", which can lead to increased cumulative stress and burnout as described by Kent et al. (2020). Failure to allow any time for recovery will increase the level of cognitive fatigue caregivers encounter over time. According to the study, caregivers who had been providing care for patients for more than five years reported feeling more burdened and mentally exhausted than those who had been providing care for patients for less time. This aligns with longitudinal studies showing that continued caregiving experience diminishes a caregiver's physical, mental, and emotional resources, resulting in chronic fatigue and increased stress for already burdened caregivers (Miyamoto et al., 2019). Long-term caregiving also involves becoming habitual in one's caregiving, which prompts the anticipation of another's needs without regard for one's own comfort level. In particular, cognitive overload and distraction are felt when caregivers' cognitive reserve is diminished (Pendergrass et al., 2018). Moreover, research in caregiving in Asian contexts found that long-term caregivers experience "caregiver career fatigue," whereby the psychological reserves of care for others, or care as duty, are slowly exhausted over time, but their investment in care remains the same (Liu et al., 2021). Psychological distress is often most closely linked with acute patient needs, financial strain, or a medical emergency (Thompson et al., 2021).

Implications

The present study delivers several theoretical contributions to the field of caregiving and psychological effects. The study results indicated that the caregiver burden affects psychological distress and cognitive fatigue, and they supported the stress-process models of caregivers, (Pearlin et al., 1990; Kent et al., 2020). This acknowledgment of cognitive and emotional impact of caregiver way to the body of work that has consistently focused on distress without acknowledging fatigue. Studies addressing gender- and relationship-role differences in caregiving extends our thinking to gender role paradigms and role identification (Cheng et al., 2020). As a result of the inequitable contributions to caregiving responsibilities and lack of support, female caregivers experience increased psychological distress and cognitive fatigue.

Caregiving experiences can also be stratified according to relationship status, as seen by variances by roles (spouses had greater exhaustion, children ruminated more, siblings had less fatigue). This suggests that in order to better understand the experience of caregivers, caregiving models should take sociocultural and role-based expectations into account.

Additionally, the study offers recommendations for clinical practice, policy, and community support for caregivers of patients with non-communicable diseases. Healthcare systems have to include regular evaluations of caregivers' well-being into care as caregiver burden is a powerful indicator of psychological distress and cognitive fatigue. Early in the appointment visit process, high-risk caregiver families can be identified in clinical settings using brief, trustworthy measures like the ZBI, K10, or MFS scales. Thus, stress management, problem-solving, family-based psychoeducation, and culturally relevant coping

mechanisms like community or religious support might be the main focuses of caregiver support programs.

Given the disproportionate caregiving responsibilities for many women, targeted interventions specifically designed for female caregivers may be necessary, such as peer support groups, workplace benefits, or access to respite, to both support and lessen the strain of caregiving. Female caregivers also reported higher levels of distress and fatigue. The differences in results by caregiving role suggest that interventions should be customized for couples who require respite services or shared care plans. The need for longitudinal plans to support caregivers who have been providing care for more than five years is demonstrated by the high levels of fatigue and strain they experience. These plans should include planned respite, ongoing counseling, and rotating caregiving tasks to help prevent chronic overload.

Limitations

There are certain limitations to the current study, even if it contributes significantly to understanding of caregiver burden, psychological distress, and cognitive fatigue among those who care for patients with non-communicable diseases (NCDs).

Inferential claims regarding the causal relationships between variables are limited by cross-sectional study methodologies. We are unable to verify the temporal ordering of the associations, despite the fact that they were statistically significant. Longitudinal studies would be useful in future research on caregiver burden and/or distress and fatigue to ascertain whether caregiver burden causes distress and fatigue over time or whether people who are more distressed are more likely to perceive themselves as having a greater caregiver burden.

All potential biases related to self-reporting must be recognized because all constructs (ZBI, K10 and MFS) were evaluated only by self-report questionnaires (e.g., socially desirable response, recall bias, subjective interpretation of items). Future research may want to add behavioral measurements, clinical interviews, or physiological indicators of fatigue and stress to self-report questionnaires, even if all behavioral measures were standardized and validated.

The results were derived from 200 caregivers from a particular region and culture.

Although there is limited generalizability and transferability to other caregiver groups, particularly in individualistic cultures, this sample is useful for understanding the experiences of caregivers in collectivist societies.

Future research that would add to our understanding of caregivers lived experience, and the culturally shaped beliefs that influence their coping would consider adopting qualitative methods. In addition, exploring more cognitive and emotional mediators (e.g. coping, emotion regulation, self-compassion) may provide multi-faceted insights into the relationships between burden and outcomes.

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