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Estimating the Economic Burden of Family Caregivers of COVID-19 Survivors in Punjab-Pakistan

Shumaila Abbas[1,2*], Jamal Abdul Nasir[1]

* Corresponding Author

1. Department of Statistics, Govt. College University, Lahore – Pakistan, dr.jamal@gcu.edu.pk
2. College of Statistical Sciences, University of the Punjab, Lahore – Pakistan, shumaila.stat@pu.edu.pk

Abstract

The COVID-19 pandemic has significantly impacted healthcare systems and families worldwide, with family caregivers bearing a substantial burden. In Punjab, Pakistan, family caregivers of COVID-19 survivors face significant financial strain due to prolonged care requirements, medical expenses, and loss of income. This study aims to quantify the economic burden on these caregivers and identify socioeconomic factors contributing to financial strain for targeted support. Employing a cross-sectional design, the study surveyed 5,770 caregivers selected through convenience sampling using a self-constructed 27-item questionnaire with dichotomous responses. Data analysis included structural equation modeling, odds ratio calculations, and tree diagrams to evaluate the economic burden and identify contributing factors. The study found that 59.1% of the family caregivers were female, with a mean age of 45 years. A six-factor economic burden model was developed to quantify the financial strain on caregivers during the pandemic. Results indicated a higher burden on female caregivers over 45, married, unemployed, earning up to sixty thousand PKR, with a maximum secondary education, living in rural areas, in joint families, or away from families. Those performing household, medical, and personal tasks faced higher financial challenges, especially when caring for survivors hospitalized, in ICU, with long disease durations, permanent disabilities, or severe infections. The study highlights the substantial economic impact on family caregivers of COVID-19 survivors in Punjab, Pakistan, underscoring the urgency for governmental and community support to alleviate their financial strain.

Key Words: COVID-19; Caregivers; Disease Burden; Structural Equation Models; Odds Ratio.

1. Introduction

Family caregivers play a pivotal role in the healthcare system, providing indispensable support to individuals with chronic illnesses, disabilities, and aging-related conditions (Thapa et al., 2024). It goes beyond basic care in that it covers not only physical care but also emotional and social care and, quite often, financial support. Family caregivers link formal healthcare services with the personal needs of patients; hence, their importance is great. (Bechthold et al., 2023). They offer individualized care throughout and ensure that their loved ones continue receiving this very attention that is critical to health outcome improvements and betterment in the quality of life.

Additionally, family caregivers often advocate on behalf of their relatives to ensure that they get the right medical care and services. Navigating complicated health systems, managing medications, and coordinating with healthcare professionals, this lightens the load on the formal infrastructure of the health-care system. Such advocacy and coordination can lead to increasingly specialized and effective care that precludes hospital readmission, hence a reduction in health-care costs. Caregivers, with their intimate knowledge of the conditions of their family members, could identify slight changes in health status that might otherwise go unnoticed and thus institute timely interventions (Montesanti et al., 2023).

Emotionally, family members provide a sense of comfort and companionship that is important to the well-being of sick patients. The presence of a recognizable and loving person may lessen feelings of isolation and depression and enhance feelings of security and belonging (Garnett et al., 2024). This is important emotional support for mental health, which in turn cultivates a positive outlook that may have a positive bearing on physical recovery and resistance.

Caregivers are seen as the backbone in healthcare support, providing unpaid care to family members who have chronic diseases, are disabled, or elderly. It is estimated by IACO that 349 million people act in informal caregivers around the world, delivering an estimated trillions of dollars' worth of care annually (IACO, 2024). According to the AARP Public Policy Institute, in 2020, nearly 53 million adults have provided unpaid care to an adult or child in the last year alone in the United States. This is a huge increase compared to that reported in 2015, which was pegged at 43.5 million (Prudencio & Young, 2020). According to Eurocarers, a European organization, about 80% of all long-term care is provided by informal caregivers, mainly family members (Santini et al., 2022). This care thus represents an enormous economic value if it were to be provided by formal services, running into hundreds of billions of euros, equating to some €370 billion a year in the European Union (Hanson & Champeix, 2023).

Similarly, in Australia, Carers Australia notes that there are approximately 2.65 million informal caregivers, contributing care valued at $77.9 billion annually, which is over half the total health and social work industry (Australia & Economics, 2020). The economic impact of family caregivers is not limited to developed nations. In Asia, the role of family caregivers is deeply embedded in cultural traditions. In Japan, for instance, an ageing population has increased reliance on family caregivers, who provide an estimated 75% of elderly care, significantly reducing the burden on the public healthcare system (Ministry of Health, 2020). In China, family caregiving is deeply rooted in cultural traditions, with over 44 million elderly individuals relying on family members for their daily needs (Bífárìn et al., 2023). In China, nearly 90% of elderly care is provided by family members, reflecting the immense reliance on informal care within Chinese society (Han et al., 2020). In Pakistan, family caregivers are an integral part of the healthcare system, often providing essential care for elderly and chronically ill relatives. According to the Pakistan Bureau of Statistics, approximately 7% of the population, or around 14 million people, are elderly, and a significant majority rely on family members for their daily needs (Statistics, 2017). The societal norm of filial responsibility burdens family caregivers, who often juggle multiple roles without formal support.

Family caregivers endure a significant financial burden, deeply impacting their economic stability and overall well-being. This burden arises from both direct and indirect costs associated with caregiving. Direct costs encompass out-of-pocket expenses such as medical supplies, medications, home modifications, and transportation to medical appointments. (Prudencio & Young, 2020) reveals that caregivers spend an average of $7,242 annually on these expenses, representing a considerable financial strain, particularly for those with limited financial resources. Indirect costs further exacerbate the financial challenges faced by family caregivers. Many caregivers are compelled to reduce their working hours or leave their jobs entirely to fulfill caregiving responsibilities. This results in lost income, reduced retirement savings, and diminished job security. The MetLife Mature Market Institute estimates that caregivers aged 50 and older who exit the workforce to care for a parent face an average loss of $303,880 in wages, Social Security benefits, and pension benefits over their lifetime (Institute, 2011). This loss underscores the profound economic impact of caregiving on long-term financial health.

The COVID-19 pandemic has significantly exacerbated the financial burden family caregivers face globally. The sudden increase in caregiving responsibilities and economic disruptions have intensified the economic strain on families. Family caregivers of COVID-19 patients often face substantial direct costs. These include expenses for personal protective equipment (PPE), sanitization supplies, medications, and transportation to medical appointments. A study by (Keita Fakeye et al., 2022) found that in the United States, caregivers of COVID-19 patients incurred additional out-of-pocket expenses averaging over $1,000 per month. (Beach et al., 2021) reported that 20.3% of caregivers experienced increased financial strain while providing care due to the COVID-19 pandemic's added expenses and challenges. In developing countries, the financial impact is even more pronounced due to weaker social safety nets and limited access to healthcare services (Chinyoka, 2023; Sevik et al., 2024). In India, for instance, the economic burden on caregivers of COVID-19 patients has been immense, with many families falling into debt to cover medical expenses and caregiving costs (George et al., 2023). A report by (Pandurangi et al., 2023) highlighted that 60% of families caring for COVID-19 patients faced significant financial hardship, with many depleting their savings or borrowing money to meet caregiving needs.

Estimating the financial burden of family caregivers of COVID-19 in Pakistan is vital for addressing significant research gaps and understanding the broader implications of the pandemic. Currently, there is limited data on the

specific financial impact faced by caregivers in Pakistan, a critical omission given the pandemic's unique pressures. This research will fill gaps in knowledge about out-of-pocket expenses, lost income, and overall financial strain experienced by caregivers. Understanding these aspects is crucial for developing targeted support policies and financial assistance programs. Additionally, this research will highlight the need for better healthcare infrastructure and support systems tailored to the needs of caregivers. By quantifying the economic impact, the study will provide valuable insights for policymakers, non-profits, and health organizations, enabling them to implement effective interventions and support mechanisms to alleviate the financial burden on family caregivers and improve their overall well-being.

2.   Materials and Methods

The study uses a cross-sectional survey research design to quantify the economic burden of COVID-19 on family caregivers of COVID-19 patients at a specific point in time. The target populations the caregivers in Punjab-Pakistan who provide care for COVID-19 patients and are from their social network. There could be many caregivers in a family, but the caregivers who provide the maximum care are the ones who enrol in the study. We assume a 1: 1 ratio in determining the population of family caregivers against one registered COVID-19 patient. Because the size of the family caregivers population will be the same as that of the COVID-19 patients, we determine the sample size. The average COVID-19 infection rate in Punjab was 9.63%. The COVID-19 patients without a PCR are excluded from the study. By considering the 99% confidence level with a 1% margin of error, the sample size is (Althubaiti & Medicine, 2023):

$$n = \frac{\left(Z_{\alpha/2}\right)^2 * \hat{p} * (1-\hat{p})}{e^2} = 5770$$

(1)

A convenient sampling method was used to collect the data. Under this scheme used different approaches were used to ensure a diverse and relevant sample. These approaches include the Google form, where the online form was shared with individuals via email, social groups, etc., and they were asked to participate in the research only if they cared about a closely related COVID-19 patient. Moreover, face-to-face data was collected from the respondents interested in participating in the research. The researcher or trained enumerators contacted these respondents in public places, shopping malls, markets, home visits, institutions, offices, etc.

A binary response questionnaire consisting of twenty-seven items, including demographic information, was meticulously designed to assess the financial impact of COVID-19 on family caregivers. This development process was preceded by a literature review and focus group discussion with six to ten stakeholders, during which all possible issues were identified. The literature review set the stage by defining some of the financial burden witnessed among caregivers, potential research gaps and potential variables to consider. This background was taken into consideration while developing the questionnaire to capture the most relevant financial issues for caregivers.

The questionnaire is designed to scale the financial burden of caregivers on six constructs. These constructs include:

Financial Outlay (FO): The construct FO with seven items covers the caregivers cut on the routine budget due to COVID-19. These cuts include spending on food and recreational activities and difficulties in paying the utilities. Moreover, the survivors used their savings, borrowed money, or did not pay the credit card bills included in FO.

Financial Hindrance (FH): The FH includes the four items of covid-19 financial burden that forced the caregivers to skip treatment due to expensive medicine, transportation, groceries, and utility bills. The difference between FO and FH is that caregivers either use their savings or cut their budget to cope with the financial burden in FO. In contrast, the caregivers could not meet the expenses incurred in FH due to covid-19 infection.

Hostile Behavior (HB): The HB use the four items to scale the caregivers antagonistic behavior faced during the infection period. These items include threats, insults, screams, physical assaults or curses from family members, lenders or others for not copying with the financial responsibilities due to COVID-19 infection and the elevated financial burden.

Care and Lifestyle (CC): This construct is measured through three items designed to quantify the impact of COVID-19 on caregivers finance regarding their care, belongings, and products used in daily routine that define the lifestyle like car, house, jewellery, mobile, etc.

Seeking Support (SS): The construct SS has four items to quantify the financial stress incurred during COVID-19 infection. These items reflect the caregivers dependence on others to cope with the financial impact due to infection.

Psychosocial Affects (PA): This construct is based on five items to depict the impact of the financial burden on caregivers emotional, psychological and social spectrum in a broader sense.

Economic Burden (EB): The latent variable EB is measured through a twenty-seven-item items scale representing the COVID-19 caregivers financial hardships during the disease period.
The reliability of the questionnaire, along with the six constructs is outlined in Table 1 (Chakrabartty et al., 2024).

Table 1. Reliability measures of the constructs of the EB questionnaire.

Construct	Items	Reliability Measure
Financial Outlay	7	0.845
Financial Hindrance	4	0.894
Hostile Behavior	4	0.903
Care and Lifestyle	3	0.899
Seeking Support	4	0.788
Psychosocial Affect	5	0.805
Overall	**27**	**0.867**

The Cronbach alpha values depicted satisfactory results for the scale development $(\alpha > 0.70)$.

The proposed model to estimate the financial burden of COVID-19 survivors based on six constructs is portrayed in Figure 1.
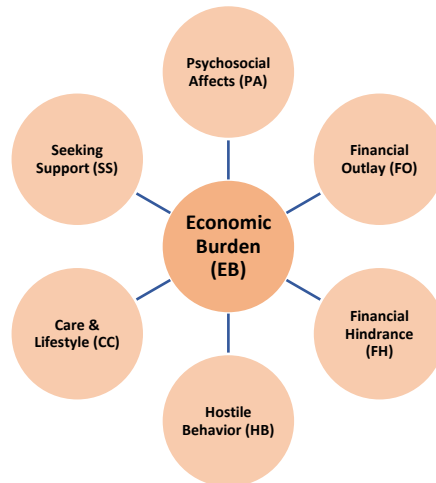

Figure 1. Proposed research model for the EB and the associated six constructs.

Since the latent variable EB is estimated based on six constructs based on different numbers of items, a structural equation model (SEM) (Kline, 2023) will be used to estimate the EB. The SEM for the latent variable EB using the six constructs and the associated items is presented in Figure 2.
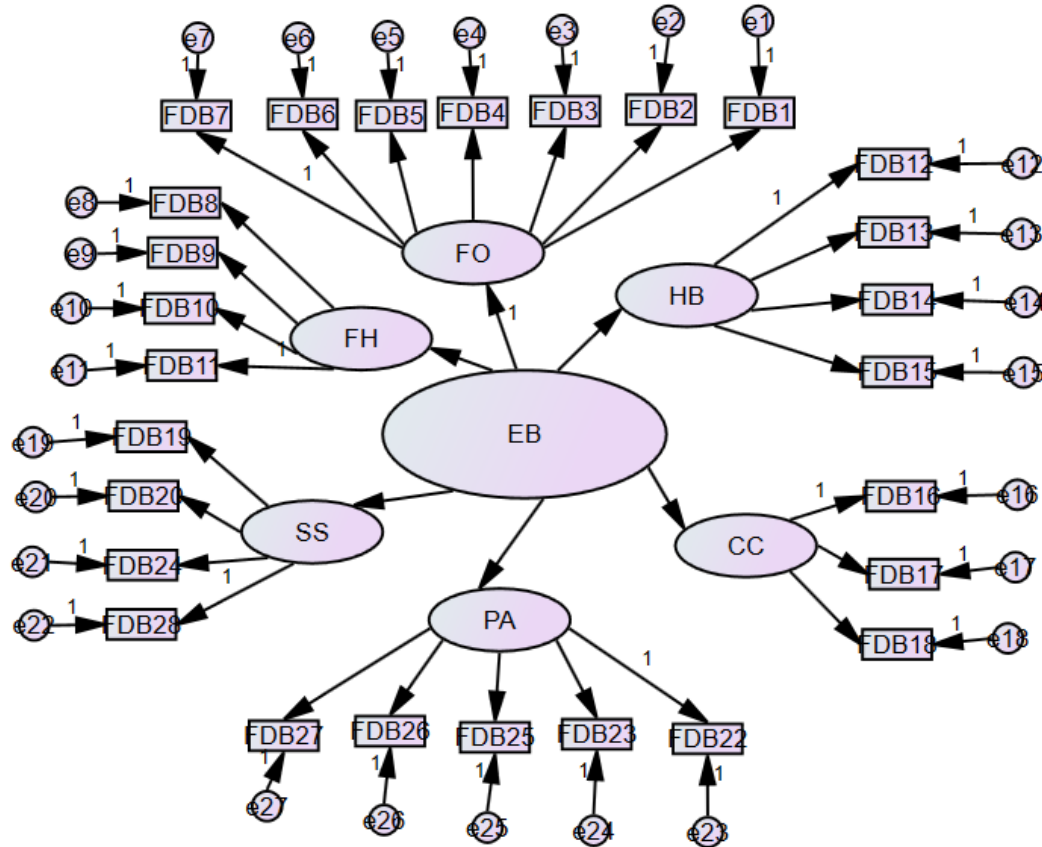
Figure 2. The proposed latent variable EB model is based on the six constructs and the associated items.
The path model specified in Figure 2 is defined in SEM notation as:

$$\mathbf{X_i} = \mathbf{\Lambda_X}\mathbf{\xi_k} + \mathbf{\theta_\delta} \tag{2}$$

Here, $\mathbf{X_i}$ is a column vector that holds the items that are employed to assess the constructs. These are the variables that are observed in this vector, and each one of them corresponds to a specific aspect of the constructs being investigated. $\mathbf{\xi_k}$ is the vector of the latent constructs; in this case, it includes the six domains of the psychological burden. These constructs are the building blocks of the factors that are assessed.

The matrix $\mathbf{\Lambda_X}$ has the coefficients which specify the link between the items and the constructs $\mathbf{\xi_k}$. Every coefficient in the matrix $\mathbf{\Lambda_X}$ shows the relation and the extent of the relation between a certain item and a certain construct. This matrix is very important in assessing the degree of correspondence of each item to their respective constructs.

The variance-covariance matrix of the residual terms of the exogenous variables $\mathbf{X_i}$ is denoted by $\mathbf{\theta_\delta}$. In other words, $\mathbf{\theta_\delta}$ represents the measurement and other unexplained discrepancies in the variables.

Together, these form a comprehensive guide for relating the observed variables with the unobserved ones within the SEM model. Thus $\mathbf{\Lambda_X}$, $\mathbf{\xi_k}$, $\mathbf{\theta_\delta}$ helps to determine the reliability and validity of the constructs and to understand the structure of the factor being measured, the psychological burden.

It is stated in equation 2 that each domain is defined by a structural equation that relates $\mathbf{\Lambda_X}$, $\mathbf{\xi_k}$, $\mathbf{\theta_\delta}$ to each other. This means several items are employed to establish the assessed domains and the residual, representing the part that belongs to each item and is not linked to the domain. In this case, equation (2) is written for estimation as a $k \times k$ variance-covariance matrix, $\mathbf{\Phi}$ providing the interdependencies between the domains $\mathbf{\xi_k}$.

$$\Sigma\left(\hat{\theta}\right) = \Lambda_X \Phi \Lambda_X + \theta_\delta \tag{3}$$

To estimate the parameters of equation (3), the likelihood function has to be used to obtain the maximum likelihood estimates. This approach entails estimating the model's parameters that yield the highest likelihood of the observed data. Thus, the maximization of this function allows us to find the values of the parameters that make the observed data most probable and, therefore, provide the best fit of the mode to the data. This approach offers the best and most efficient way of estimating the model's parameters since it enables the assessment of the link between the constructs and the variables.

$$F_{MLE}\left(\theta\right) = \log\left|\Sigma\left(\theta\right)\right| + tr\left(S\Sigma\left(\theta\right)^{-1}\right) - \log\left|S\right| - p \tag{4}$$

Here S is the sample covariance matrix and p is the number of items in the set.

Currently, a single standard measure does not exist for the model's goodness of fit, so we rely on the commonly used fit criteria. The indices are the ones that are used to evaluate the model performance in terms of how well it fits the data. In AMOS v23, several fit indexes are available to assess the model's goodness of fit. The goodness of fit index used in the study includes:

Goodness-of-Fit Index (GFI): The GFI quantifies the proportion of variance-covariance S predicted by $\Sigma\left(\theta\right)$.

This index is an equivalent of R^2 in regression analysis and is defined as:

$$GFI = 1 - \frac{tr\left[\left(\Sigma^{-1}S - I\right)^2\right]}{tr\left[\left(\Sigma^{-1}S\right)^2\right]} \tag{5}$$

The range of GFI is from 0 to 1, and the least acceptable value for a model is at least 0.7 (Collier, 2020; West et al., 2023).

Adjusted GFI (AGFI): The GFI is sensitive to the sample size and is affected by the number of parameters. AGFI is a modified version of GFI after adjusting the number of parameters. This index is again an analog of adjusted R^2 as in regression analysis and is defined as:

$$AGFI = 1 - \left[\frac{k\left(k+1\right)}{2df}\right]\left(1 - GFI\right) \tag{6}$$

The AGFI ranges from 0 to 1, and this index also has an acceptable model range of 0.7 or more (Collier, 2020; West et al., 2023).

Chi-square/degrees of freedom (χ^2/df): This statistic assesses the likelihood of the difference between the population covariance matrix Σ and the sample covariance matrix S. It is defined as:

$$\chi^2 / df = \left\{\left(N-1\right)F\left(\theta\right)\right\} / df \tag{7}$$

and, $df = k\left(k+1\right)/2 - t$

where, t is the number of parameters to be estimated. However, the acceptable range for this statistic is less than three. The statistic is highly sensitive to sample size and is not a good measure for large sample sizes (Collier, 2020; West et al., 2023).

Root Mean Square Error (RMSE): The RMSE quantifies the model adequacy by considering the model complexity in terms of the number of parameters estimated and the model discrepancy. It is defined as:

$$RMSE = \sqrt{\frac{\chi^2 - df}{\left(N-1\right)}} \tag{8}$$

The statistic ranges from 0 to 1, and the least acceptable value for model adequacy is 0.08 (Collier, 2020; West et al., 2023).

Root Mean Square Error Approximation (RMSEA): The RMSEA is a modified version of RMSE defined in equation (7). It is adjusted for the model degrees of freedom and defined as:

$$RMSEA = \sqrt{\frac{\chi^2 - df}{df(N-1)}} \qquad (9)$$

The RMSEA ranges from 0 to 1, and the least acceptable value for accepting a fitted model is 0.08 (West et al., 2023).

3. Results

The results presented in Table 2 are the descriptive statistics of the family caregivers who participated in the study. About 59.1% of the caregivers were female, 50.7% were more than 45 years of age, 70.3% had at least higher secondary education, married (55.8%), employed (66.7%), belonged to urban area (77.1%), 62.2% had more than sixty thousand income and 53% had more than four members in the family. The relationship of caregivers with the survivors reported as spouse (21.9%), parents (29.1%), siblings (19.6%) and others (10.7%).Out of 5339 caregivers, 50.7% live in a joint family system and 64.1% live in the same place as of the COVID-19 patient. The caregivers reported that their health status was at least good 86.3% while 23.8% was fair or poor.

The caregivers mentioned that the types of caregiving include the medical tasks (68.4%), household tasks (83.3%) and personal tasks (72.2%). The caregivers stated that they had spent up to 5 hours (27.8%), 6 hours to 12 hours (37.5%) and more than 12 hours (34.7%) daily for caregiving. The caregivers mentioned that they had lost less than one thousand rupees (7.1%), one thousand to four thousand (17.4%) and more than four thousand (75.4%) at a cost of caregiving. The caregivers (4768) stated that they had on average lost up to seven days (34%), eight to twenty four days (59%) and more than twenty four days (6.9%) because of caregiving. The family caregivers reported facing mild (24.9%), moderate (37.4%), and high (37.7%) financial burdens due to caregiving for COVID-19 patients.

Nearly 32.1% of the survivors hospitalized due to the disease, 22.2% admitted to the intensive care unit because of the critical condition of the disease and 5.1% faced a permanent disability due to the disease. About 65.6% of the survivors had mild to moderate level of disease infection, while 34.4% experienced severe or critical conditions of the disease. Out of 5222 survivors, 4040 (77.4%) disease duration was at most 14 days, and 1182 (22.6%) were more than 14 days remained infected with the diseases.

Table 2. Descriptive statistics of family caregivers profile variables.

Variable	N	Categories	Frequency (%)
Gender	5339	Male	2182 (40.9)
		Female	3157 (59.1)
Age (years)	5339	≤ 45	2630 (49.3)
		> 45	2709 (50.7)
Education	5214	Up to Secondary	1549 (29.7)
		Above Secondary	3665 (70.3)
Marital Status	5266	Ever Married	2941 (55.8)
		Never Married	2325 (44.2)
Occupation	5281	Employed	3521 (66.7)
		Unemployed	1760 (33.3)
Area	5288	Urban	4077 (77.1)
		Rural	1211 (22.9)
Income (PKR)	5291	≤ 60,000	2000 (37.8)
		> 60,000	3291 (62.2)
Relationship with Survivor	5272	Child	989 (18.8)
		Spouse	1154 (21.9)
		Parents	1534 (29.1)
		Siblings	1032 (19.6)
		Others	563 (10.7)
Family Size	5279	≤ 4	2481 (47.0)
		> 4	2798 (53.0)
Health Ratings	5307	Excellent	1007 (19.0)
		Very good	1289 (24.3)
		Good	1752 (33.0)
		Fair	752 (14.2)
		Poor	507 (9.6)
Living Place	5339	Same	3420 (64.1)
		Away	1919 (35.9)
Family Type	5339	Nuclear	2078 (38.9)
		Joint	2709 (50.7)
Caregiving Types	5336	Medical tasks	3649 (68.4)
	5339	Household tasks	4446 (83.3)
	5339	Personal tasks	3857 (72.2)
Caregiving Time (hours/day)	5271	≤ 5	1465 (27.8)
		6 – 12	1975 (37.5)
		> 12	1831 (34.7)
Financial Loss due to caregiving (PKR/day)	4498	≤ 1000	321 (7.1)
		1001 – 4000	784 (17.4)
		> 4000	3393 (75.4)
Workdays loss due to caregiving	4768	≤ 7	1623 (34.0)
		8 – 24	2814 (59.0)
		> 24	331 (6.9)
Financial Burden (PKR)	5339	No/Mild	1329 (24.9)
		Moderate	1995 (37.4)
		High/Severe	2015 (37.7)
Survivor Hospitalized	5289	Yes	1696 (32.1)
Survivor Admitted in ICU	1699	Yes	377 (22.2)
Survivor Permanent Disability	5295	Yes	271 (5.1)
Survivor Infection Status	5320	Mild/Moderate	3488 (65.6)
		Severe/Critical	1832 (34.4)
Survivor Disease Duration (days)	5222	≤ 14	4040 (77.4)
		> 14	1182 (22.6)

The EB scale was developed on six constructs named financial outlay (FO), financial hindrance (FH), hostile behavior (HB), care and lifestyle (CC), seeking support (SS), and psychosocial affect (PA). These constructs were confirmed through confirmatory factor analysis (CFA) (Goretzko et al., 2024). The estimated proposed path model with unstandardized coefficients is given in Figure 3 and the standardized coefficients are in Figure 4.
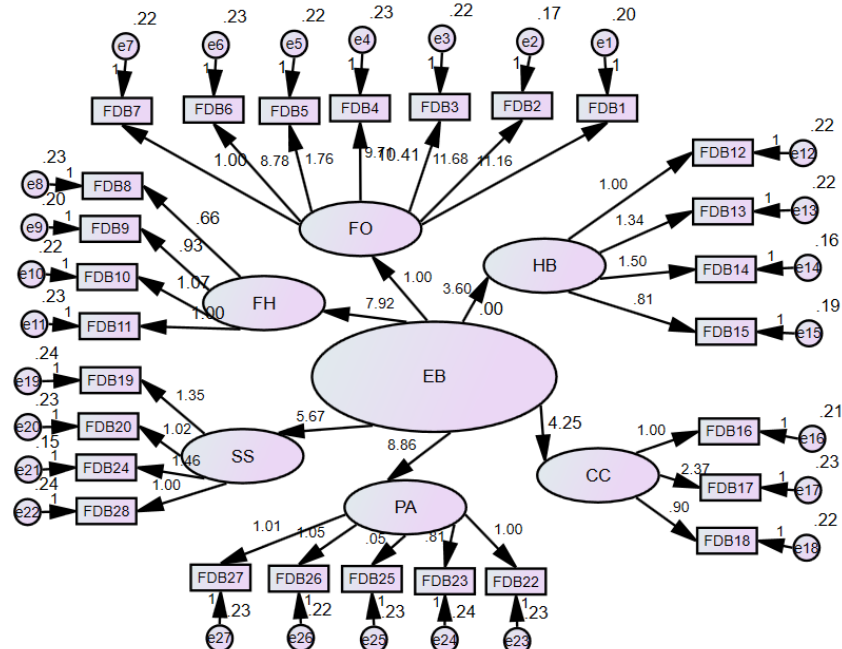

Figure 3. Estimated unstandardized coefficients for the caregivers financial burden.
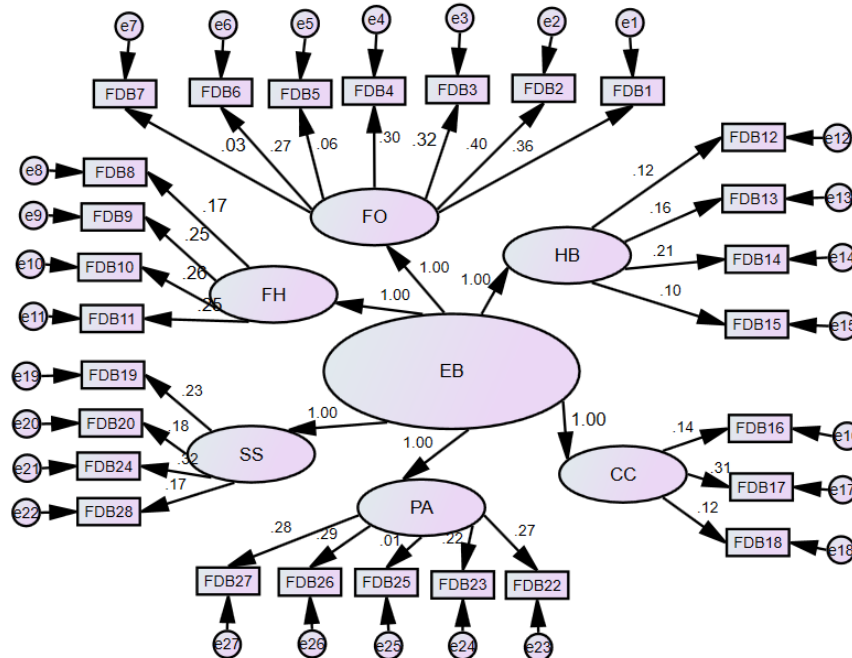

Figure 4. Estimated standardized coefficients for the caregivers financial burden.

The unstandardized and standardized regression weights with respective error variances for the estimated EB model are given in Table 3 and the goodness of fit indices in Table 4.

Table 3. Unstandardized and standardized regression weights with respective error variances for the estimated EB model.

Items	Weights		Error
	Unstandardized	**Standardized**	**Variances**
FDB1: I had to use savings.	11.157*	0.358	0.200***
FDB2: I had to borrow money or take out a loan.	11.685*	0.396	0.173***
FDB3: I could not make payments on credit cards or other bills.	10.413*	0.320	0.223***
FDB4: I cut down on spending for food and/or clothes.	9.705*	0.298	0.228***
FDB5: I cut down on spending for health care for other family members.	1.762***	0.058	0.220***
FDB6: I cut down on recreational activities.	8.781*	0.270	0.232***
FDB7: I cut down on expenses in general.	1.000	0.033	0.218***
FDB8: I skipped my treatment just because of the expensive medicine.	0.659***	0.166	0.226***
FDB9: During covid-19, I avoided myself to going hospital just because of transportation fare.	0.927***	0.247	0.196***
FDB10: During the disease period, I was worried that the grocery I bought just didn't last and I didn't/do have money to get more.	1.066***	0.264	0.225***
FDB11: For not giving proper time to my job/work the electric, gas, oil, or water (utility) company threatened to shut off services in my home?	1.000	0.246	0.229***
FDB12: During that time someone, including family, threaten me with harm for not meeting the financial responsibilities.	1.000	0.116	0.223***
FDB13: Does anyone from which you have taken debt threaten you for not giving back the debt?	1.335***	0.157	0.217***
FDB14: Did anyone, including family, insult/ scream/ curse or talk down to you for not handling the family life/ meeting the financial responsibility properly?	1.501***	0.206	0.156***
FDB15: Did anyone, including family, physically hurt you for not handling the family life/ meeting the financial responsibilities properly?	0.811***	0.101	0.193***
FDB16: Covid-19 kept me away from taking a health check on myself from regular doctor appointments.	1.000	0.142	0.208***
FDB17: I delayed or avoided my personal treatment, follow up or a recommended procedure due to financial concerns?	2.366***	0.309	0.226***
FDB18: I sell some of my belongings (house, car, jewelry, mobile, any valuable thing) for the treatment of Covid-19 / coping with financial problems.	0.902***	0.124	0.220***
FDB19: During the disease period, I depend on someone else for income or self-sufficient?	1.348***	0.235	0.236***
FDB20: I financially support some other Covid-19 affectee, to help them meet their treatment/household expenses.	1.024***	0.181	0.234***
FDB22: I fear/experienced a loss of income/ employment/ work as a result of my time diversion towards Covid-19 treatment.	1.000	0.274	0.241***
FDB23: I had faced difficulties in paying for daily household expenses then.	0.806***	0.220	0.227***
FDB24: I am currently in debt as a result of treatment expenses.	1.459***	0.315	0.236***
FDB25: My financial condition was satisfactory to me then.	0.046	0.013	0.226***
FDB26: I or my family experienced financial hardships as a result of the Covid-19.	1.045***	0.288	0.224***
FDB27: My financial condition worsened as a result of Covid-19.	1.013	0.276	0.230***
FDB28: I discussed my health/ personal/ financial issues with anyone during that time.			

* p<0.10, ** p<0.05, *** p<0.01.

Table 4. Goodness of fit indices of the proposed EB SEM model.

Indices	Values
GFI	0.949
AGFI	0.940
Chi-square / df	12.474
RMR	0.009
RMSEA	0.046

The chi-square/df goodness of fit index is greater than the acceptable cutoff ($\chi^2/df < 5$) and is a poor index to use for sample sizes over 200 (Verma & Verma, 2023). The goodness of fit indices less or not sensitive to sample sizes reported in Table 1 are in an acceptable range with respect to their cutoffs e.g., $GFI = 0.949$ (> 0.90), $AGFI = 0.940$ (> 0.90), $RMR = 0.009$ (< 0.05) and $RMSEA = 0.046$ (< 0.05) (Bueno & Chase, 2023).

Table 5. The odds ratio with 95% CI of six EB constructs with caregivers profile variables.

Profile	Categories	Financial Outlay	Financial Hindrance	Hostile Behavior	Care and Lifestyle	Seeking Support	Psychosocial Affect	Economic Burden
Gender	Male							
	Female	**1.297****	**1.196***	**1.233***	**1.250****	**1.114**	**1.344****	**1.983*****
		[1.002, 1.679]	[0.969, 1.476]	[0.990, 1.537]	[1.017, 1.537]	[0.905, 1.372]	[1.070, 1.689]	[1.327, 2.963]
Age	≤ 45 years							
	> 45 years	**1.517*****	**1.430*****	**2.035*****	**1.610*****	**1.433*****	**1.188**	**3.700*****
		[1.177, 1.956]	[1.162, 1.759]	[1.637, 2.530]	[1.313, 1.973]	[1.167, 1.759]	[0.949, 1.487]	[2.481, 5.518]
Marital Status	Single							
	Married	**1.434*****	**1.532*****	**1.173**	**1.064**	**1.235****	**1.511*****	**2.493*****
		[1.108, 1.856]	[1.240, 1.893]	[0.942, 1.460]	[0.867, 1.307]	[1.003, 1.520]	[1.203, 1.898]	[1.667, 3.729]
Occupation	Employed							
	Unemployed	**1.604*****	**1.049**	**1.228***	**1.003**	**1.502*****	**1.194**	**2.121*****
		[1.223, 2.103]	[0.842, 1.308]	[0.977, 1.544]	[0.808, 1.245]	[1.207, 1.868]	[0.939, 1.517]	[1.390, 3.237]
Education	Above Matriculation							
	Up to Matriculation	**1.583*****	**1.673*****	**1.523*****	**1.670*****	**1.608*****	**1.442*****	**4.446*****
		[1.195, 2.097]	[1.330, 2.105]	[1.203, 1.930]	[1.333, 2.092]	[1.281, 2.019]	[1.123, 1.851]	[2.842, 6.957]
Income (PKR)	> 60,000							
	≤ 60,000	**2.307*****	**1.443*****	**1.265****	**1.530*****	**2.201*****	**1.540*****	**5.577*****
		[1.770, 3.005]	[1.165, 1.787]	[1.012, 1.580]	[1.240, 1.887]	[1.776, 2.726]	[1.219, 1.945]	[3.668, 8.481]
Hospital Admission	No							
	Yes	**2.970*****	**2.056*****	**1.441*****	**1.386*****	**1.307****	**1.558*****	**6.202*****
		[2.253, 3.915]	[1.643, 2.572]	[1.145, 1.815]	[1.114, 1.725]	[1.048, 1.629]	[1.222, 1.987]	[4.002, 9.611]
Disease Duration	≤ 14 days							
	> 14 days	**1.303***	**1.944*****	**1.225**	**1.261*****	**1.815*****	**2.059*****	**4.491*****
		[0.956, 1.776]	[1.514, 2.495]	[0.946, 1.586]	[0.988, 1.611]	[1.417, 2.324]	[1.563, 2.713]	[2.752, 7.330]
ICU	No							
	Yes	**1.828***	**1.719****	**2.007*****	**1.925*****	**1.674****	**1.655****	**9.698*****
		[0.986, 3.392]	[1.088, 2.714]	[1.266, 3.182]	[1.240, 2.989]	[1.081, 2.590]	[1.003, 2.728]	[3.642, 25.827]
Infection	Mild/Moderate							
	Severe/Critical	**2.674*****	**1.508*****	**1.255****	**1.299****	**1.288****	**1.709*****	**4.591*****
		[2.041, 3.504]	[1.213, 1.875]	[1.001, 1.573]	[1.049, 1.609]	[1.038, 1.598]	[1.347, 2.169]	[3.002, 7.022]
Permanent Disability	No							
	Yes	**1.705***	**1.645****	**1.739****	**1.704****	**2.178*****	**1.343**	**5.666*****

		[0.957, 3.036]	[1.031, 2.625]	[1.081, 2.798]	[1.074, 2.703]	[1.367, 3.471]	[0.803, 2.247]	[2.283, 14.059]
Area	Urban							
	Rural	**1.124**	**1.067**	**1.770*****	**1.656*****	**1.391*****	**0.969**	**2.168*****
		[0.830, 1.521]	[0.834, 1.366]	[1.375, 2.280]	[1.299, 2.111]	[1.089, 1.776]	[0.741, 1.268]	[1.350, 3.480]
Living Type	Nuclear							
	Joint	**1.566*****	**1.335*****	**1.423*****	**1.530*****	**1.153**	**1.309****	**2.775*****
		[1.207, 2.033]	[1.079, 1.652]	[1.139, 1.778]	[1.242, 1.885]	[0.935, 1.422]	[1.040, 1.647]	[1.849, 4.167]
Living Place	Same							
	Away	**1.229**	**1.396*****	**1.894*****	**1.680*****	**1.199***	**0.970**	**2.543*****
		[0.943, 1.600]	[1.125, 1.731]	[1.516, 2.368]	[1.360, 2.077]	[0.969, 1.483]	[0.768, 1.225]	[1.681, 3.849]
Caregiving Type (Households Tasks)	No							
	Yes	**2.594*****	**1.430****	**1.667*****	**1.549*****	**1.622*****	**1.700*****	**5.848*****
		[1.838, 3.661]	[1.081, 1.891]	[1.238, 2.244]	[1.178, 2.035]	[1.231, 2.138]	[1.260, 2.294]	[3.454, 9.900]
Caregiving Type (Personal Tasks)	No							
	Yes	**2.406*****	**1.357****	**0.872**	**1.126**	**1.458*****	**1.599*****	**3.199*****
		[1.806, 3.205]	[1.076, 1.712]	[0.686, 1.108]	[0.898, 1.412]	[1.159, 1.834]	[1.245, 2.054]	[2.058, 4.973]
Caregiving Type (Medical Tasks)	No							
	Yes	**2.286*****	**1.881*****	**0.967**	**1.158**	**1.333****	**1.790*****	**4.003*****
		[1.734, 3.012]	[1.501, 2.357]	[0.768, 1.219]	[0.931, 1.441]	[1.069, 1.663]	[1.405, 2.279]	[2.612, 6.136]

* p<0.10, ** p<0.05, *** p<0.01

Table 5 presents the odds ratios with 95% confidence interval relating the caregivers profile variables to their financial burden constructs. The OR for the latent variables FO (1.297), FH (1.196), HB (1.233), CC (1.25), SS (1.114), PA (1.344) and overall EB (1.983) for female caregivers depicted that female caregivers experienced more financial burden than the male caregivers. The caregivers over 45 years of age, married, unemployed, up to secondary level education, rural, living in joint family, living away, and income up to sixty thousand rupees faced an elevated financial burden than their counterparts. The caregivers with survivors admitted to hospital, ICU, faced permanent disability, had severe or critical infection status, and diseased more than fourteen days experienced more financial strain than the competitive caregivers. The caregivers performed medical, household, and personal tasks and faced more financial challenges than their counterparts. The financial burden of family caregivers are also categorized and portrayed in Figure 5.
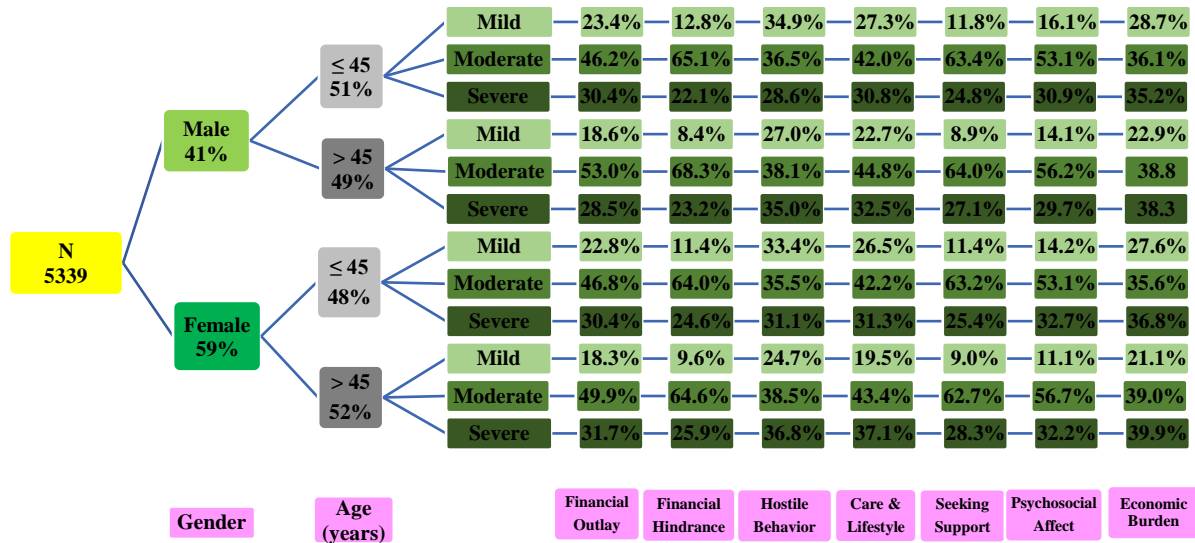
Figure 5. Gender and Age-wise Tree diagram of EB of caregivers with respect to constructs.

4. Discussion

The study highlights that family caregivers with specific socioeconomic characteristics faced a significantly higher financial strain due to COVID-19. The female family caregivers experience significantly greater financial strain due to COVID-19 compared to male caregivers, with an odds ratio (OR) of 1.983 (p<0.01). This suggests that female caregivers are nearly twice as likely as their male counterparts to report financial difficulties while providing care during the pandemic. The statistical significance (p<0.01) confirms that this difference is unlikely to be due to chance. Factors such as gender-based economic disparities and increased caregiving responsibilities among women may contribute to this heightened financial burden (Beach et al., 2021; Ervin et al., 2024; George et al., 2023; Liu et al., 2024; Pacheco Barzallo et al., 2024; Thapa et al., 2024). Addressing these challenges requires targeted support and resources for female caregivers. The study's findings demonstrate that family caregivers over 45 experienced significantly greater financial strain during the COVID-19 pandemic than younger caregivers. The odds ratio (OR) of 3.7 (p<0.01) indicates that these older caregivers were 3.7 times more likely to face financial difficulties than their younger counterparts. The outcome is aligned with other studies in literature e.g., (Beach et al., 2021; Liu et al., 2024; Ngamasana et al., 2023; Thapa et al., 2024; Truskinovsky et al., 2022). This heightened strain may be attributed to factors such as reduced income due to pandemic-related job losses, increased healthcare costs, and the additional responsibilities of caring for elderly or vulnerable family members. Older caregivers may also have fewer financial resources and savings, exacerbating their financial challenges during the pandemic. Married caregivers experienced an odds ratio (OR) of 2.493 (p<0.01), indicating they were nearly 2.5 times more likely to report financial difficulties than unmarried caregivers. Unemployed caregivers had an OR of 2.121 (p<0.01), showing they were more than twice as likely to face financial strain compared to their employed counterparts. Those with education up to the secondary level experienced an OR of 4.446 (p<0.01), meaning they were over four times more likely to report financial challenges than those with higher education levels. Additionally, caregivers with an income of up to 60 thousand had an OR of 5.577 (p<0.01), indicating they were more than five times more likely to experience financial difficulties than higher-income caregivers. These findings underscore the intersectionality of marital status, employment, education, and income in determining financial vulnerability during the pandemic. The similar findings are also quoted by many researchers in literature (Beach et al., 2021; Bechthold et al., 2023; Ervin et al., 2024; Kabembo, 2024; Keita Fakeye et al., 2022; Liu et al., 2024; Reich et al., 2023; Thapa et al., 2024; Zwar et al., 2023).

The study reveals that family caregivers living in joint family systems experienced a higher financial strain during COVID-19, with an odds ratio (OR) of 2.775 (p<0.01), meaning they were nearly three times more likely to report financial difficulties than those in nuclear family settings. Caregivers living away from their families had an OR of 2.543 (p<0.01), indicating a significantly greater financial burden than those living with their families. Additionally, caregivers residing in rural areas faced an OR of 2.168 (p<0.01), showing they were over twice as likely to encounter financial challenges compared to their urban counterparts. These findings alike others (Azman et al., 2024; Beach et al., 2021; Dellafiore et al., 2022; Liu et al., 2024; Thapa et al., 2024; Truskinovsky et al., 2022) highlight the increased vulnerability of caregivers in joint, distant, and rural living conditions, emphasizing the need for targeted support in these demographics.

The study found that family caregivers who performed various caregiving tasks during COVID-19 experienced significantly greater financial strain than their counterparts who did not engage in these tasks. Caregivers responsible for household tasks, such as cooking and cleaning, faced an OR of 5.848 (p<0.01), indicating they were nearly six times more likely to report financial difficulties. Those performing medical tasks, such as administering medications and managing healthcare appointments, had an OR of 4.003 (p<0.01), suggesting they were four times more likely to experience financial strain. Additionally, caregivers providing personal care tasks, such as bathing and dressing, had an OR of 3.199 (p<0.01), meaning they were over three times more likely to face financial challenges. These findings as other studies (Beach et al., 2021; Irani et al., 2021; Rahimi et al., 2021; Sheikhbardsiri et al., 2022; Zwar et al., 2023) underscore the financial impact of increased caregiving responsibilities during the pandemic.

The study reveals that family caregivers of COVID-19 survivors face significant financial strain when the survivors require intensive medical care or experience severe outcomes. Caregivers whose survivors were admitted to the hospital experienced an OR of 6.202 (p<0.01), indicating they were over six times more likely to face financial difficulties compared to caregivers of non-hospitalized patients. For caregivers of patients admitted to the ICU, the financial strain was even more pronounced, with an OR of 9.698 (p<0.01), highlighting nearly ten times the financial burden due to the high costs of critical care and extended hospital stays. Caregivers of patients with a disease duration of over 14 days faced an OR of 3.199 (p<0.01), showing they were over three times more likely to encounter financial stress, likely due to prolonged treatment costs and caregiving responsibilities. Additionally, caregivers dealing with survivors who faced permanent disability had an OR of 5.666 (p<0.01), indicating over five times the financial burden, reflecting the long-term care and medical expenses required. Lastly, caregivers of patients with severe or critical infections faced an OR of 4.591 (p<0.01), highlighting the increased costs associated with treating severe COVID-19 cases. These findings emphasize the substantial economic impact on caregivers when dealing with severe and long-term COVID-19 cases, underscoring the need for targeted financial support and resources for these individuals as suggested in other studies (Beach et al., 2021; Irani et al., 2021; Mirzaei et al., 2020; Picardi et al., 2021; Rahimi et al., 2021; Reich et al., 2023; Thapa et al., 2024).

5. Conclusion

The current study focuses on one of the most important economic burdens that family caregivers have borne due to the COVID-19 pandemic. In terms of aetiology, this is attributable to demographic characteristics of the caregivers, such as age, marital status, and employment status, as well as factors related to the severity of the disease and duration of illness of survivors. Those caregivers experiencing hospitalization, admission to ICU, longer duration of illness, and permanent disabilities are the worst hit. These findings underscore the need for support and resources to attenuate these challenges. Addressing these needs in a way that can help to take some of the financial burden off the caregiver so they are supported in having effective care for their loved one.

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