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Research Article

Risk Factors with the Greatest Impact on Caregiver Burden in Informal Homecare Settings in Austria: A Quantitative Secondary Data Analysis

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The aim of this study was to reveal the factors that most contribute to caregiver burden in informal adult caregivers, caring for adult care recipients in homecare settings in Austria. A quantitative supplementary secondary analysis based on the dataset of the Austrian Caregiver Study was conducted between February 2021 and March 2022. Based on the dataset of the primary study, which was deemed representative for caregivers in homecare context, 2532 caregivers (92.3% of the cases) were selected for data analysis. Theoretically relevant regressors on caregiver burden, which were available in the dataset, were identified based on an adaptation of Pearlin's framework of caregiver stress. Data analysis was conducted using descriptive statistics followed by multifactorial analysis of variance and a logistic regression model. Multiple variables, related to (1) sociodemographic characteristics of both care recipients and caregivers; (2) caregiving situation; (3) family-, work-, and finance-related characteristics; (4) availing social support and services, emerged as statistically significant owing to their influence on caregiver burden. Further data analysis illustrated that the five variables with the greatest impact on caregiver burden were as follows: (1) caregiver's health status, (2) care recipient's behavioral problems, (3) frequency of provision of direct care, (4) time spent on care, and (5) care dependency level.

1. Introduction

According to a report by the European Union, almost 48% of the current elderly population in 28 countries has moderate or severe difficulties with personal care and/or in conducting household activities [1]. Between 2016 and 2018, 8% to 40% of the adult population was engaged in providing care for older adults with disabilities [2]. In this sense, informal family caregiving in home care settings is the most frequent form of care provision.

Family caregivers play a pivotal role in caring for older adults with chronic conditions and nursing care dependency in their family and social environments [3]. They have been described as an "invisible workforce" [4] that helps sustain the healthcare structure responsible for long-term care in homecare settings. This is mainly due to three interrelated reasons: recent demographic and epidemiological developments, changes in the structure of the healthcare system itself, and changes in familial roles and structures [5].

Firstly, the ageing of the population and the increase of chronic illnesses among older adults are driving the demand for healthcare and caregiving services in Western societies [5]. In the European Union, for example, life expectancy has

increased steadily in recent decades; today, a European citizen can expect to live to an average age of 85 years [1]. However, citizens aged 65 years can only expect to live an average of 10 more years in a good health condition [1]. As a result, healthcare utilization is linked to older age; in Norway, for example, citizens aged 65 and above (15% of the population) account for almost half of the total cost of healthcare services [6].

Secondly, the sustainability of the healthcare system requires economically efficient structures, which are not currently sufficient to meet the current demand for long-term care [5]. Since the healthcare system alone does not provide it, the responsibility for caring for older adults or for adults with disabilities falls on family members. Austrian health policy recognizes the inclination of care recipients and caregivers to remain in their homecare setting and encourages this expectation on family members, under the motto: "Care *at home* instead of *at the nursing home*" [7].

Thirdly, many families are struggling to meet the demand for care within the family. This is mainly due to the increased professional emancipation of women and the gradual decline in the number of adults available to provide care within families [5]. Nevertheless, the need for long-term care remains, and it is—because of the limited capacity of the healthcare system—primarily organized through caregivers.

2. Background

Kent et al. have shown that individuals in a caregiving role typically invest considerable amounts of time and energy in providing direct care to their loved ones, and in organizing the necessary financial and material resources to do so. This investment, paired with an underdeveloped family-centered primary healthcare and home care services, as well as a tendentially sinking number of available family members are pushing the situation of caregivers toward increasingly burdensome circumstances [8].

The phenomenon of caregiver burden, often defined as caregiver stress or caregiver strain, is a well-researched topic in nursing and healthcare sciences. Previously, Zarit et al. [9] defined caregiver burden as "the extent to which caregivers perceived their emotional or physical health, social life, and financial status as suffering as a result of caring for their relative." From this perspective, caregiver burden is a subjective state that affects different dimensions of the caregiver's life and is associated with negative health-related outcomes, such as anxiety or depression, which are associated with negative effects on relationships, reduced self-care, and personal economic disadvantages [5].

Many studies confirm that the multiple influencing factors of caregiver burden—caring for an elderly person, a highly care-dependent person, or a person with mobility or behavioral problems, among others—correlate with higher burden and stress levels. Factors related to work or living conditions also appear to have an impact on caregiver burden [10].

Despite the importance of caregiver burden, a number of studies investigating this phenomenon either lack sufficient theoretical background or insufficiently consider contextual factors when exploring this issue [11]. Nevertheless, a number of studies propose a theoretical perspective on caregiver burden that explains its relevant influencing factors. Pearlin et al. developed a model to describe caregiver burden and its influencing factors. This model emphasizes the impact of background and contextual factors (such as sociodemographic characteristics of care recipients and caregivers), identifying both primary (the characteristics of the care situation itself), and secondary (such as family-, work- and finance-related characteristics) stressors that can exacerbate the level of caregiver burden (i.e., one of the relevant caregiver symptoms which are the outcome of caregiver stress). At the same time, the authors identified mediators, such as coping mechanisms and various types of social support, that might contribute to reducing caregiver stress [12].

Pearlin's Framework of Caregiver's Stress was originally developed to address caregiver stress in individuals caring for persons with Alzheimer's disease [12]. Many authors have since adapted this conceptual model to explore caregiver burden in different settings. The relationships between the dimensions that influence caregiver burden are complex and have been interpreted differently, depending on the specificities of research and practice settings. For our study, we propose a background based on this theoretical approach to caregiver burden, as shown in Figure 1. We chose this framework owing to its relevance and practicability in previous explorative quantitative studies regarding this topic [10, 13].

Given the reliance of healthcare systems on caregivers to support care-dependent people in homecare settings, it is of paramount importance that the factors associated with increased levels of caregiver burden are addressed. Understanding which factors have the greatest impact on caregiver burden and the interaction between them can help to develop specific healthcare policies and provide guidance on what support measures healthcare professionals should consider, when supporting this vulnerable group to provide care [14]. This is particularly important in Austria, the focus of this study, where there is still a lack of studies using representative datasets and statistical models to identify the most influential factors in caregiver burden across the country, considering the characteristics of both care recipients and caregivers.

In Austria, about 0.95 million people are involved in caregiving and about half a million people receive a care allowance owing to a care dependency. This represents about 10% and 5% of the country's total population, respectively; in other words, one in six people is involved in a long-term care arrangement, either as a care recipient or as an informal caregiver [15]. It is known that around 70% of those receiving care are cared for exclusively by family or informal networks embedded in their social environment [16].

The healthcare and social system in Austria is mainly financed by the public sector and based on the Bismarck model, relying on compulsory social insurance with universal cash benefits, and is supplemented by private voluntary insurance and copayments for services [17, 18]. In this sense, despite significant public investments in the social
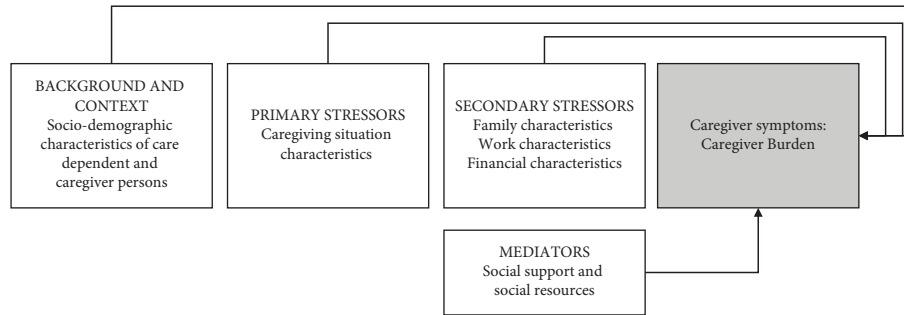
FIGURE 1: Theoretical background (adapted from the conceptual model of caregiver stress [12].

and healthcare system, the same system in Austria still relies heavily on informal care and cash for care professional services in private households to support people in need of care [16].

Previous studies on informal caregiving in Austria have shown that caregivers are often available for care recipients around the clock or provide them with social support (such as providing companionship or cheering up), but also that they often perform personal direct care activities (e.g., dressing, assistance with personal hygiene, or toileting assistance). Organizational and/or instrumental activities (such as shopping, preparing meals, dealing with authorities, and post) constitute a substantial part of their daily work [15]. Although Austrian long-term care policy recognizes some caregivers as coclients owing to their intensive involvement in providing care, and despite regulated efforts to support caregivers (e.g., through measures like caregiver's leave or psychosocial support), many individuals in this role are still not equally included in the measures currently implemented. The lack of monitoring regarding informal caregivers also makes it difficult to analyze their need for support and hinders evidence-baseddecision-making targeting specific needs associated with caregiving burden [16]. With this in mind, this study aims to contribute to the discussion on the pressing conditions related to caregiving in homecare settings in Austria that may be contributing to caregiver burden, and the need to consider these when developing further long-term policies in this setting.

3. Materials and Methods

This study aims to uncover the influencing factors with most impact on caregiver burden in adult caregivers caring for adult care recipients in homecare settings in Austria.

The following research questions guided the data analysis:

(i) What is the influence of the (1) sociodemographic characteristics of care recipients and caregiver persons, (2) caregiving-related characteristics, (3) family-, work-, and finance-related characteristics, and (4) utilization of social support and social resources on caregiver burden in homecare settings in Austria?

(ii) Which of the identified influencing factors show the most impact when assessing the risk of high levels of caregiver burden in homecare settings in Austria?

A secondary analysis was conducted between February 2021 and March 2022. According to Heaton [19], a secondary analysis consists in a research method, through which available research data may be utilized to investigate a different (new) research question. When a secondary analysis aims to answer research questions, which became scientifically relevant *after* the original research project was concluded, such as in our case, the type of secondary analysis is defined as a supplementary analysis [19].

3.1. Primary Study/Data Source

3.1.1. Primary Study. The primary study was a cross-sectional study conducted in Austria regarding the situation of care recipients and their caregivers, aiming to provide insight into the situation of family caregivers and the development of caregiver networks [15].

3.1.2. Participants. The participants of the Austrian Caregiver Study were recruited from a stratified random sample consisting of 11,487 recipients of long-term care allowance. The sample was stratified according to the known distribution of the different care allowance levels in Austria at the cutoff date of 30th September 2017.

3.1.3. Data Collection. For the purpose of data collection, questionnaires were sent to care allowance recipients, requesting them to pass the questionnaires on to the person in the family or circle of friends who takes care of the care allowance recipient, in their home, most frequently. The questionnaire consisted of sixty-three items and included questions regarding the following: (1) characteristics of care recipients, (2) care situation, (3) effects of care and support, (4) private environment, (5) support from formal services, (6) other support services, and (7) characteristics of the respondent. The questionnaire was developed based on a copy-paste technique built on validated questionnaires (e.g., EUROFAMCARE [20], Resources of family caregivers survey [21], and experts' consensus. The theoretical background was the framework of previous studies on caregivers in Austria [22]. Data collection was conducted

between November 2017 and January 2018. A total of 29.7% of the sent questionnaires were returned completely ($n = 2742$).

3.1.4. Data Source/Type.

The generated data consisted of 253 quantitative variables. The dataset was deemed representative for Austria [15].

3.1.5. Ethical Considerations.

The primary study was conducted according to national regulations for scientific research. All participants received an information letter in the primary study, where the study's aim and context were explained and where they could give an informed consent regarding their participation. Informed consent included the authorization for data utilization and further data analysis in secondary research projects.

3.2. Secondary Analysis

3.2.1. Sample.

Based on this dataset, 2532 cases (92.3% of the observations) were selected for secondary analysis. A case was included if the caregiver: (1) was an adult; (2) was caring for an adult or older adult at home. We decided to focus on adult caregivers and on adult, i.e., older adult care recipients because of the demographic developments and the relevance of both of these age groups for health policy development in Austria.

3.2.2. Variables.

Self-perceived caregiver burden is the dependent variable of our study. Caregiver burden was assessed using a general item "*How much of an overall burden do you feel from caring for the person you are caring for*?" and an endpoint-scale ranging from 1 ("not at all") to 5 ("very strongly"). Following the identification of relevant influencing factors for caregiver burden in the literature (based on the model of caregiver stress of [12], Figure 1), relevant questionnaire items were identified and categorized in *regressor* groups (Figure 2). Considering the theoretical background, we considered variables regarding *background and context*, *primary stressors*, *secondary stressors*, and the *utilization of social resources*:

(1) For exploring the influence of *background and context* we regarded sociodemographic characteristics of both (1.1) care recipient and (1.2) caregiver

(2) For exploring the influence of *primary stressors*, we regarded the characteristics of the caregiving situation itself

(3) For exploring the influence of *secondary stressors*, we regarded factors concerning family, work, and finance-related characteristics

(4) And for exploring the influence of social support as mediating factors we regarded (4.1) utilization of social support as well as (4.2) formal (i.e., professional) social resources (*mediators*)

3.2.3. Data Analysis.

Data analysis was conducted in IBM SPSS Statistics 28 and RStudio v. 2021.09.1 + 372. Following descriptive analysis and exploratory factorial analysis, four multiple generalized linear models were calculated for each of the defined regressor groups using multifactorial analysis of variance (mANOVA) to identify the influence of single factors on caregiver burden and to explore interactions between factors within each regressor group. By means of mANOVA, significant single regressors, which did not show significant interactions with other factors, were selected within the identified regressor groups for further modelling. The impact of the identified single regressors on high levels of caregiver burden was then estimated using a logistic regression model and odds ratios (OR). The first steps for logistic statistical modelling consisted in recoding caregiver burden to a dichotomous variable and fitting a generalized binomial logistic model. The new dependent variable "burden" was coded with number 1 if caregiver burden was equal to or greater than 4 (i.e., high level of caregiver burden), and with 0 otherwise (i.e., low level of caregiver burden or no caregiver burden at all). A balanced case distribution of the response variable burden was observed across the regressors (see Supplementary Information File 2). Model selection was then conducted by manually eliminating variables stepwise and backwards. The decision to eliminate or retain a regressor was based on the Akaike Information Criterion (AIC), interactions between variables, alterations on p and/or OR values, and iterative discussion to the theoretical relevance of the regressors in the research team. Regressors with a larger or smaller OR were considered to have the most impact on caregiver burden. Confounders were addressed within the statistical model. Missing values were coded with "99" in SPSS and "NA" in R and excluded from the statistical modelling listwise. The level of statistical significance was set at, respectively, $\alpha = 0.05$.

4. Results

In total, 2532 cases were considered for secondary analysis. Caregiver age varied between 18 and 99 years ($M = 62.0$, SD = 12.9 years). A total of 72.0% were women ($n = 1779$), whereas 77.0% ($n = 1902$) were married or lived together in a partnership. Approximately 21% completed high school education or higher education ($n = 507$), and 29.7% were professionally active ($n = 698$) at the time of the primary study. Merely 7.7% ($n = 187$) did not have health insurance. Most participants lived in rural areas (64.4%, $n = 1589$). Almost half of the participants reported a very good/good health status (47.8%, $n = 1172$), whereas 8.2% ($n = 202$) reported poor/very poor health status (middle category, "fair health status" = 44.0%, $n = 1081$). More than half of the caregivers lived together with the care recipient they were caring for (59.9%, $n = 1453$). For caregivers who were not living with the care recipient (42.0%, $n = 1064$), the frequency of visits was considered intense in 54.3% of the cases ($n = 578$, i.e., as in multiple times a day or daily).

Of the care recipients, 60.4% were women ($n = 1518$). In approximately 60.6% of the cases care dependency occurred
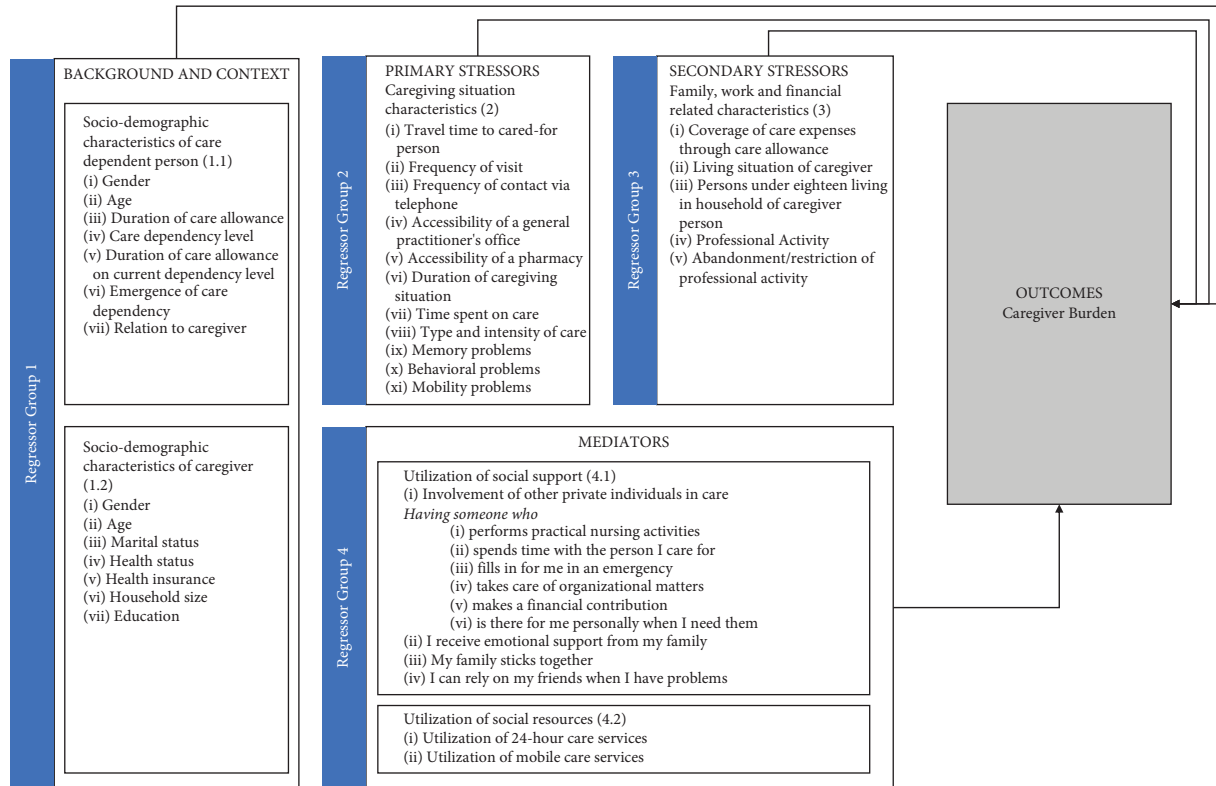
FIGURE 2: Variables included in statistical data analysis.

progressively over time ($n = 1472$). The mean level of care dependency was level 3.3 (SD = 1.8, in a range from 1 "lowest" to 7 "highest care dependency level"). A total of 17.9% ($n = 453$) of caregivers reported recurring to 24-hour homecare assistance services, and approximately 35.0% ($n = 868$) were being frequently visited by mobile healthcare services at home.

4.1. Caregiver Burden.
In the original study, 47.1% of caregivers reported a strong or very strong level of caregiver burden ($n = 1148$). Descriptive analysis ($n = 2438$) showed a mean of 3.4 (SD = 1.6) (Figure 3). The normal probability plot (Q-Q plot) showed approximately normally distributed quantiles (see Supplementary Information File 2). According to the literature, this type of variable may be addressed as a metric variable when appropriate statistical analysis methods are considered [23]. The variable was, therefore, treated as a metric and normally distributed for further data analysis.

4.2. Type and Frequency of Performed Care Activities.
Eighteen variables in the original dataset aimed to survey the type and frequency of the performed caregiving activities, using an ordinal scale from 1 ("daily") to 5 ("never"). To facilitate a parsimonious data analysis, we reduced these variables to a small set of uncorrelated principal components containing most of the information of the original data by means of principal component analysis (PCA) [24] (see Supplementary Information File 1). The components direct care, support in daily life, mobility and joint dislocations, and organizational activities were generated (Figure 4).

The most frequently performed caregiving activities were helping with activities for support in daily life, such as doing housework and preparing meals as well as keeping company and shopping ($M = 4.3$, SD = 0.9), followed by direct care activities, such as assisting with toileting or incontinence care, as well as administering medication, assisting with eating, and drinking ($M = 3.6$, SD = 1.3). Tasks regarding mobilization and the joint physical dislocations to outside the household were the third most frequently performed activities ($M = 3.3$, SD = 1.3) and the least frequently type of performed caregiving activities regarded *organizational* matters, such as taking care of administrative and postal matters or taking care of finances ($M = 3.3$, SD = 1.1).

4.2.1. Selecting Factors Influencing Caregiver Burden.
Before conducting mANOVA, variance homogeneity across regressor groups was tested for all independent variables using Levene's test for equality of variances and was non-significant ($F(1.1) = 1.058$, $p = 0.190$; $F(1.2) = 1.057$, $p = 0.182$; $F(2) = 1.187$, $p = 0.292$; $F(3) = 1.180$, $p = 0.165$; $F(4.1) = 0.720$, $p = 0.997$; $F(4.2) = 1.386$, $p = 0.245$). Interaction effects were controlled within regressors groups. The results showed that the following significant factors influenced caregiver burden based on the differences in variances of the different groups of independent variables:

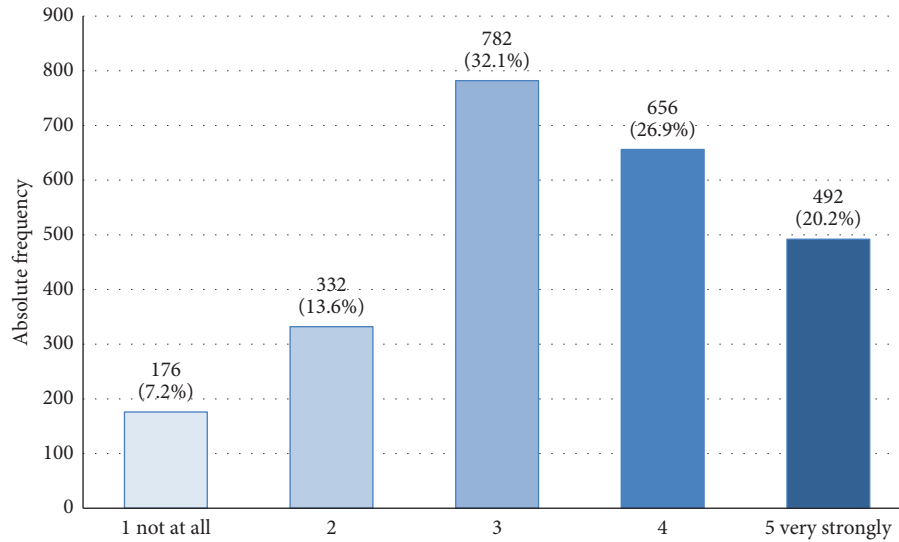(1) Amongst the characteristics of care recipients, the care dependency level ($p < 0.001$) and the relation to

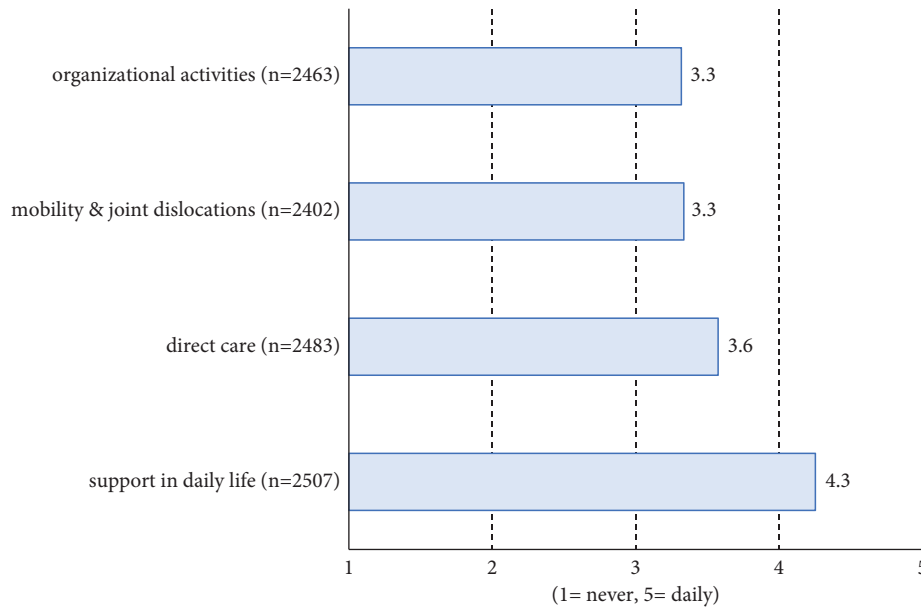FIGURE 3: Intensity of caregiver burden ($n = 2438$, missing $= 94$).

FIGURE 4: Components of performed caregiving activities and their mean frequency ($n = 2532$).

the caregiver ($p < 0.001$) had a statistically significant influence on caregiver burden. Regarding the characteristics of caregivers, gender ($p < 0.001$), health status ($p < 0.001$), and household size ($p = 0.001$) played a key role. Specifically, caregivers who were women, had a poorer health status, or were caring for care recipients with a higher dependency level or for a parental figure, reported higher levels of caregiver burden.

(2) Time spent on care was a significant factor for caregiver burden ($p < 0.001$, after statistical interaction control with the variable of travel time to cared-for person). All dimensions of caregiving activities were statistically significant except for activities regarding the support in daily life ($p = 0.736$).

Both behavioral and mobility problems of the care recipient were relevant as well ($p < 0.001$ and $p = 0.002$, respectively). Specifically, caregivers who invested more time in direct care provided care relating to mobility, joint dislocations and organizational matters, as well as caregivers caring for care recipients with behavioral and mobility problems, reported higher levels of caregiver burden.

(3) When considering family-, work-, or finance-related characteristics, the fact that care expenses were being covered through care allowance ($p = 0.001$), the living situation ($p < 0.001$) as well as the abandonment or restriction of professional activity ($p < 0.001$) were important influences on caregiver burden: caregivers who gave up aspects of their

professional activity, who had insufficient financial support and were living with care recipients, reported higher levels of caregiver burden.

(4) Having someone who takes care of organizational matters ($p = 0.005$) or is dependably there for the caregiver when he or she needs them ($p = 0.020$), as well as having dependable friends when confronted with problems ($p < 0.001$), were all important aspects regarding social support that were associated with lower caregiver burden. As expected, caregivers using 24-hour care services ($p = 0.001$) or receiving frequent home care visits from healthcare professionals ($p < 0.001$) showed lower levels of caregiver burden.

All significant influencing factors were discussed regarding theoretical conceptual relevance and included for further data analysis (Table 1).

4.2.2. Modelling Caregiver Burden. A total of 1963 cases (77.5%) were included in the regression model. Of these, 48.9% ($n = 960$) reported high levels of caregiver burden owing to the caregiving situation (vs. $n = 1003$, 51.1%). Descriptive analysis of the included cases is presented in Tables 2 and 3.

The final model and OR are presented in Table 4. The model is statistically significant to explain high levels of caregiver burden (likelihood ratio chi-square test = 614.709, d$f = 5$, $p < 0.001$). Compared to the initial model the final logistic regression model had a higher AIC (1563 vs. 883) but showed better goodness of fit regarding deviance, standardized residuals, and influencing cases. There were no major interactions between regressors, all regressors were statistically significant and theoretically relevant (see Supplementary Information File 3).

In the following section, the influence of each identified statistically significant regressor will be explained through the interpretation of the OR values. Parallelly, the association of each independent variable, which was included in the final model in Table 4, and the original dependent variable of caregiver burden will be visualized using simple bivariate statistics (Figures 5(a)–9(a)). Accompanying these graphics are the partial residual plots for all fitted regressors in the final model, which represent the influence of each independent variable on the dependent binomial variable burden, accounting for the effects of the other fitted regressors in the same model (Figures 5(b)–9(b)).

The greater the care dependency level of the care recipient, the greater the chance of high levels of caregiver burden occurring: our model estimated that for each increasing level of care dependency, the odds of caregiver burden increased 1.13 times (confidence interval (CI) = (1.07; 1.21), Figure 5(b)). Furthermore, and according to our model, caregiver's health status impacts significantly high levels of caregiver burden. For every level that caregivers estimate their own health status negatively, the odds of caregiver burden increased 2.39 times (CI = (2.07; 2.75), Figure 6(b)).

Caring for a care recipient with behavioral problems increases the odds of high levels of caregiver burden as well: it is approximately two times greater in this case (OR = 1.99, CI = (1.61; 2.46), Figure 7(b)). The more frequently caregivers provided care, investing their time almost permanently in caregiving, the greater caregiver burden: the odds of caregiver burden increased 1.32 times for this group of caregivers (CI = (1.03; 1.68), Figure 8(b)).

Providing direct care activities, such as assisting with eating and drinking or assisting with toileting or incontinence care, influenced the odds of high levels of caregiver burden: for each unit increased in the mean frequency of performed caregiving activities related to direct care, the odds of caregiver burden increased 1.72 times (CI = (1.55; 1.91), Figure 9(b)).

Although single variables regarding family, work, and financial characteristics and the utilization of social support and social resources showed a strong influence on caregiver burden when regarded separately, they showed multiple interactions between themselves and other significant regressors and were therefore not included in the final model.

5. Discussion

Our study focused on adult caregiver burden in the homecare setting in Austria, considering known factors in the literature and aiming to identify influencing factors with the greatest statistical impact on high levels of caregiver burden. Almost 50% of caregivers in our study reported high levels of caregiver burden. We confirmed previous findings, revealing that caregiver burden is a common condition associated with family caregiving [8]. In addition, we were able to confirm that factors influencing caregiver burden, as defined in Pearlin's conceptual model of caregiver stress [12], have a particular relevance for predicting this problem. Here, we have shown that factors related to all of the dimensions of background and context, primary stressors, secondary stressors, and mediators were associated with differences in caregiver burden. Among these, the following factors were shown to have a particular impact on high levels of caregiver burden: (1) caregiver's health status, (2) managing behavioral problems of care recipient, (3) high frequency of provision of direct care (i.e., instrumental) activities, (4) duration of time that caregiver spends providing care, and (5) a higher care dependency level of the care recipient (Figure 10).

Caregiver burden is a topic that has been widely explored in recent nursing research [5, 27]. According to Pearlin's conceptual model of caregiver stress [12], known reasons for caregiver burden are (1) specific sociodemographic characteristics of both the caregiver and care recipients (background and context), (2) the caregiving situation itself (primary stressors), (3) characteristics regarding family, work and financial situations (secondary stressors), and (4) the level and type of social support and social resources (mediators). Recent theoretical developments have focused on the influencing factors of caregiver burden. For example, Liu et al. [26] conducted a concept analysis and identified the antecedents to caregiver burden as insufficient financial

TABLE 1: Statistically significant variables in the different regressor groups.

Regressor group	Variable	F	Sig.
(1.1) Characteristics of care-dependent person	Gender of care-dependent person	0.812	0.368
	Age of care-dependent person	1.344	0.251
	Duration of care allowance	1.645	0.131
	Care dependency level	22.614	<0.001
	Duration of care allowance on current dependency level[a]	3.869	0.001
	Emergence of care dependency	0.083	0.773
	Relation to caregiver	9.870	<0.001
(1.2) Characteristics of caregiver person	Gender of caregiver	15.262	<0.001
	Age of caregiver	1.640	0.109
	Marital status	0.037	0.991
	Health status	91.581	<0.001
	Health insurance coverage	0.789	0.454
	Household size	6.829	0.001
	Education	1.324	0.251
(2) Caregiving situation related factors	Travel time to cared-for person[b]	3.366	0.010
	Frequency of visit	2.315	0.056
	Frequency of contact via telephone	0.567	0.726
	Accessibility of a general practitioner's office	1.378	0.240
	Accessibility of a pharmacy	1.104	0.354
	Duration of caregiving situation	1.374	0.223
	Time spent on care[b/c]	1.491	0.223
	Intensity of care: direct care	19.166	<0.001
	Intensity of care: support in daily life	0.114	0.736
	Intensity of care: mobility and joint dislocations	10.130	0.002
	Intensity of care: organizational	15.083	<0.001
	Memory problems	2.489	0.115
	Behavioral problems	12.629	<0.001
	Mobility problems	9.848	0.002
(3) Family-, work-, and finance-related factors	Coverage of care expenses through care allowance	5.378	0.001
	Living situation of caregiver	25.656	<0.001
	Persons under eighteen living in the household of caregiver person	0.243	0.622
	Professional activity[c]	0.045	0.832
	Abandonment/restriction of professional activity	21.755	<0.001
(4.1) Social support	Involvement of other private individuals in care	2.031	0.154
	They perform practical nursing activities	1.145	0.334
	They spend time with the person they care for	1.291	0.272
	They fill in for me in an emergency	2.115	0.077
	They take care of organizational matters	3.787	0.005
	They make a financial contribution	0.726	0.575
	I have a person who is there for me personally when I need them	2.936	0.020
	I receive emotional support from my family	0.591	0.669
	My family sticks together	1.389	0.235
	I can rely on my friends when I have problems	8.525	<0.001
(4.2) Social resources	Utilization of 24-hour care services	11.803	0.001
	Utilization of mobile care services	26.061	<0.001

[a]Loss of significance after statistical control: the independent variable *Duration of care allowance of current dependency level* lost statistical significance when modelled with the variables *Duration of care allowance* and *Care dependency level* ($F(df = 6) = 9.148$, $p = 0.516$) and was eliminated. [b]Loss of significance after statistical control: the independent variable *Travel time to cared-for-person* lost statistical significance when modelled with the variable *Time spent on care* ($F(df = 4) = 1.457$, $p = 0.362$) and was eliminated. When assessing the interaction between variables and their effect on caregiver burden, the variable *Time spent on care* was statistically significant ($F(df = 1) = 34.223$, $p < 0.001$) and was considered for further data modelling. [c]Considered conceptually relevant after discussion in the research team.

TABLE 2: Descriptive analysis: categorical regressors.

		N	%
Time spent on care	0 for a defined period of hours	1077	54.9
	1 permanently	886	45.1
	Total	1963	100.0
Symptoms: behavioral problems	0 no	1102	56.1
	1 yes	861	43.9
	Total	1963	100.0

TABLE 3: Descriptive analysis: continuous regressors.

	N	Range	M	SD
Care dependency level: 1 "lowest care dependency level", 7 "highest care dependency level"	1963	1–7	3.3	1.8
Direct care: Frequency of performed activities: 1 "never", 5 "daily" (scale inverted)	1963	1–5	3.6	1.3
Health status: 1 "very good", 5 "very poor"	1963	1–5	2.5	0.8

TABLE 4: Final logistic generalized linear regression model on caregiver burden.

| Parameter	Estimates	Std.-error	95% Wald-CI		Sig.	OR	95% Wald-CI	
			2.5%	97.5%			2.5%	97.5%
(Intercept)	−5.049	0.2758	−5.590	−4.508	<0.001	0.006	0.004	0.011
Caregiver's health status (1-very good, 5-very poor)	0.870	0.0718	0.729	1.011	<0.001	2.387	2.073	2.748
Symptoms: behavioral problems (1-yes)	0.688	0.1085	0.476	0.901	<0.001	1.990	1.609	2.462
Intensity of care: direct care (1-never, 5-daily)	0.540	0.0538	0.435	0.646	<0.001	1.716	1.545	1.908
Time spent on care (1-permanently)	0.275	0.1233	0.034	0.517	0.025	1.317	1.034	1.677
Care dependency level (1-lowest, 7-highest)	0.130	0.0325	0.066	0.193	<0.001	1.139	1.068	1.213
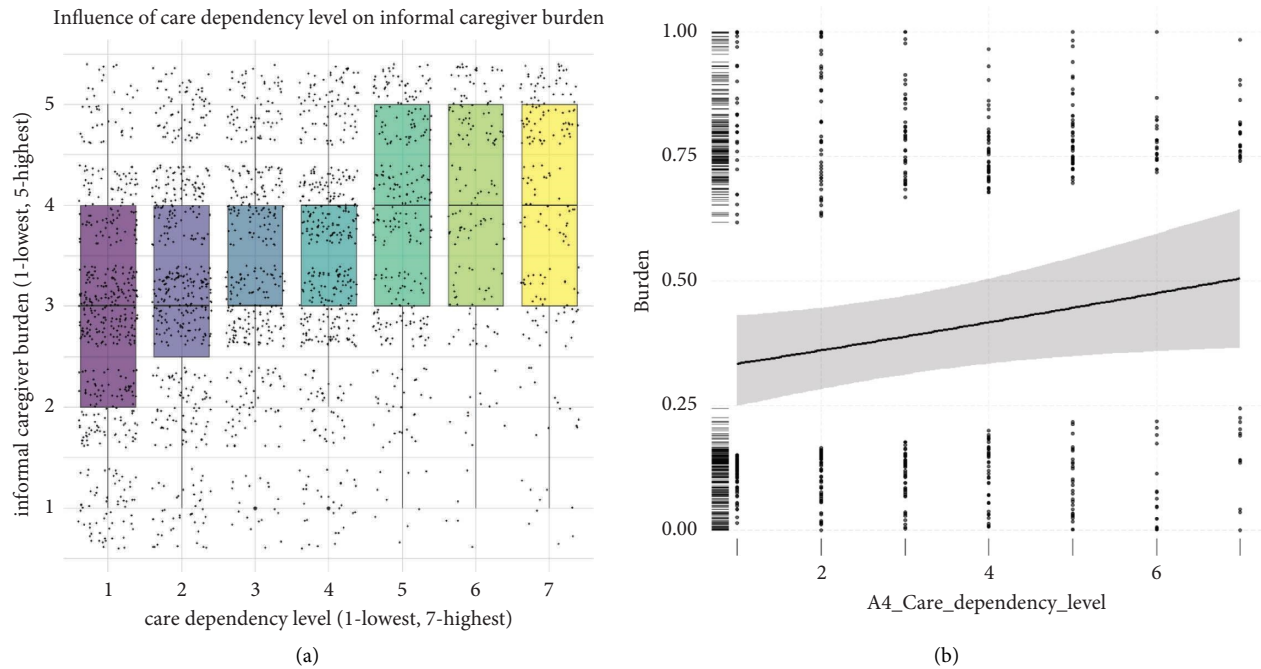
FIGURE 5: (a, b) Influence of care dependency level on caregiver burden.

resources, multiple responsibility conflict, and lack of social activities. These are included in the original Pearlin's conceptual model of caregiver stress [12] under secondary stressors and mediating aspects of caregiver burden.

According to our findings, there are many relevant factors influencing caregiver burden, such as caregivers' gender, living and professional situation, or their relationship to the care recipient. These results are partly consistent with the multidimensionality of caregiver burden as explained by Pearlin et al. [12] and Liu et al. [26] However, when a greater intensity of caregiver burden is considered and the specific influencing factors are weighted, it becomes

clear that some factors are more relevant than others in independently predicting caregiver burden. Here, the statistical impact of individual aspects related to secondary stressors and mediating aspects related to social support and social activities, as identified by Liu et al. [26], appears to be lacking. Although this might be expected for factors regarding the utilization of *social support and resources*; because of their theorized complex mediating effect regarding caregiver burden [11, 12], the question remains whether this is also the case for *secondary stressors*. If so, this may be one of the reasons why we did not find individual aspects of secondary stressors with a significant effect on caregiver
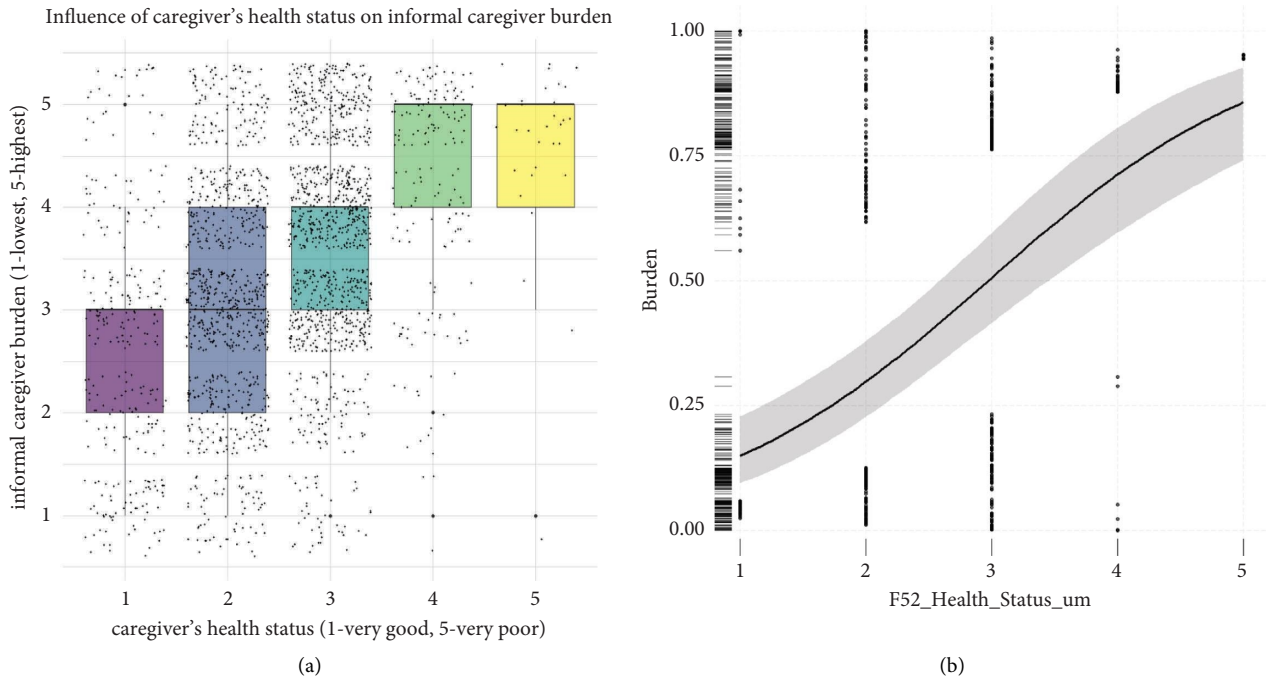
Influence of caregiver's health status on informal caregiver burden

(a)

(b)

FIGURE 6: (a, b) Influence of caregiver's health status on caregiver burden.

Influence of caring for a care dependent person with behavioural problems on informal caregiver burden
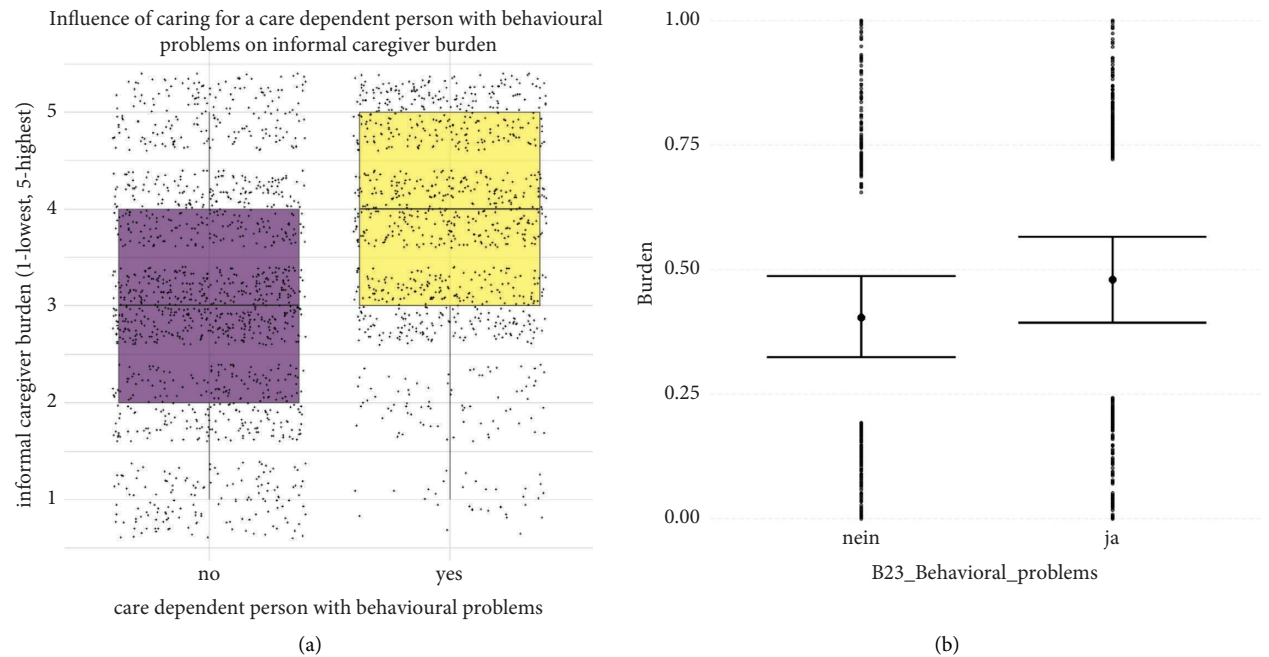
(a)

(b)

FIGURE 7: (a, b) Influence of caring for a care-dependent person with behavioral problems on caregiver burden (reference category: caring for a care-dependent person without behavioral problems).

burden, that is, they may operate through complex mechanisms and, therefore, not be identifiable using methods that rely on linear relationships. Nevertheless, in contrast to our study, other authors using similar statistical analysis procedures have been able to identify the influence of *secondary stressors* on caregiver burden [27]. In this sense, this finding

could be specific to high levels of burden or, alternatively, to the Austrian context of long-term care in home settings.

The factors with the greatest impact on caregiver burden in our study were caregivers' poor health status, care recipients' behavioral problems, high frequency of providing instrumental direct care activities, high amount of time
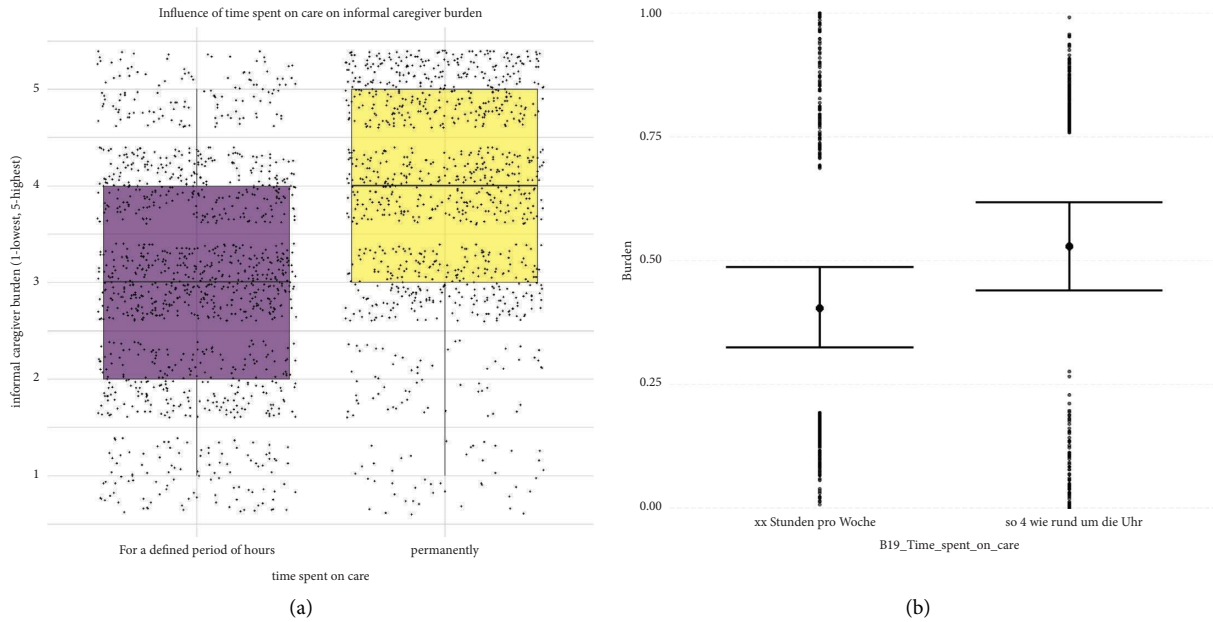
Figure 8: (a, b) Influence of permanently caring for a care-dependent person on caregiver burden (reference category: caring for a care-dependent person during a particular period of time).
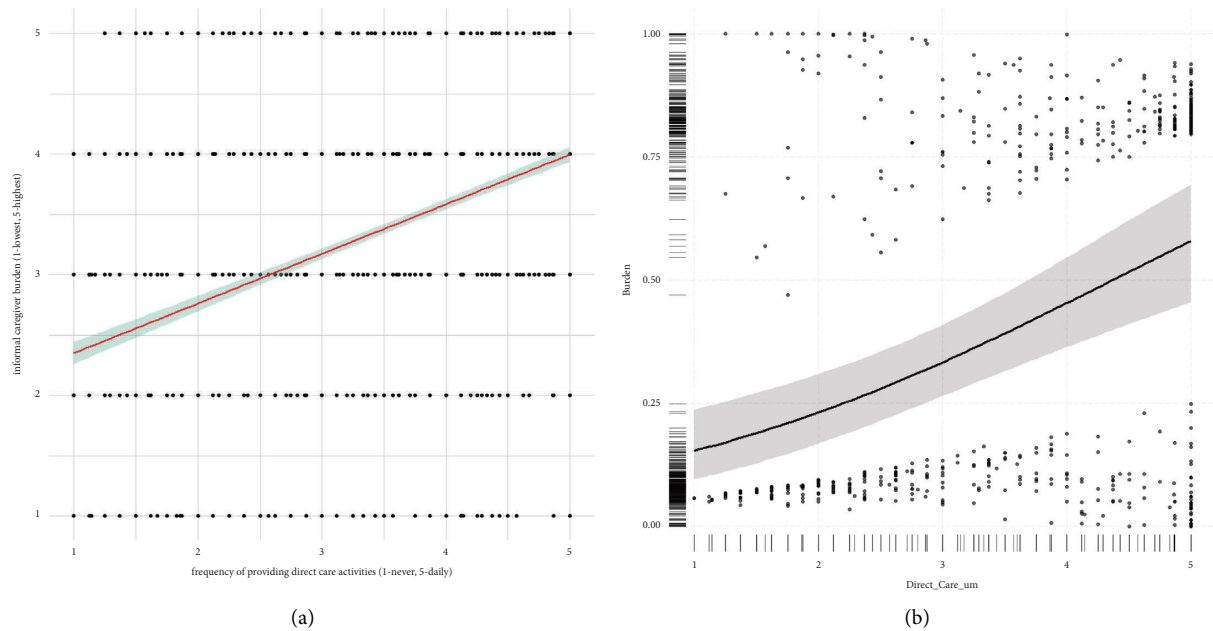

Figure 9: (a, b) Influence of frequency of providing direct care activities on caregiver burden.

spent caring for the care recipient, and high level of care dependency. These results are in accordance with those of Rodríguez–González, Rodríguez–Míguez, and Claveria [27].

In our study the health status of caregivers had the most relevant impact on the self-perceived caregiver burden. Many studies confirm this significant relationship [8]. Furthermore, there is evidence showing that caregiver burden can lead to higher levels of anxiety, depression, guilt, or worry [8]. This suggests a possible reciprocal relationship between caregiver burden and caregivers' health status.

Specifically, caregivers with a poorer health status may be more prone to experience higher levels of caregiver burden; contrastingly, this situation has the potential to further negatively impact caregivers' health status and exacerbate health deterioration, assuming a positive feedback loop mechanism [28].

In addition, previous studies have shown that caring for someone with behavioral problems is a major challenge for caregivers [27, 29, 30]. Therefore, it is important for healthcare professionals to pay particular attention to
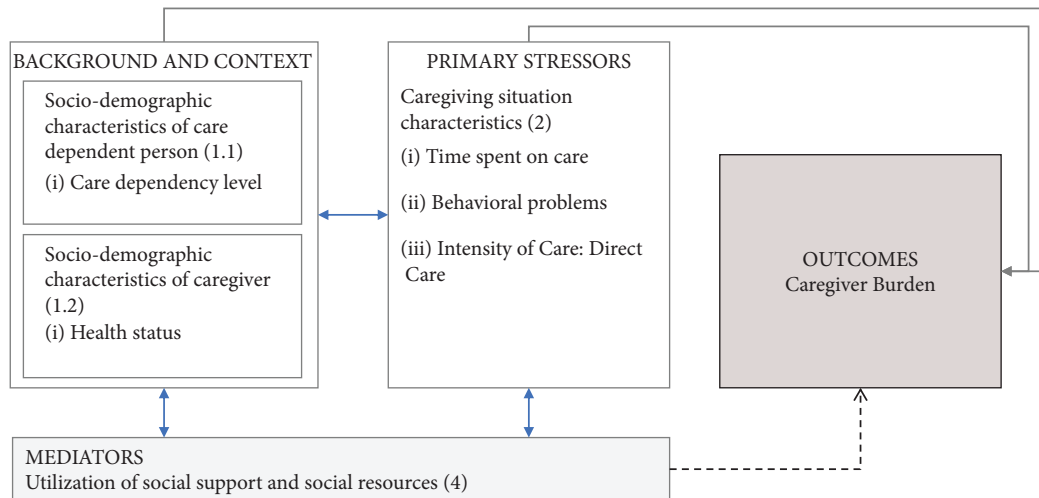
FIGURE 10: Influencing factors with most impact on the burden of caregivers in Austrian homecare settings.

caregiver burden when the care recipient is someone with behavioral problems.

In line with the literature [27], spending a significant amount of time caring for someone with a higher level of care dependency appears to be an important predictive factor for caregiver burden. Our findings show that burden is especially high, when caregivers frequently provide instrumental direct care activities. The literature suggests that a higher investment of both time and energy in caring for a care-dependent person is correlated with higher levels of caregiver burden [27].

When considering high levels of caregiver burden from the subjective perspective of caregivers, these are specific factors that have a consistent predictive value for early detection of this problem. Caregivers who are in contact with these specific risk factors are exposed to high levels of stress and need support to cope with caregiver burden and maintain this role within their families.

6. Limitations

The main limitation of our study stems from the fact that the data analysis was based on data collected using a questionnaire that was not designed specifically to assess caregiver burden, but rather to assess the situation of caregivers from a general perspective. As a result, there may be factors influencing caregiver burden that we have not considered. Nevertheless, we were able to carry out a comprehensive exploration of the characteristics of caregivers and care recipients, and of the caregiving situation itself, which revealed important theoretical and practical considerations concerning the risk of caregiver burden in homecare settings.

The caregiver stress process framework [12] was an important theoretical reference when preparing data analysis, identifying regressor groups, and testing their impact on caregiver burden. However, the primary study did not refer to this specific framework when constructing its questionnaire. This seems to be the case for other studies conducted on this topic, which are based on Pearlin's

framework [13]. Further studies on this topic could gain deeper insights through statistical analysis and interpretation if the problem identification, measurement instrument, and hypothesis testing are all based on the same theoretical foundation.

Lastly, we have adopted a reductionist theoretical and statistical approach, that not only focuses on the impact of individual influencing factors on caregiver burden, but also addresses this problem by focusing mainly on negative aspects of caregiving in relation to caregiver burden. In this sense, it is possible that we did not fully account for the systematic related complexity of caregiver burden and its causal mechanisms. Contrastingly, our pragmatic approach offered the opportunity to focus explicitly on known factors related to caregiver burden.

7. Conclusion

Caregiver burden is a common and multidimensional problem, affected by several types of influencing factors, which are, on the one hand, intrinsic to caregivers and care recipients, but on the other hand, emerged from the social context where the family is embedded. Our findings contribute to the identification of specific factors that, from a public healthcare perspective and at a policy level, have emerged as important in predicting high levels of caregiver burden in the Austrian homecare context. Furthermore, understanding which factors pose the greater risk for high levels of caregiver burden can help contribute to individual case management or counselling measures. In this sense, healthcare providers working in family and community healthcare settings should be aware of the preventive potential of the early identification of these factors when caring for caregivers and addressing caregiver burden management.

It is imperative that social and healthcare policies regarding prevention and management of caregiver burden in Austria consider these "Big Five" factors for caregiver burden when planning and addressing this problem, moving forward on the current long-term care

policy. In conclusion, further action is needed to take a more systemic and holistic approach to caregiver burden, looking beyond the characteristics of care recipients, and including the needs of caregivers. There is increasing support for people with behavior problems, including for those who care for a family member with dementia. However, as is common in some other European countries, policy measures should also focus on the health of family caregivers by developing educational and health promotion interventions their needs. In addition, the development and utilization of formal services must be supported in order to reduce the participation of caregivers in care involving a high level of dependency and in care that focus on direct, instrumental care activities.

Data Availability

The Austrian Caregiver Study data used to support the findings of this study were made available within the project of the Federal Ministry of the Austrian Republic of Social Affairs, Health, Care and Consumer Protection and so cannot be made freely available. Requests for access to these data should be made to this Federal Ministry.

Additional Points

What Is Known About This Topic? (i) Caregiver burden in home care settings is a complex phenomenon associated with multiple possible causal mechanisms. (ii) Caregivers with higher burden levels have a decreased health status and are limited in their caregiving role. *What Does This Paper Add?* (i) Interventions aimed at early detecting and managing caregiver burden need to consider that background and contextual characteristics, primary stressors, and social support mediators have the greatest impact on caregiver burden. Secondary stressors, although important for understanding caregiver burden at a statistical level, have shown little predictive value for higher values of caregiver burden in our study. (ii) In addition, our study provides guidance to Austrian long-term care policy developers on how to prioritize measures regarding caregiver burden in home care settings: a more holistic approach focusing on the level and type of care dependency of care recipients as well as on the health status of caregivers and the time they spend providing direct care is needed.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Manuscript drafting was performed by AC, MK, MNC, HM, and FK. Acquisition of data was performed by MNC, MK, HM, and FK. Data analysis was performed by AC and MK. Conception and study design and critical revision of important intellectual content were performed by AC, MNC, MK, HM, and FK.

Supplementary Materials

Supplementary Information File 1: factor analysis regarding frequency of care activities. With the aim of facilitating parsimonious data analysis during our secondary data analysis, we used principal component analysis to reduce eighteen variables describing different caregiving activities to a small set of uncorrelated principal components containing most of the information in the original data. The procedure and main results are presented in this online supplement. Supplementary Information File 2: descriptive statistics. In this Supplementary Information File we present all relevant descriptive statistics which we conducted prior to analysis of variance and regression analysis. Following univariate analyses are depicted in this file: (1) Q-Q-plot of the variable caregiver burden (visual analysis of normality); (2) absolute und relative frequencies of categorical independent variables; (3) absolute und relative frequencies of continuous independent variables; and (4) correlations between caregiver burden and independent variables. Supplementary Information File 3: quality of model adjustment (goodness of fit). Results regarding the robustness (goodness of fit) of the final regression model can be consulted in this file (including the visual analysis of analysis of standardized residuals). (*Supplementary Materials*)

References

[1] Eurostat, "Disability statistics—elderly needs for help or assistance," 2019, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Disability_statistics_-_elderly_needs_for_help_or_assistance.

[2] ECORYS, *Study on exploring the incidence and costs of informal long-term care in the EU,* Publications Office European Commission, Luxembourg, 2021.

[3] C. L. Gilliss, W. Pan, and L. L. Davis, "Family involvement in adult chronic disease care: reviewing the systematic reviews," *Journal of Family Nursing*, vol. 25, no. 1, pp. 3–27, 2019.

[4] E. E. Kent, J. H. Rowland, L. Northouse et al., "Caring for caregivers and patients: research and clinical priorities for informal cancer caregiving," *Cancer*, vol. 122, no. 13, pp. 1987–1995, 2016.

[5] G. F. Cascella Carbó and R. García-Orellán, "Burden and gender inequalities around informal care," *Investigación y Educación en Enfermería*, vol. 38, no. 1, 2020.

[6] J. Kalseth and T. Halvorsen, "Health and care service utilisation and cost over the life-span: a descriptive analysis of population data," *BMC Health Services Research*, vol. 20, no. 1, p. 435, 2020.

[7] Bundesministerium für Soziales, "Allgemeines zum thema "pflegende angehörige [general information on the topic of family caregivers]," 2021, https://www.oesterreich.gv.at/themen/soziales/pflege/5/Seite.360524.html.

[8] R. Del-Pino-Casado, E. Priego-Cubero, C. López-Martínez, and V. Orgeta, "Subjective caregiver burden and anxiety in informal caregivers: a systematic review and meta-analysis," *PLoS One*, vol. 16, no. 3, 2021.

[9] S. H. Zarit, P. A. Todd, and J. M. Zarit, "Subjective burden of husbands and wives as caregivers: a longitudinal study," *The Gerontologist*, vol. 26, no. 3, pp. 260–266, 1986.

[10] H. Kim, M. Chang, K. Rose, and S. Kim, "Predictors of caregiver burden in caregivers of individuals with dementia," *Journal of Advanced Nursing*, vol. 68, no. 4, pp. 846–855, 2012.

[11] M. Bastawrous, "Caregiver burden? A critical discussion," *International Journal of Nursing Studies*, vol. 50, no. 3, pp. 431–441, 2013.

[12] L. I. Pearlin, J. T. Mullan, S. J. Semple, and M. M. Skaff, "Caregiving and the stress process: an overview of concepts and their measures," *The Gerontologist*, vol. 30, no. 5, pp. 583–594, 1990.

[13] D. Schaffler-Schaden, S. Krutter, A. Seymer, R. Eßl-Maurer, M. Flamm, and J. Osterbrink, "Caring for a relative with dementia: determinants and gender differences of caregiver burden in the rural setting," *Brain Sciences*, vol. 11, no. 11, p. 1511, 2021.

[14] E. Rocard and A. Llena-Nozal, *Supporting informal carers of older people: Policies to leave no carer behind. OECD*, 2022.

[15] M. Nagl-Cupal, F. Kolland, U. Zartler et al., *Angehörigenpflege in Österreich: einsicht in die Situation pflegender Angehöriger und in die Entwicklung informeller Pflegenetzwerke*-Bundesministerium für Arbeit, Soziales, Gesundheit und Konsumentenschutz, Vienna, Austria, 2018.

[16] B. Trukeschitz, A. Österle, and U. Schneider, "Austria's long-term care system: challenges and policy responses," *Journal of Long-Term Care*, pp. 88–101, 2022.

[17] E. Jakubowski and R. Busse, *Health Care Systems in the European Union: A Comparative Study. Public Health and Consumer Protection Series, SACO 101*, European Parliament, Luxemburg, 1998.

[18] A. Comas-Herrera, *Peer Review on "Financing Long-Term Care" Thematic Discussion Paper, Approaches to Long-Term Care Financing*, Brussels, European Commission, Directorate-General for Employment, Social Affairs and Inclusion, Belgium Europe, 2022.

[19] J. Heaton, *Reworking Qualitative Data*, Sage Publications Ltd, London, UK, 2004.

[20] M. Meyer, *Überblick über den derzeitigen Stand und zukünftige Entwicklungen*Deutsche Überarbeitung des "National Background Report for Germany" im Rahmen des EU-Projektes – EUROFAMCARE, Pflegende Angehörige in Deutschland, 2006.

[21] C. Mischke, "Ressourcen pflegender Angehöriger - eine Forschungslücke? Gesundheitssoziologische und empirische Annäherung an ein bislang vernachlässigtes Forschungsfeld [Resources and their meaning for caregivers--a gap in research? Health sociological and empirical approach to a hitherto neglected field of research]," *Pflege*, vol. 25, no. 3, pp. 163–174, 2012.

[22] E. Pochobradsky, F. Bergmann, H. Brix-Samoylenko, H. Erfkamp, and R. Laub, *Situation pflegender angehöriger endbericht*Bundesministerium für Arbeit, Soziales, Gesundheit und Konsumentenschutz, Vienna, Austria, 2005.

[23] T. M. Liddell and J. K. Kruschke, "Analyzing ordinal data with metric models: what could possibly go wrong?" *Journal of Experimental Social Psychology*, vol. 79, pp. 328–348, 2018.

[24] D. Cozzolino, A. Power, and J. Chapman, "Interpreting and reporting principal component analysis in food science analysis and beyond," *Food Analytical Methods*, vol. 12, no. 11, pp. 2469–2473, 2019.

[25] S. Brini, A. Hodkinson, A. Davies et al., "In-home dementia caregiving is associated with greater psychological burden and poorer mental health than out-of-home caregiving: a cross-sectional study," *Aging & Mental Health*, vol. 26, no. 4, pp. 709–715, 2021.

[26] Z. Liu, C. Heffernan, and J. Tan, *Caregiver burden: a concept analysis. International Journal of Nursing Sciences*, vol. 7, no. 4, pp. 438–445, 2020.

[27] A.-M. Rodríguez-González, E. Rodríguez-Míguez, and A. Claveria, "Determinants of caregiving burden among informal caregivers of adult care recipients with chronic illness," *Journal of Clinical Nursing*, vol. 30, no. 9-10, pp. 1335–1346, 2021.

[28] W. Yu, J. Chen, S. Sun, P. Liu, L. Ouyang, and J. Hu, "The reciprocal associations between caregiver burden, and mental health in primary caregivers of cancer patients: a longitudinal study," *Psycho-Oncology*, vol. 30, no. 6, pp. 892–900, 2021.

[29] D. C. Hergert and C. R. Cimino, "Predictors of caregiver burden in Huntington's disease," *Archives of Clinical Neuropsychology: The Official Journal of the National Academy of Neuropsychologists*, vol. 36, 2021.

[30] B. Kim, G. O. Noh, and K. Kim, "Behavioural and psychological symptoms of dementia in patients with Alzheimer's disease and family caregiver burden: a path analysis," *BMC Geriatrics*, vol. 21, no. 1, p. 160, 2021.

[31] S. C. Bagley, H. White, and B. A. Golomb, "Logistic regression in the medical literature," *Journal of Clinical Epidemiology*, vol. 54, no. 10, pp. 979–985, 2001.

[32] G. Maina, M. Ogenchuk, T. Phaneuf, and A. Kwame, "'I can't live like that': the experience of caregiver stress of caring for a relative with substance use disorder," *Substance Abuse Treatment, Prevention, and Policy*, vol. 16, no. 1, p. 11, 2021.