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Featured Article

Health-related quality of life and work ability among paid and family caregivers: A cross-sectional study in an industrially developing country

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ABSTRACT

Caregivers are essential for providing daily care to individuals with functional disabilities, but caregiving can negatively impact physical and mental health. This study assessed the health-related quality of life and work ability of 97 paid caregivers and 91 family caregivers, identifying factors associated with these outcomes. Mann-Whitney U and chi-square tests were used to analyze differences between groups, along with logistic regression models to explore the relationship between caregiver burden, social support, and the outcomes. Results showed family caregivers experienced higher burden, lower social support, worse quality of life, and reduced work ability compared to paid caregivers. Longer caregiving hours were linked to poorer outcomes, while good physical fitness was a protective factor. Moderate to severe caregiver burden strongly correlated with poor outcomes, while social support had a protective effect. The findings highlight the importance of interventions to reduce caregiver burden, enhance social support, and promote physical fitness for caregivers.

Key messages

Family caregivers have worse health-related quality of life than paid caregivers.

Family caregivers also have worse work ability than paid caregivers.

Factors associated with health-related quality of life and work ability are similar.

Policy implications suggest mixing individual and social interventions for caregivers.

Introduction

The United Nations estimates that the global life expectancy will reach 77 years by 2048.[1] Latin America and the Caribbean are also experiencing significant growth in their older populations, with approximately 190 million older adults, equaling the youth population (176 million).[2] In Brazil, 2020 statistics show that people aged 60 years and older make up 14% of the population, and this number is expected to match the youth population in a decade.[3] Furthermore, medical advancements have increased survival rates for adults and children with complex health conditions, leading to a rise in people with functional disabilities, requiring care.[4,5]

Caregivers play a crucial role in assisting individuals in dependency or semi-dependency, promoting their autonomy and well-being.[6] Caregivers can be classified as paid caregivers (also known as formal caregivers, home health aides, home care workers, or personal care attendants) or family caregivers (also known as informal

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caregivers, unpaid caregivers or lay caregivers) based on their relationship with the care recipient.[7-9] It is worth noting, however, that there is currently no updated and widely accepted definition of what constitutes a family caregiver.[9-11] In general, family caregivers provide care without financial compensation, often being family members, friends, or neighbors, and this support may occur either in close proximity to or at a distance from the care recipient.[7,8,12,13] On the other hand, a paid caregiver is someone whose professional occupation is to provide caregiving activities for which they are hired and paid to perform.[8,14-16] It is important to highlight that, unlike some other countries,[17] Brazil does not have policies to financially support family caregivers.

Caregiving can result in positive outcomes, such as a sense of purpose,[12,18] but it can also have negative impacts on caregivers' mental and physical health, leading to burnout, exhaustion, and chronic physical complaints.[12,19-21] Beyond these adverse effects, caregiving can lead to financial toxicity,[22-24] which can subsequently exacerbate negative caregiver health outcomes.[25-27] Given these potential negative consequences, caregiving may affect health-related quality of life (HRQoL) and work ability (WA). HRQoL can be defined as the extent to which an individual operates in their life and their perceived wellness across physical, mental, and social health aspects,[28] while WA refers to an individual's capacity to perform work based on its demands and their health and resources.[29] Both are influenced by numerous personal, job-related, and lifestyle factors.[30-37]

To address these challenges effectively, it is essential to understand how these impacts differ between caregiver groups, since caregiving consequences may be influenced by the prior relationship between caregiver and care recipient, and the type of interaction developed during the caregiving process.[19,21] However, few studies have investigated the differential impact on health outcomes between family and paid caregivers comprehensively. A literature search using Google, Google Scholar, and PubMed with the keywords "health-related quality of life," "work ability," "caregiver burden," "paid caregivers," "formal caregivers," "home health aides," "family caregivers," "informal caregivers," and "unpaid caregivers" identified only four studies that compared family and paid caregivers [38-41] in terms of mental health,[38,39,41] physical health,[41] quality of life [39,41] and caregiver burden.[38-41] The results of these studies consistently indicate that family caregivers experience worse outcomes across all measured variables.[38-41] Nevertheless, none of these studies specifically evaluated HRQoL or WA.

HRQoL has been suggested to be a predictor of various conditions, such as all-cause mortality,[42,43] cardiovascular events,[44,45] dementia,[46] asthma,[47] functional impairment,[48] and disability retirement due to musculoskeletal disorders.[49] Additionally, WA has already been associated with job stress, sickness absence, intention to leave work, and early retirement.[50-53] Thus, promoting caregivers' HRQoL and WA is crucial to addressing challenges related to the increasing population with functional disabilities that require care.

Considering the above, this study aimed to evaluate the HRQoL and WA of paid and family caregivers and investigate factors associated with both outcomes. By addressing these understudied outcomes and comparing caregiver groups, this study offers a novel contribution to public health and occupational health. Understanding the differences between paid and family caregivers is critical, as these groups face distinct challenges due to their caregiving roles. Family caregivers often lack formal training, social support and resources, while paid caregivers encounter unique occupational demands and stressors. These differences may have implications for targeted policies and interventions, both to alleviate the growing burden on family caregivers and to improve the working conditions of paid caregivers, ensuring the sustainability and effectiveness of caregiving systems. By clarifying these distinctions, this study provides essential information to guide strategies that promote caregivers' well-being and address the challenges posed by an aging population.

Material and methods

Design

This is a cross-sectional study involving paid and family caregivers working in Itapetininga, a medium-sized city in the southwest region of the State of São Paulo, Brazil. Itapetininga has a population of approximately 160,000 inhabitants, with 11.5% aged 65 years or older. The city has 4.78 physicians and 2.62 nurses per 1,000 inhabitants.

Participants

Sample size calculation was conducted using the following parameters: a significance level (alpha) of 5%, a test power (1-beta) of 80%, a mean Work Ability Index (WAI) of 39.7 (SD = 6.6) for paid caregivers,[54] and a mean WAI of 37.2 for family caregivers.[55] Based on these assumptions, the estimated minimum sample size was 110 paid caregivers and 110 family caregivers.

In this study, paid caregivers were defined as individuals whose primary activity is caregiving, who receive payment for their work. In contrast, family caregivers were defined as those providing care without financial compensation, typically being family members, friends, or neighbors.

The inclusion criteria for paid caregivers were being 18 years or older and having caregiving as their primary work activity. For family caregivers, the inclusion criteria were being 18 years or older, not receiving payment for caregiving, and identifying as the primary caregiver of the care recipient. The exclusion criteria for both groups were the inability to complete the questionnaire, provision of support and assistance as a distance caregiver and not currently providing direct care to an individual with functional limitations. Additionally, family caregivers who were healthcare professionals providing care in a professional capacity were also excluded.

Participants were recruited, and data were collected between January and August 2023, resulting in a final sample of 188 caregivers (97 paid and 91 family).

Family caregivers were recruited through the Brazilian public health system's home care service (Serviço de Atenção Domiciliar - SAD) and an outpatient physical therapy university clinic. Paid caregivers were recruited from four long-term care facilities and two vocational nursing schools offering practical nursing training (equivalent to Brazilian técnico de enfermagem programs). All paid caregivers employed at the facilities, as well as those enrolled in the vocational nursing schools, were invited to participate.

Additionally, both paid and family caregivers were recruited through referrals (snowball sampling), messaging app groups, social media, and the offer of a free one-day course on domiciliary oxygen use for caregivers. This multi-faceted recruitment approach has been employed in previous studies with caregivers.[56] While this method can expand a study's reach, enhance consistency, and reduce bias, it also makes it difficult to determine the exact number of caregivers invited. Consequently, estimating the response rate was not possible.

During recruitment, each potential participant was approached individually and provided with a detailed explanation of the study. Those who expressed interest in participating were screened for eligibility based on the inclusion and exclusion criteria. Eligible participants were then asked to provide written informed consent and complete the study questionnaire.

Data collection

The questionnaire collected the following caregiver-related variables: sociodemographic characteristics, self-perceived physical fitness, caregiving activities, caregiver burden, perceived social support, HRQoL, and WA. Additionally, the functional independence level of the care recipients was assessed.

To assess caregivers' sociodemographic characteristics, a questionnaire was developed containing the following self-reported variables: sex (female or male), age (in complete years), and skin color. Ethnoracial categorization followed Brazilian census classification, with participants self-identifying according to skin-color-based classifications: White, Black, Mixed, East Asian, or Indigenous. Due to shared socioeconomic marginalization and statistical limitations (low subgroup frequencies and uneven distribution), these categories were aggregated into "white" and "non-white" for regression analyses. This aggregation aligns with Brazil's affirmative action frameworks, particularly the PPI ("Pretos, Pardos, e Indígenas" - Black, Mixed, and Indigenous) grouping, which is used in public policies to identify and support these groups.

Other variables included self-reported body mass index (kg/m^2), marital status (single, married or living with a partner, or other), number of children (continuous variable), and household size (number of people in the household). Employment status was classified as unemployed or employed. Personal income was categorized as up to one minimum wage, up to two minimum wages, three or more minimum wages, or "don't know/prefer not to disclose" (during the data collection period, the Brazilian minimum wage was approximately USD 250 per month). Family income followed the same categories as personal income. Education level was recorded as middle school, high school, or college. Additional variables included religiousness (yes or no), smoking (yes or no), alcohol consumption (yes or no), and medication use (yes or no).

Self-perceived physical fitness was assessed with the question: "How do you rate your physical fitness?" Responses were recorded on a six-point ordinal scale, ranging from "precarious" [0] to "excellent".[5] Following a previous study that used this same assessment method, physical fitness was categorized as "good" for scores greater than three and "precarious" for scores equal to or less than three.[57]

Regarding caregiving activities, participants were asked about the length of their caregiving experience (in complete years), the number of care recipients (continuous variable), and the number of daily caregiving hours (continuous variable). The questionnaire also included items to identify which daily caregiving activities were performed. The following activities were listed: bathing, feeding, manual patient handling, dressing/undressing, walking assistance, and toileting. Participants responded to each activity on a five-point Likert scale ranging from "never" to "always." For statistical analysis, these responses were dichotomized into "yes" or "no". The response "never" was coded as "no," while all other responses ("rarely," "sometimes," "often," and "always") were coded as "yes". Additionally, caregivers were asked if they performed household activities such as cooking, laundry, and cleaning. Based on these responses, the variable "household tasks" was created and categorized into four levels: none, one, two, or three tasks.

In this study, caregiver burden is defined as the perceived adverse effects of caregiving on caregivers' mental and physical health, social relations, financial situation, and work status.[58] Caregiver burden was evaluated using the seven-item version of the Zarit Burden Scale (ZBI-7),[59] which is considered to be efficient for large-scale studies.[60] The ZBI-7 has demonstrated high correlation with the full version of the scale across various caregiving populations, including family caregivers for patients with advanced cancer, dementia, and acquired brain injury. It also shows strong internal consistency, with Cronbach's alpha ranging from 0.82 to 0.90.[61] In the present study, Cronbach's alpha for the ZBI-7 was 0.92.

The ZBI-7 comprises seven items rated on a five-point Likert scale, with responses ranging from "never" to "almost always". The total score is obtained by summing the item scores, yielding a range from 7 to 35 points.[59] According to the Brazilian Ministry of Health guidelines, caregiver burden scores were categorized as mild (up to 14 points), moderate (15 to 21 points), and severe (22 points or more).[62]

Perceived social support was assessed using the Brazilian version of the MOS Social Support Survey (MOS-SSS).[63] This instrument demonstrated high internal consistency, with Cronbach's alpha coefficients ranging from 0.83 to 0.92 for all dimensions of the Brazilian version.[64] In the present study, Cronbach's alpha for the MOS-SSS was 0.97.

The MOS-SSS consists of 19 questions rated on a five-point Likert scale, with responses ranging from "never" to "always." These questions assess four dimensions of social support: material support, emotional support, positive social interaction, and emotional support. The overall scale score was calculated by averaging the scores of all items, with higher scores indicating a better perception of social support.

HRQoL was assessed using the Brazilian version of the Nottingham Health Profile (NHP).[65] This instrument demonstrated a Cronbach's alpha of 0.82, with intra-class correlation coefficients for test-retest and inter-rater reliability of 0.96 and 0.92, respectively.[66] In the present study, the NHP had a Cronbach's alpha of 0.90.

The NHP consists of 38 items with dichotomous "yes" or "no" responses.[65] These items are grouped into six domains: energy level (3 items), pain (8 items), emotional reactions (9 items), sleep (5 items), social interaction (5 items), and physical abilities (8 items). The total NHP score was calculated by averaging the item scores, with each item weighted according to the original guidelines. Higher scores indicate a perceived worse state of health. As the NHP lacks an established cutoff, the score was dichotomized at the median (5.493) for analytical purposes, a methodologically robust approach that helps mitigate imbalance in subsequent statistical comparisons. Thus, scores above this value were interpreted as indicating poor HRQoL.

WA was evaluated using the Brazilian version of the Work Ability Index (WAI).[67] The Brazilian version of the WAI demonstrated a Cronbach's alpha of 0.72,[68] while in the present study, Cronbach's alpha was 0.85. The WAI consists of 10 items distributed across seven dimensions. Each item is scored individually, resulting in a total score ranging from 7 to 49 points. Higher scores indicate a better self-perception of WA. In this study, WA scores below 37 points were considered inadequate.[55,69,70]

Finally, the functional independence of care recipients was assessed using the Brazilian version of the Functional Independence Measure (FIM).[71] Although the FIM was translated into Brazilian Portuguese in 2004, no psychometric data on its use have been published to date. In this study, Cronbach's alpha for the FIM was 0.97. The FIM consists of 18 items divided into two major domains: motor (self-care, sphincter control, mobility, and locomotion) and cognitive (communication and social cognition). Each item is scored on a scale from 1 (total dependence) to 7 (complete independence). The final score is the sum of all item scores, ranging from 18 to 126.

Data analysis

Data analysis was performed using IBM SPSS Statistics software v.26.0 (IBM, Armonk, NY, USA). Descriptive analyses included measures of central tendency and dispersion for continuous variables, and simple frequencies for categorical variables. The Kolmogorov-Smirnov test was applied to check the normality assumption for continuous variables. Differences between paid and family caregivers were

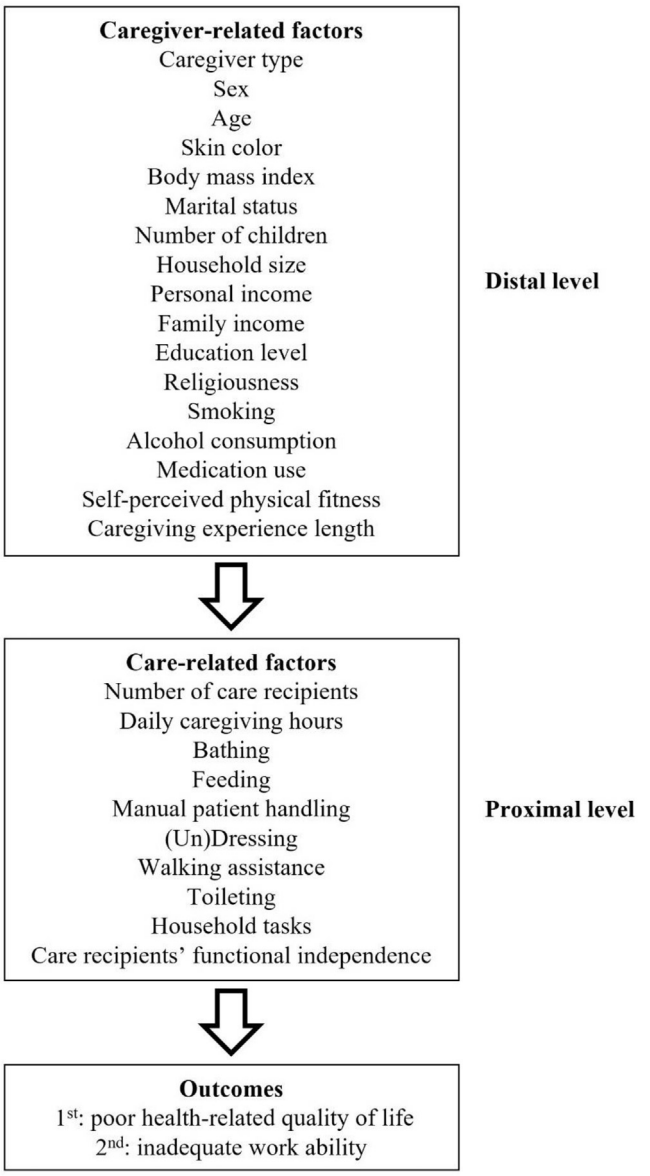

Fig. 1. Theoretical hierarchical model of the studied variables, according to established levels.

then evaluated. The chi-square test was used for categorical variables, while the Mann-Whitney U test was applied to continuous variables, as none exhibited a normal distribution. A significance level of 5% ($p < 0.05$) was adopted for all statistical tests.

To assess factors associated with caregivers' HRQoL and WA, two distinct logistic regression models were employed for each outcome. The first model was hierarchical and evaluated the association between the outcomes and independent variables, grouped according to a two-level hierarchical structure (Fig. 1). The second model examined the relationship between caregiver burden, social support, and the outcomes. The decision to use two distinct regression models was based on the adoption of a hierarchical conceptual framework for the analysis. In this framework, distal-level variables were related to the caregiver, while proximal-level variables pertained to care. Since both the ZBI-7 and the MOS-SSS included variables from both levels, they were excluded from the hierarchical model to avoid potential confounding effects due to multicollinearity, as done in a previous study.[45]

The hierarchical models were preceded by bivariate analysis, in which the association of independent variables with each outcome was examined using simple logistic regressions. Subsequently, the independent variables were grouped according to the two-level hierarchical model, and the analysis was conducted sequentially, starting with the distal level (caregiver-related factors) and moving to the proximal level (care-related factors). Distal-level variables were adjusted for each other through logistic regression using a stepwise forward procedure. Variables with $p \leq 0.05$ were retained in the model. Next, proximal-level variables were adjusted for each other, along with the distal-level variables that remained in the model, using the same procedure and p-value cut-off. Finally, variables that achieved a $p \leq 0.05$ in the previous step were included in the final multiple hierarchical models. In these final models, variables with a two-tailed p-value of less than 5% were considered significantly associated with the outcomes.

The models assessing the association between caregiver burden and social support with HRQoL and WA were initially adjusted using simple logistic regression. Variables with $p \leq 0.25$ in these models were included in the multiple logistic regression analysis. In the multiple models, variables with a two-tailed p-value below 5% were considered significantly associated with the outcomes

Ethical approval

The study adhered to Resolution 466/12 concerning ethical guidelines for research involving human subjects. It was conducted with approval from the Research Ethics Committee of the Botucatu Medical School, UNESP (Approval number 5.651.612, CAAE 61013422.0.0000.5411). Participants were informed about the research and its objectives. Those who agreed to participate provided written informed consent by signing the Informed Consent Form.

Results

A total of 188 caregivers participated in the study, comprising 97 paid caregivers and 91 family caregivers. As shown in Table 1, several sociodemographic characteristics differed significantly between these two groups. Family caregivers reported higher levels of caregiver burden, lower perceived social support, and poorer HRQoL and WA compared to paid caregivers. Notably, despite caring for recipients with higher functional capacity, family caregivers reported dedicating a median of 24 hours per day to caregiving activities. Accordingly, 67.8% of family caregivers were unemployed.

Regarding WA, just over a quarter (25.8%) of paid caregivers exhibited inadequate WA, which includes the poor and moderate categories of the WAI. In contrast, this percentage was significantly higher among family caregivers, reaching 51.6% ($p < 0.001$). Notably, only 1.1% of all caregivers were classified as presenting excellent WA; this group comprised two paid caregivers, while no family caregivers achieved this classification.

Table 2 presents the results of the simple logistic regression models, grouped according to the two hierarchical levels, as well as the variables associated with inadequate HRQoL in the final multiple hierarchical logistic regression model. Medication use (OR 0.499, 95% CI 0.229-0.880) and good self-perceived physical fitness (OR 0.275, 95% CI 0.140-0.543) were inversely associated with inadequate HRQoL. In contrast, the number of daily caregiving hours (OR 1.057, 95% CI 1.006-1.111) was positively associated with inadequate HRQoL.

Table 3 presents the odds ratio estimates and respective 95% confidence intervals for caregiver burden and perceived social support in the simple and multiple logistic regression models. Caregiver burden exhibited a strong dose-response positive association with

Table 1
Study participants' characteristics stratified into paid and family caregivers (Brazil, 2024).

Variable (n)	Total Median (IQR) or n (%)	Paid caregivers Median (IQR) or n (%)	Family caregivers Median (IQR) or n (%)	p-value
Sex (188)				
Female	146 (77.7)	74 (76.3)$_a$	72 (79.1)$_a$	0.641
Male	42 (22.3)	23 (23.7)$_a$	19 (20.9)$_a$	
Age (174)	37.5 (21.0)	31.0 (16.0)$_a$	43.0 (23.0)$_b$	<0.001
Skin color (188)				
Non-white	66 (35.1)	38 (39.2)$_a$	28 (30.8)$_a$	0.228
White	122 (64.9)	59 (60.8)$_a$	63 (69.2)$_a$	
Body mass index (179)	27.0 (5.1)	26.8 (5.2)$_a$	27.1 (4.7)$_a$	0.472
Marital status (188)				
Single	55 (29.3)	37 (38.1)$_a$	18 (19.8)$_b$	
Married or living with a partner	98 (52.1)	41 (42.3)$_a$	57 (62.6)$_b$	0.010
Others	35 (18.6)	19 (19.6)$_a$	16 (17.6)$_a$	
Number of children (188)	1.0 (2.0)	0.0 (2.0)$_a$	2.0 (2.0)$_b$	<0.001
Household size (186)	2.0 (2.0)	2.0 (2.0)$_a$	2.0 (2.0)$_a$	0.055
Personal income (183)				
Up to one minimum wage	58 (31.7)	27 (27.8)$_a$	31 (36)$_a$	<0.001
Up to two minimum wages	71 (38.8)	55 (56.7)$_a$	16(18.6)$_b$	
Three or more minimum wages	43 (23.5)	13 (13.4)$_a$	30 (34.9)$_b$	
Don't know/prefer not to disclose	11 (6.0)	2 (2.1)$_a$	9 (10.5)$_b$	
Family income (183)				
Up to one minimum wage	16 (8.7)	5 (5.3)$_a$	11 (12.5)$_a$	0.365
Up to two minimum wages	37 (20.2)	21 (22.1)$_a$	16 (18.2)$_a$	
Three or more minimum wages	93 (50.8)	49 (51.6)$_a$	44 (50.0)$_a$	
Don't know/prefer not to disclose	37 (20.2)	20 (21.1)$_a$	17 (19.3)$_a$	
Education level (188)				
Middle school	22 (11.7)	7 (7.2)$_a$	15 (16.5)$_b$	
High school	105 (55.9)	66 (68.0)$_a$	39 (42.9)$_b$	0.002
College	61 (32.4)	24 (24.7)$_a$	37 (40.7)$_b$	
Religiousness (188)				
Yes	153 (81.4)	79 (81.4)$_a$	74 (81.3)$_a$	0.982
No	35 (18.6)	18 (18.6)$_a$	17 (18.7)$_a$	
Smoking (188)				
Yes	33 (17.6)	19 (19.6)$_a$	14 (15.4)$_a$	0.449
No	155 (71.8)	78 (80.4)$_a$	77 (84.6)$_a$	
Alcohol consumption (188)				
Yes	80 (42.6)	44 (45,4)$_a$	36 (39.6)$_a$	0.421
No	108 (57.4)	53 (54.6)$_a$	55 (60.4)$_a$	
Medication use (188)				
Yes	66 (35.1)	29 (29.9)$_a$	37 (40.7)$_a$	0.122
No	122 (64.9)	68 (70.1)$_a$	54 (59.3)$_a$	
Self-perceived physical fitness (188)				
Precarious	66 (35.1)	25 (25.8)$_a$	41 (45.1)$_b$	0.006
Good	122 (64.9)	72 (74.2)$_a$	50 (54.9)$_b$	
Caregiving experience length (180)	4.0 (6.0)	4.0 (5.0)$_a$	5.0 (6.0)$_a$	0.350
Number of care recipients (186)	1.0 (8.0)	5.0 (19.0)$_a$	1.0 (0.0)$_b$	<0.001
Daily caregiving hours (187)	12.0 (12.0)	12.0 (0.0)$_a$	24.0 (14.0)$_b$	<0.001
Bathing (188)				
Yes	152 (80.9)	92 (94.8)$_a$	60 (65.9)$_b$	<0.001
No	36 (19.1)	5 (5.2)$_a$	31 (34.1)$_b$	
Feeding (188)				
Yes	144 (76.6)	92 (94.8)$_a$	52 (57.1)$_b$	<0.001
No	44 (23.4)	5 (5.2)$_a$	39 (42.9)$_b$	
Manual patient handling (188)				
Yes	152 (80.9)	92 (94.8)$_a$	60 (65.9)$_b$	<0.001
No	36 (19.1)	5 (5.2)$_a$	31 (34.1)$_b$	
(Un)Dressing (188)				
Yes	155 (82.4)	95 (97.9)$_a$	60 (65.9)$_b$	<0.001
No	33 (17.6)	2 (2.1)$_a$	31 (34.1)$_b$	
Walking assistance (188)				
Yes	158 (84.0)	91 (93.8)$_a$	67 (73.6)$_b$	<0.001
No	30 (16.0)	6 (6.2)$_a$	24 (26.4)$_b$	
Toileting (188)				
Yes	150 (79.8)	93 (95.9)$_a$	57 (62.6)$_b$	<0.001
No	38 (20.2)	4 (4.1)$_a$	34 (37.4)$_b$	
Household tasks (188)				
None	46 (24.5)	36 (37.1)$_a$	10 (11.0)$_b$	<0.001
One	17 (9.0)	14 (14.4)$_a$	3 (3.3)$_b$	
Two	14 (7.4)	14 (14.4)$_a$	0 (0.0)$_b$	
Three	111 (59.1)	33 (34.1)$_a$	78 (85.7)$_b$	

(*continued*)

Table 1 (*Continued*)

Variable (n)	Total Median (IQR) or n (%)	Paid caregivers Median (IQR) or n (%)	Family caregivers Median (IQR) or n (%)	p-value
Care recipients' functional independence (187)	38.0 (54.0)	18.0 (31.0)$_a$	64.5 (69.0)$_b$	<0.001
Caregiver burden (186)				
Mild	102 (54.8)	64 (66.0)$_a$	38 (42.7)$_b$	0.001
Moderate	43 (23.2)	22 (22.7)$_a$	21 (23.6)$_b$	
Severe	41 (22.0)	11 (11.3)$_a$	30 (33.7)$_b$	
Perceived social support (181)	4.4 (1.5)	4.8 (1.2)$_a$	4.0 (2.0)$_b$	0.002
Health-related quality of life (187)	5.4 (15.2)	3.9 (10.6)$_a$	7.9 (18.0)$_b$	0.014
Work ability (188)	38.0 (7.0)	40.0 (6.0)$_a$	36.0 (8.0)$_b$	0.001

Notes:
1) Categorical variables compared using the chi-square test.
2) Numerical variables compared using the Mann-Whitney U test.
3) Values followed by different letters in the subindex indicate statistically significant differences between groups ($p < 0.05$).

Table 2
Odds ratio (OR), 95% confidence interval (CI) and p-values obtained in the simple hierarchical logistic regression model and in the multiple hierarchical logistic regression model for HRQoL (Brazil, 2024).

Variable		OR	CI	p-value
Simple hierarchical logistic regression model				
Distal level	**Caregiver type** (ref.: paid)			
	Family	1.956	1.093-3.501	0.024
	Sex (ref.: male)			
	Female	1.792	0.884-3.634	0.106
	Age	1.030	1.008-1.053	0.008
	Skin color (ref.: non-white)			
	White	0.675	0.369-1.234	0.202
	Body mass index	1.144	1.055-1.241	0.001
	Marital status (ref.: single)			
	Married or living with a partner	1.432	0.736-2.786	0.290
	Others	1.534	0.654-3.597	0.325
	Number of children	1.272	1.036-1.562	0.021
	Household size	1.111	0.922-1.339	0.267
	Personal income (ref.: Up to one minimum wage)			
	Up to two minimum wages	0.637	0.317-1.281	0.206
	Three or more minimum wages	1.054	0.475-2.340	0.897
	Do not know/prefer not to disclose	1.045	0.287-3.812	0.947
	Family income (ref.: Up to one minimum wage)			
	Up to two minimum wages	0.352	0.096-1.294	0.116
	Three or more minimum wages	0.319	0.096-1.063	0.063
	Do not know/prefer not to disclose	0.203	0.055-0.754	0.017
	Education level (ref.: middle school)			
	High school	0.927	0.363-2.367	0.873
	College	0.880	0.326-2.374	0.800
	Religiousness (ref.: no)			
	Yes	1.433	0.688-3.028	0.332
	Smoking (ref.: yes)			
	No	0.548	0.251-1.198	0.132
	Alcohol consumption (ref.: yes)			
	No	0.855	0.479-1.528	0.598
	Medication use (ref.: yes)			
	No	0.431	0.232-0.798	0.007
	Self-perceived physical fitness (ref.: precarious)			
	Good	0.230	0.120-0.442	<0.001
	Caregiving experience length	1.041	1.000-1.083	0.050
Proximal level	**Number of care recipients**	1.012	0.978-1.046	0.501
	Daily caregiving hours	1.064	1.016-1.113	0.008
	Bathing (ref.: no)			
	Yes	0.944	0.453-1.970	0.879
	Feeding (ref.: no)			
	Yes	1.216	0.614-2.406	0.575
	Manual patient handling (ref.: no)			
	Yes	1.252	0.599-2.616	0.551
	(Un)Dressing (ref.: no)			
	Yes	1.178	0.550-2.525	0.674
	Walking assistance (ref.: no)			
	Yes	0.792	0.358-1.755	0.566
	Toileting (ref.: no)			
	Yes	1.422	0.689-2.936	0.341
	Household tasks (ref.: none)			
	One	1.778	0.571-5.538	0.321
	Two	2.000	0.592-6.756	0.264
	Three	2.723	1.319-5.624	0.007
	Care recipients' functional independence	1.000	0.991-1.009	0.964

(*continued*)

Table 2 (*Continued*)

Variable		OR	CI	p-value
Multiple hierarchical logistic regression model				
Final model	**Medication use** (ref.: yes)			
	No	0.449	0.229-0.880	0.020
	Self-perceived physical fitness (ref.: precarious)			
	Good	0.275	0.140-0.543	<0.001
	Daily caregiving hours	1.057	1.006-1.111	0.028

Table 3
Odds ratio (OR), 95% confidence interval (CI) and p-values obtained in the simple logistic regression model and in the multiple logistic regression model for HRQoL (Brazil, 2024).

Variable	OR	CI	p-value
Simple logistic regression model			
Caregiver burden (ref.: mild)			
Moderate	5.143	2.382-11.106	<0.001
Severe	14.483	5.505-38.105	<0.001
Perceived social support	0.619	0.450-0.852	0.003
Multiple logistic regression model			
Caregiver burden (ref.: mild)			
Moderate	5.908	2.613-13.362	<0.001
Severe	12.502	4.677-33.424	<0.001
Perceived social support	0.666	0.462-0.960	0.029

inadequate HRQoL. In contrast, perceived social support (OR 0.666, 95% CI 0.462-0.960) was inversely associated with inadequate HRQoL.

Table 4 presents the results of the simple logistic regression models, grouped into two hierarchical levels, as well as the variables associated with inadequate WA in the final multiple hierarchical logistic regression model. As shown, age (OR 1.057, 95% CI 1.028-1.087), body mass index (OR 1.108, 95% CI 1.001-1.226), and daily caregiving hours (OR 1.057, 95% CI 1.006-1.111) were positively associated with inadequate WA. In contrast, good self-perceived physical fitness (OR 0.257, 95% CI 0.116-0.570) was inversely associated with inadequate WA.

Table 5 presents the odds ratio estimates and their respective 95% confidence intervals for caregiver burden and perceived social support in both the simple and multiple logistic regression models. Caregiver burden demonstrated a stronger dose-response positive association with inadequate WA than with HRQoL. In contrast, perceived social support (OR 0.565, 95% CI 0.384-0.832) was inversely associated with inadequate WA.

Discussion

In this study, we found significant differences between paid and family caregivers. Family caregivers, despite caring for recipients with higher functional capacity, reported greater caregiver burden, lower perceived social support, and poorer HRQoL and WA. Regression analyses also revealed notable similarities in the factors associated with HRQoL and WA among caregivers. Specifically, more daily caregiving hours were associated with worse HRQoL and WA, while better self-perceived physical fitness was associated with improved outcomes. Additionally, caregiver burden showed a strong dose-response positive association with worse HRQoL and WA, whereas perceived social support was negatively associated with the outcomes.

It is important to note that the two groups of caregivers differed in several sociodemographic and caregiving characteristics. Family caregivers were older, dedicated more hours to caregiving, and cared for recipients with higher functional capacity. These differences may have contributed to the higher caregiver burden, lower social support, and poorer health-related quality of life and work ability observed in family caregivers. Therefore, the caregiver type might not be the primary factor leading to the outcomes, but rather a combination of these contextual factors. This is supported by our regression analyses, which identified daily caregiving hours and self-perceived physical fitness as factors associated with both outcomes, regardless of caregiver type.

Although few studies have compared paid and family caregivers,[38-41] our findings are supported by the literature. Previous studies suggest that family caregivers experience greater caregiver burden, lower quality of life, and more health problems.[38-41] Regarding WA, previous studies found that 28.8% of paid caregivers [54] and 35.7% of family caregivers [55] presented inadequate WA. These percentages, similar to those found in our study, highlight a worrying scenario.

A possible explanation for these findings may relate to the different caregiving activities performed by paid and family caregivers. A previous study divided family caregivers' activities into three major groups: "helping around the house" (preparing meals, shopping, or cleaning), "looking after someone" (emotional support and supervision, as well as transportation and accompanying to appointments), and "nursing care services" (helping with functional activities of daily living like eating, dressing, bathing, or toileting).[72] While "nursing care services" led to significant decreases in self-rated health, "helping around the house" and "looking after someone" were associated with broader negative outcomes, including both poorer self-rated health and increased depressive symptoms.[72] Since paid caregivers usually do not engage, or do so less frequently, in "helping around the house" and "looking after someone" activities,[14] it would be expected that family caregivers would report worse HRQoL, lower WA, and higher caregiver burden.

Another explanation for this finding may be the greater number of daily caregiving hours dedicated by family caregivers. Furthermore, over 30% of family caregivers combined caregiving with formal employment. This dual role likely reduced their rest time and made it difficult to access healthcare services, obtain medications or treatments, and recover from their own health issues. These factors, along with the caregiving tasks performed, may have contributed to their poorer outcomes.

Regarding HRQoL, numerous studies indicate that assuming the family caregiver role might negatively affect health, with higher prevalence of depressive feelings and lower mental health scores.[73-76] The impact on physical health, however, is mixed. Some studies report negative effects, such as increased medication use and pain that affects daily activities, while others have found positive effects on physical health for specific subgroups of caregivers.[73,74]

These differences in physical health outcomes may originate from the assessment methods used. When measured by self-assessed health, caregiving may show short-term positive effects. However, evaluations based on medication use or reported pain often reveal negative effects.[73] Notably, the positive self-assessment may reflect a bias,[77] as caregivers might compare their health to that of the care recipient, masking declines in their own physical health.[77]

Although extensive research has explored the relationship between caregiving and health outcomes, few studies have

Table 4
Odds ratio (OR), 95% confidence interval (CI) and p-values obtained in the simple hierarchical logistic regression model and in the multiple hierarchical logistic regression model for WA (Brazil, 2024).

Variable		OR	CI	p-value
Simple hierarchical logistic regression model				
Distal level	**Caregiver type** (ref.: paid)			
	Family	3.076	1.666-5.680	<0.001
	Sex (ref.: male)			
	Female	1.744	0.827-3.679	0.144
	Age	1.060	1.034-1.086	<0.001
	Skin color (ref.: non-white)			
	White	1.225	0.673-2.338	0.475
	Body mass index	1.129	1.045-1.219	0.002
	Marital status (ref.: single)			
	Married or living with a partner	1.855	0.894-3.850	0.097
	Others	3.905	1.582-9.638	0.003
	Number of children	1.379	1.118-1.700	0.003
	Household size	1.050	0.569-1.268	0.613
	Personal income (ref.: Up to one minimum wage)			
	Up to two minimum wages	1.135	0.540-2.384	0.739
	Three or more minimum wages	2.807	1.237-6.371	0.014
	Do not know/prefer not to disclose	2.667	0.719-9.890	0.142
	Family income (ref.: Up to one minimum wage)			
	Up to two minimum wages	2.955	0.717-12.182	0.134
	Three or more minimum wages	2.615	0.696-9.824	0.155
	Do not know/prefer not to disclose	2.955	0.717-12.182	0.134
	Education level (ref.: middle school)			
	High school	2.267	0.777-6.614	0.134
	College	2.361	0.770-7.237	0.133
	Religiousness (ref.: no)			
	Yes	1.447	0.661-3.167	0.356
	Smoking (ref.: yes)			
	No	1.298	0.588-2.866	0.519
	Alcohol consumption (ref.: yes)			
	No	0.967	0.534-1.753	0.913
	Medication use (ref.: yes)			
	No	0.386	0.208-0.716	0.003
	Self-perceived physical fitness (ref.: precarious)			
	Good	0.257	0.136-0.483	<0.001
	Caregiving experience length	1.061	1.018-1.105	0.005
Proximal level	**Number of care recipients**	0.951	0.914-0.990	0.014
	Daily caregiving hours	1.087	1.037-1.139	<0.001
	Bathing (ref.: no)			
	Yes			
	Feeding (ref.: no)	0.840	0.401-1.760	0.644
	Yes			
	Manual patient handling (ref.: no)	0.867	0.435-1.726	0.684
	Yes			
	(Un)Dressing (ref.: no)	0.840	0.401-1.760	0.644
	Yes			
	Walking assistance (ref.: no)	0.946	0.438-2.042	0.887
	Yes			
	Toileting (ref.: no)	0.779	0.353-1.719	0.537
	Yes			
	Household tasks (ref.: none)	0.940	0.453-1.949	0.867
	One			
	Two	0.480	0.094-2.458	0.378
	Three	2.000	0.546-7.327	0.295
	Care recipients' functional independence	1.005	0.996-1.014	0.256
Multiple hierarchical logistic regression model				
Final model	**Age**	1.057	1.028-1.087	<0.001
	Body mass index	1.108	1.001-1.226	0.048
	Self-perceived physical fitness (ref.: precarious)			
	Good	0.257	0.116-0.570	0.001
	Daily caregiving hours	1.079	1.018-1.143	0.011

Table 5
Odds ratio (OR), 95% confidence interval (CI) and p-values obtained in the simple logistic regression model and in the multiple logistic regression model for WA (Brazil, 2024).

Variable	OR	CI	p-value
Simple logistic regression model			
Caregiver burden (ref.: mild)			
Moderate	6.670	2.961-15.024	<0.001
Severe	23.925	9.280-61.679	<0.001
Perceived social support	0.512	0.369-0.711	<0.001
Multiple logistic regression model			
Caregiver burden (ref.: mild)			
Moderate	6.358	2.677-15.096	<0.001
Severe	21.829	8.174-58.295	<0.001
Perceived social support	0.565	0.384-0.832	0.004

investigated its impact on caregivers' occupational issues.[78,79] WA remains particularly underexplored among caregivers in Brazil and worldwide. This may be due to the lack of visibility and recognition of family caregivers by healthcare workers and healthcare systems,[80-83] and even by the caregivers themselves, who may view themselves simply as a spouse, child, or sibling providing practical care, rather than as workers.[84,85] Paid caregivers, on the other hand, often face a negative public image, frequently perceived as uneducated, poorly trained, and unskilled individuals performing unpleasant work.[86-88] Furthermore, they endure precarious work conditions, lack of unions and labor law protections, experience job insecurity, and receive low wages.[86-88] Therefore, the role of both paid and family caregivers as workers often goes unnoticed, which contributes to the scarcity of research on WA in this population despite its clear relevance, since for paid caregivers, caregiving is their remunerated work, and for many family caregivers, it is an unpaid role managed alongside paid employment.

Regarding the factors associated with both outcomes, previous studies have shown that more caregiving hours are associated with poorer HRQoL.[89-94] For female nursing personnel, total work hours are also associated with inadequate WA.[95] This may be due to the detrimental effects of long workhours on health and subjective fatigue,[96] and reduced time for activities that promote mental and physical health. Therefore, reducing daily caregiving hours may be essential.

Previous research suggests that using assistive devices (e.g., wheelchairs, walkers, canes, magnifiers, hearing aids, and amplifiers) can reduce caregiving hours by promoting care recipient's independence.[97] These devices alleviate caregivers' physical demands by minimizing hands-on assistance with mobility, personal care, and household tasks. For example, wheelchairs and walkers facilitate safer, independent mobility, while magnifiers and hearing aids improve communication and engagement in daily activities. Adaptive tools for dressing, bathing, and feeding can further streamline caregiving, allowing caregivers more time for rest or other responsibilities.

Additionally, adult day services, which offer out-of-home therapeutic activities, health monitoring, socialization, medical care, and transportation, have also been shown to decrease daily caregiving hours.[98] These services lower exposure to care-related stressors and may mitigate the negative effects of long-term caregiving.[99]

Concerning physical fitness, previous studies have shown its inverse association with several chronic diseases.[100,101] Physical fitness may optimize neuroendocrine and physiological responses, improving adaptations to physical and psychosocial stressors. This helps protect against chronic stress and buffer against depression and anxiety.[100] Consequently, physical fitness has been associated with better HRQoL across various age groups,[102-106] which corroborates our findings. It is important to note, however, that while our study assessed self-perceived physical fitness, most prior research has relied on objectively assessed fitness. Evidence suggests a moderate to strong correlation between these measures,[107] which makes findings on self-perceived physical fitness a valuable, if indirect, reference for understanding the role of physical fitness in caregiver health. Nonetheless, these constructs are not identical and should be interpreted with caution. There is also evidence for an association between physical fitness and better WA.[108] Importantly, caregivers' HRQoL and WA are crucial not only for themselves but also for their care recipients. Good physical fitness enables caregivers to deliver care vigorously and safely, minimizing pain and fatigue, thereby providing high-quality care.

Consequently, physical activity interventions may help caregivers maintain or improve their HRQoL and WA, enabling them to perform their roles effectively. Previous studies have identified significant improvements in caregivers' cardiorespiratory fitness,[109,110] balance,[109] and BMI [110] in response to physical activity interventions. A systematic review also found a small yet significant improvement in both physical and mental health among family caregivers through exercise training.[111]

Regarding WA, high-intensity physical activity during leisure time has been associated with better WA in a dose-response manner among workers in physically demanding jobs.[112] However, two systematic reviews found inconsistent effects of physical activity interventions on caregivers' physical fitness,[113,114] highlighting the need for further research. Moreover, time constraints, fatigue, lack of motivation, and insufficient support often hinder caregiver engagement in physical activities.[115] These barriers should be considered when planning such interventions.

Regarding caregiver burden, multiple studies support our findings.[55,116-119] Caregiver burden is also associated with decreased work productivity,[120,121] highlighting the importance of addressing this issue. Improving health literacy may help, as higher health literacy has been associated with lower caregiver burden.[122] Psychological interventions, especially those involving both caregivers and care recipients, have also shown promise in reducing caregiver burden.[123]

Additionally, multicomponent interventions that combine strategies such as education, skills training, counselling, support, and stress and mood management are likely to be effective in reducing caregiver burden.[124] It is important to consider the nature of caregiving tasks when designing these interventions, as emotional and personal care tasks tend to be more burdensome than instrumental tasks like household chores.[125,126]

The inverse association between social support and poor HRQoL has been previously identified in caregivers.[127-129] Recent studies suggest that social support may act as a protective factor, mediating the relationship between caregiver burden and HRQoL,[130,131] and between psychological distress and quality of life.[132] Furthermore, a positive perception of the support received by caregivers has been shown to improve both mental and physical HRQoL of care recipients.[133-135]

Regarding WA, although the impact of social support outside of work on WA has been scarcely investigated, some studies also found that it is inversely associated with WA,[136,137] corroborating our results.

These results emphasize the need to expand the focus beyond caregivers and care recipients, highlighting the role of social support in policies and interventions aimed at improving caregiver's HRQoL and WA. Previous studies have shown that social support provided by trained volunteers was ineffective in improving HRQoL.[138] In contrast, support groups led by experienced caregivers improved caregivers' HRQoL.[138] This suggests that social support from individuals in similar situations may be more effective than support from those without shared experiences.[138]

One such intervention is the establishment of caregiver support groups, where caregivers could share experiences, receive emotional support, and learn coping strategies. Telephone-based support programs, offering easy access to counseling, advice, and emotional support without requiring in-person attendance, could also be an alternative. Additionally, educational programs that provide legal and financial support, helping caregivers navigate challenges such as securing benefits, managing finances, and understanding their rights could empower caregivers and improve their HRQoL and WA.

Regarding the inverse association between medication use and HRQoL, previous studies have shown that nonprescription medicine users exhibit lower HRQoL than the general population.[139] Additionally, polypharmacy may be negatively associated with HRQoL.[140] Medication use involves several factors that can affect quality of life, such as practical difficulties (e.g., opening packaging, self-monitoring, numeracy), costs, seeking and understanding information, decision-making (e.g., weighing pros and cons), disruptions to daily routines, and side effects.[141-143] These challenges are captured by the concept of "medicine burden", which has been associated with poorer HRQOL.[142,143]

Given the above, interventions aimed at maintaining or improving caregivers' HRQoL should consider rational use of medicines. Pharmaceutical care could be an effective strategy, as it has been shown to improve HRQoL across various medical conditions.[144] This may be especially relevant in Brazil, where high rates of medication use, self-medication and polypharmacy are prevalent.[145-147]

The inverse association between age and WA among caregivers has been found in a previous study.[55] As individuals age, they experience declines in motor, cognitive, and sensory abilities. Additionally, aging is often accompanied by an increase in comorbidities that further compromise these abilities. These factors make it difficult to perform work activities, compromising WA.[148] It has already been shown that WA decreases 1.5% per year among individuals over 45 years of age.[149]

Although age is an immutable characteristic, interventions to promote WA among older workers should incorporate ergonomic interventions, such as participatory ergonomic programs. Ergonomic interventions have been shown to have a positive influence on WA on the age group 50 years and older.[148]

Finally, consistent with previous studies,[35,37,150] a significant positive association was found between BMI and inadequate WA. A previous study showed that BMI is associated with lower WA in relation to physical work demands, but not with mental demands.[150] However, the authors noted a borderline association for class III obesity (BMI > 40 kg/m2 or > 35 kg/m2 with at least one serious obesity-related health condition), suggesting that severe obesity might influence WA in relation to mental tasks. Several factors may explain this association, including obesity-related comorbidities, physical limitations and discomfort at work.

A significant body of literature consistently shows an association between food insecurity and obesity, particularly among adult women.[151] Some studies also suggest that family caregivers may be at a higher risk of food insecurity and hunger,[152,153] likely due to the health burdens and high healthcare costs of caregiving. Thus, effective policies ensuring caregivers access to affordable, healthy and nutritious food may be necessary. Evidence indicates that multisectoral government programs, which provide cash or food assistance and address other needs such as healthcare access and support for food production, can effectively combat food insecurity through national healthcare and social assistance systems.[154]

Our results show that 67.8% of family caregivers were unemployed, consistent with previous findings that caregivers often reduce working hours or leave paid employment to fulfill caregiving responsibilities.[155-157] This employment disruption can exacerbate food insecurity by reducing household income and limiting access to healthy food. To mitigate these challenges policies promoting flexible work arrangements and employment protections can help caregivers balance professional and caregiving duties.[158-160] Furthermore, access to paid and sick leave has been associated with better mental and physical health, as it allows caregivers to meet family health needs while maintaining employment.[161] These measures could reduce the risk of food insecurity and promote sustained WA among family caregivers.

Although our study provides valuable information about caregivers' HRQoL and WA, several limitations should be considered. First, like many other studies in this field, the use of non-probabilistic sampling may limit the generalizability of our findings. Convenience sampling and snowball recruitment increases the risk of selection bias, as participants who are more accessible or engaged may be overrepresented. This could exclude caregivers with different sociodemographic profiles or caregiving experiences, potentially affecting external validity. However, the multi-faceted recruitment strategy involving public health services, long-term care facilities, vocational schools, outpatient clinics, and online platforms aimed to mitigate this limitation by diversifying the recruitment sources.[56] Future studies using probabilistic sampling methods could help confirm our findings and improve their applicability to broader caregiver populations.

Second, participants were from a single geographic location, limiting the generalizability of the findings. Conducted in a specific region of Brazil, the results may not fully reflect caregivers' experiences in other parts of the country, where healthcare access, socioeconomic factors, and cultural aspects may vary. Thus, future studies should include a larger, randomly selected sample from multiple regions and cities to improve generalizability.

Additionally, generalizing the findings to other countries should be done cautiously, given the lack of comprehensive workplace and social policies to support caregivers in Brazil, as well as the unique characteristics of Brazil's healthcare system, which combines public services with private sector businesses that operate for profit. Nevertheless, the findings of this study may have implications for a broad range of contexts. In countries where family caregivers play a critical role, these findings can guide interventions to reduce caregivers' burden and promote HRQoL and WA. Similarly, the study's relevance may extend to regions where caregiving relies heavily on private healthcare services and paid caregivers, since it evaluated both family and paid caregivers.

Moreover, cultural factors and values, such as familism, social support, caregiver burden, and religious beliefs, vary across ethnic-cultural groups and significantly influence caregiving experiences and outcomes.[162-165] These factors can impact caregiving dynamics and burden,[163,165] as well as caregivers' mental and physical health.[163,165] Understanding these cultural influences is crucial for designing interventions that address the unique needs and challenges of caregivers from different cultures or regions.

Thus, while this study provides important understandings into the challenges faced by caregivers in Brazil, future research should be conducted in diverse geographic and healthcare contexts. Such studies would contribute to the development of globally relevant interventions, while also considering the nuances of different healthcare systems.

Third, the cross-sectional design limits the ability to establish causal relationships and directionality of the associations observed. While reverse causality is a recognized limitation of cross-sectional studies, they remain valuable for identifying associations that can inform health interventions and guide future research. Therefore, our findings have significant practical implications and can support initiatives to maintain and potentially improve HRQoL and WA among caregivers. Future longitudinal studies are needed to confirm these findings and clarify the temporal relationships between factors

associated with HRQoL and WA. Such research could reveal how changes in these variables over time influence caregiver well-being.

Fourth, caregivers' preexisting health conditions were not evaluated. While these conditions may have influenced the outcomes, their inclusion was not feasible due to practical constraints, such as potential recall bias and challenges in accurately evaluating caregivers' health histories. Additionally, the focus was primarily on the caregiving role itself rather than on prior health conditions. Regarding care recipients, only their functional independence was included as an independent variable. This was based on the assumption that functional independence of the care recipient is a key factor influencing HRQoL and WA, and it was the most feasible measure within the study's design.

Fifth, self-reported data may have introduced information bias, including social desirability bias and recall errors. This is especially relevant for sensitive questions, such as those on caregiver burden assessed by the ZBI-7, and for BMI. To mitigate these biases, the questionnaires were anonymized, and confidentiality was assured. However, bias may still have led to an underestimation of caregiver burden and BMI, potentially weakening the observed associations with HRQoL and WA. Future research could address this by using complementary methods, such as objective anthropometric measurements and assessing physical and psychological symptoms of caregiver burden.[166] Additionally, direct observation or data from care recipients, when feasible, could help validate self-reported information on caregiving activities or caregiving hours.

Sixth, although there is evidence indicating that measured physical fitness is moderately to strongly correlated with self-reported physical fitness when assessed by a single-item question among older adults,[107] this remains a subjective measure. Our assessment of self-perceived physical fitness, while cost-effective and time-efficient, may not fully capture objective physical capacity or its components and is susceptible to biases, especially overestimation.

Finally, even though the ZBI-7 is widely used to detect caregiver burden in family caregivers, it has not been validated for use among paid caregivers. Unlike family caregivers, paid caregivers face distinct challenges and pressures due to their professional responsibilities, such as balancing multiple care recipients and adhering to institutional policies, which may not be fully captured by the ZBI-7. However, there is a notable lack of tools specifically designed to measure caregiver burden in paid caregivers. Potential options are the Professional Caregivers' Burden Index [167] and the Professional Care Team Burden scale [168]; however, both were validated for use with caregivers of persons with dementia and neither has a translated and validated version for Brazilian Portuguese. Therefore, the development and evaluation of new tools tailored to assess the burden of paid caregivers across diverse settings is essential to improve the understanding of their experiences and inform targeted interventions.

Despite these limitations, our study has several strengths that enhance the validity and relevance of the findings. The use of internationally recognized tools, translated and validated for Brazilian Portuguese, ensures reliable and comparable data. Our study also provides a broad representation of caregiving and its effects on HRQoL and WA, including both paid and family caregivers, without selecting participants based on the care recipient's condition. In doing so, we captured a wide spectrum of caregivers' problems and needs.

Importantly, the group of paid caregivers encompassed a heterogeneous profile, including individuals with formal vocational training, those currently enrolled in such programs, and others without any formal preparation. This diversity reflects the unregulated nature of Brazil's caregiving labor market, where paid caregiving does not require mandatory certification or training. By capturing these realities, the study not only enhances the validity of its findings but also strengthens the transferability of results to similar unregulated labor markets in Global South contexts.

Finally, this study is one of the few to investigate WA among caregivers, addressing a significant gap in the literature by exploring an under-researched yet highly relevant topic among a crucial but commonly neglected population who are often not even recognized as workers.

Conclusion

Our findings underscore a high prevalence of inadequate WA among caregivers, with more than a quarter of paid caregivers and over half of family caregivers affected. Family caregivers also reported greater caregiver burden, lower perceived social support, and poorer HRQoL. Notably, similar factors were associated with both poor HRQoL and inadequate WA. These findings emphasize the urgent need for government policies that promote better coordination between health and social care systems and caregivers to reduce caregiving hours, mitigate caregiver burden, and improve caregivers' physical fitness. Furthermore, additional research among both paid and family caregivers, particularly longitudinal studies with large, representative samples, is needed to deepen our understanding of the complex relationships between caregiving, HRQoL, and WA. Such studies should be prioritized given the growth of the older population, increasing proportion of workers aged 50 years and older, and growing number of caregivers.

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