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Depression and self-care in older adults with multiple chronic conditions : A multivariate analysis**Iovino, Paolo, De Maria, Maddalena, Matarese, Maria, Vellone, Ercole, Ausili, Davide and Riegel, Barbara**

This is the peer reviewed version of the following article:

Iovino, P., De Maria, M., Matarese, M., Vellone, E., Ausili, D. and Riegel, B. (2020). Depression and self-care in older adults with multiple chronic conditions : A multivariate analysis. *Journal of Advanced Nursing*, 76(7), pp. 1668-1678, which has been published in final form at <https://doi.org/10.1111/jan.14385>.

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FULL TITLE: Depression and Self-Care in Older Adults with Multiple Chronic Conditions: a Multivariate Analysis

RUNNING TITLE: Depression and self-care in multimorbidity

AUTHORS

Paolo IOVINO (Corresponding author), University of Rome Tor Vergata, Rome, Italy. Electronic address: paolo.iovino@uniroma2.it. Tel: +39 3479392534. ORCID: 0000-0001-5952-881X

Maddalena DE MARIA, University of Rome Tor Vergata, Rome, Italy. Electronic address: maddalena.demaria@outlook.it. ORCID: 0000-0003-0507-0158

Maria MATARESE, University Campus Bio-Medico, Rome, Italy. Electronic address: m.matarese@unicampus.it ORCID: 0000-0002-7923-914X

Ercole VELLONE, University of Rome Tor Vergata, Rome, Italy. Electronic address: ercole.vellone@uniroma2.it ORCID: 0000-0003-4673-7473

Davide AUSILI, Department of Medicine and Surgery, University of Milan-Bicocca, Monza, Italy. Electronic address: davide.ausili@unimib.it ORCID: 0000-0001-5212-6463

Barbara RIEGEL, University of Pennsylvania, Philadelphia, United States. Electronic address: briegel@nursing.upenn.edu ORCID: 0000-0002-0970-136X

Corresponding author: Paolo IOVINO, University of Rome Tor Vergata, Rome, Italy. Electronic address: paolo.iovino@uniroma2.it. Tel: +39 3479392534. ORCID: 0000-0001-5952-881X

This article has been accepted for publication and undergone full peer review (not applicable for Editorials) but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as [doi: 10.1111/JAN.14385](https://doi.org/10.1111/JAN.14385)

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CONFLICT OF INTEREST: No conflict of interest has been declared by the authors

AUTHOR CONTRIBUTIONS: All authors have agreed on the final version and meet at least one of the following criteria:

- Substantial contributions to conception and design, acquisition of data or analysis and interpretation of data;
- Drafting the article or revising it critically for important intellectual content.

FUNDING: This study was funded by a grant from the Centre of Excellence for Nursing Scholarship (CECRI), Rome, Italy.

DR PAOLO IOVINO (Orcid ID : 0000-0001-5952-881X)

DR MADDALENA DE MARIA (Orcid ID : 0000-0003-0507-0158)

PROFESSOR MARIA MATARESE (Orcid ID : 0000-0002-7923-914X)

DR ERCOLE VELLONE (Orcid ID : 0000-0003-4673-7473)

DR BARBARA RIEGEL (Orcid ID : 0000-0002-0970-136X)

Article type : Original Research: Empirical research - quantitative

**DEPRESSION AND SELF-CARE IN OLDER ADULTS WITH MULTIPLE
CHRONIC CONDITIONS: A MULTIVARIATE ANALYSIS**

ABSTRACT

Aims. To investigate the relationship between depression and self-care behaviors in older individuals with multimorbidity.

Design. Cross-sectional study. Data were collected between April 2017-June 2019.

Methods. Patients were enrolled from community and outpatient settings and included if they were ≥ 65 years, affected by heart failure, diabetes mellitus or chronic obstructive pulmonary disease and at least another chronic condition. They were excluded if they had dementia and/or cancer. Patient Health Questionnaire-9 was used to measure depression and Self-Care of Chronic Illness Inventory was used to measure self-care maintenance, monitoring and management. The relationship between depression and self-care was evaluated by performing two sets of univariate analyses, followed by multivariate and step-down analyses. The second set was performed to control for the number of chronic conditions, age and cognitive function.

Results. The sample (N=366) was mostly female (54.2%), with a mean age of 76.4 years. Most participants (65.6%) had mild to very severe depressive symptoms. Preliminary analysis indicated a significant negative association between depression and self-care maintenance and monitoring and a significant negative association between depression and multivariate self-care. Step-down analysis showed that self-care maintenance was the only dimension negatively associated with depression, even after controlling for the number of chronic conditions, age and cognitive function.

Conclusion. In multimorbid populations, depression is more likely to be associated with self-care maintenance than the other self-care dimensions. Therefore, self-care maintenance behaviors (e.g. physical activity and medication adherence) should be prioritized in assessment and focused on when developing interventions targeting depressed older adults with multimorbidity.

Impact. The results of this study may help guide clinical practice. In patients with depressive symptoms, self-care maintenance behaviors should be assessed first, as a potential first indicator of poor self-care.

Keywords: chronic obstructive pulmonary disease, depression, diabetes mellitus, heart failure, multiple chronic conditions, multimorbidity, cognition, age, self-care

INTRODUCTION

Multiple Chronic Conditions (MCC), defined as the presence of more than two chronic conditions simultaneously, are common, especially in older populations (Wang, Palmer, Cocker, & Sanderson, 2017). In the US and Europe, approximately half of people over age 65 have MCC (Buttorff, Ruder, & Bauman, 2017; van der Heide et al., 2015) and a sharp increase is expected in the near future (Kingston et al., 2018) due to a decline in mortality rates and ageing of the population (Fabbri et al., 2015).

MCC represents a challenge worldwide (Hajat & Stein, 2018) due to its negative impact on a variety of health outcomes. Evidence from systematic reviews indicate that MCC is associated with an important decline in physical functioning (Ryan, Wallace, O'Hara, & Smith, 2015), quality of life (Makovski, Schmitz, Zeegers, Stranges, & van den Akker, 2019) and survival (Wei & Mukamal, 2018). Individuals with MCC also exhibit higher psychological symptoms, such as anxiety and depression (Gould, O'Hara, Goldstein, & Beaudreau, 2016; Read, Sharpe, Modini, & Dear, 2017).

There is growing evidence that effective management of MCC requires the active participation by patients in the care process (Koch, Wakefield, & Wakefield, 2015). This involvement, broadly known as self-care, is particularly challenging for individuals affected by MCC, because of overlapping and competing symptoms and multiple medications with a higher risk of adverse effects. Together, these issues require collaboration between patients and healthcare providers to avoid complications and maintain illness stability (Poitras, Maltais, Bestard-Denomme, Stewart, & Fortin, 2018; Vermunt et al., 2018).

Depression is one of the most prevalent psychological manifestations of chronic conditions that can affect self-care behaviors. Depressive symptoms are linked to reduced physical activity (Roshanaei-Moghaddam, Katon, & Russo, 2009), limited adherence to a healthy diet (Walsh, Senn, & Carey, 2013) and prescribed medication (Grenard et al., 2011; Pierobon et al., 2017; Riegel, Moser, et al., 2009). Studies in heart failure (HF) (Cameron, Worrall-Carter, Riegel, Lo, & Stewart, 2009; Riegel, Vaughan Dickson, Goldberg, & Deatricks, 2007) have demonstrated that patients with depressive symptoms were more likely to delay consulting a healthcare

provider, particularly after an episode of symptom exacerbation (Johansson, Nieuwenhuis, Lesman-Leegte, van Veldhuisen, & Jaarsma, 2011).

Our study focuses on the relationship between depression and self-care of individuals affected by MCC. There is a pressing need to gain in-depth knowledge of this relationship because: (i) self-care represents an integral part of pharmacological and clinical treatments for MCC patients; (ii) multimorbidity is a growing public health concern; (iii) depression is frequently associated with MCC older adults and (iv) studies on specific chronic conditions have demonstrated a detrimental influence of depression on self-care behaviors. Finally, there is a general lack of knowledge about the relationship between depression and self-care in the context of MCC.

BACKGROUND

Self-care, defined as the process of promoting health and managing illnesses (Riegel et al., 2012), is important for individuals affected by MCC as it can improve a variety of outcomes including symptoms, quality of life (Kessing, Denollet, Widdershoven, & Kupper, 2017), hospital admission rates (De Vito, D'Addario, Di Lascio, Villari, & Damiani, 2013) and mortality (Laxy et al., 2014). The Theory of Self-care of Chronic Illness (Riegel et al., 2012) describes self-care behaviors in individuals affected by chronic conditions as including (i) self-care maintenance, defined as the adherence to healthy lifestyles such as physical activity, diet and medication adherence, (ii) self-care monitoring, defined as the process of self-observation of behavior and in search of signs and symptoms of the disease and (iii) self-care management, or the response to signs and symptoms when they occur. According to this theory, self-care maintenance behaviors initiate the self-care process. That is, mastery of self-care maintenance precedes mastery of self-care monitoring and self-care management (Riegel, Dickson, & Faulkner, 2016).

Previous studies have demonstrated that self-care is consistently poor in patients with specific chronic conditions (Cocchieri et al., 2015; Gonzalez, Tanenbaum, & Commissariat, 2016; Yang et al., 2019). These investigations have stimulated further research to understand which factors influence self-care, showing a broad variety of sociodemographic and clinical variables influencing self-care behaviors of individuals with chronic conditions (Abubakari, Cousins, Thomas,

Sharma, & Naderali, 2016; Ausili et al., 2016; Cocchieri et al., 2015; Niriayo et al., 2019). For example, age and cognitive function are important risk factors that may blunt self-care in chronic conditions (Uchmanowicz, Jankowska-Polanska, Mazur, & Sivarajan Froelicher, 2017). The number of chronic conditions may influence self-care directly either by causing disability (Strauss, Jones, Kadam, & Jordan, 2014), or by increasing the presence of overlapping symptoms and signs, which therefore, become more difficult to manage.

As noted above, what we know about the effect of depression on self-care maintenance and management is gleaned from individual disease groups. By contrast, there is limited research regarding the impact of depression on self-care monitoring behaviors. What we know derives predominately from diabetes mellitus (DM) studies, but these results are often contradictory. Wagner, Tennen and Osborn (2010) found that depressed women with DM tended to skip blood glucose monitoring more frequently than their non-depressed counterparts. Bynum et al. (2018) added that those with depression were twice as likely to skip foot monitoring than those without depression. But Mut-Vitcu, Timar, Timar, Oancea and Citu (2016) observed that depression did not affect the quality of glycemic monitoring in a cohort of DM patients. This conclusion was consistent with that of Lin et al. (2004) and Rivera-Hernandez (2014) who also found that depression did not influence regular foot examinations in these patients.

THE STUDY

Aims

The aim of the present study was to assess the relationship between depression and self-care behaviors in individuals with MCC.

METHODS

Design

This was a secondary analysis of an ongoing multicenter longitudinal study aimed at measuring self-care in patient with MCC and their caregivers; the details of this study have been published previously (De Maria et al., 2019). Cross-sectional data collected from April 2017 - June 2019 across outpatient and community settings in Southern and Central Italy are presented in this article.

Participants

The investigators of the parent study (De Maria et al., 2019) planned to recruit 1000 participants to compensate for attrition. For our secondary analysis, 369 was judged to be enough based on a post-hoc test. We assumed an effect size of 0.12 with MANOVA with an alpha error of 0.05 and a power of 0.99. Two-hundred participants would have been enough to detect this effect, but we included more because we included covariates in the analysis. Patients were eligible if they were at least 65 years old with a diagnosis of DM, chronic obstructive pulmonary disease (COPD), or HF and at least one additional chronic condition that could be also one of these (e.g., DM and COPD). Exclusion criteria were the presence of a clinical diagnosis of cancer and/or dementia and the inability to sign the informed consent form.

Data collection

Research assistants who were all registered nurses were trained to gather information from medical records and directly from participants by interview. After eligibility criteria were met, the research assistants approached the participants, explained them the objectives of the study and invited them to sign the informed consent form. The interviews were performed either at the patients' homes or at the outpatient settings.

A battery of instruments was administered to the participants. However, for the aim of this study, only the following were used:

Self-Care of Chronic Illness Inventory (SC-CII)

SC-CII is a self-reported generic tool developed to measure self-care in patients affected by chronic conditions. The instrument is based on the Theory of Self-care of Chronic Illness and consists of 19 items distributed in three separate scales that measure self-care maintenance, self-care monitoring and self-care management (Riegel et al., 2018). Scores are standardized from 0-100, with higher scores indicating higher self-care levels. The cut-point for self-care adequacy is 70 (Riegel, Lee, Dickson, & Carlson, 2009).

9-Item Patient Health Questionnaire (PHQ9)

PHQ9 is a self-reported tool developed to measure depression symptoms in primary care and other medical settings. It consists of 9 items with a total score ranging from 0 (no symptoms) - 27 (symptoms present nearly every day). Scores of 5, 10, 15 and 20 represent the cut-off points for mild, moderate, moderately severe and severe depressive symptoms, respectively. We used the validated Italian version (Rizzo, Piccinelli, Mazzi, Bellantuono, & Tansella, 2000), freely downloadable on the PHQ Web site (<http://www.phqscreeners.com>).

Montreal Cognitive Assessment Scale (MoCA)

MoCA is an instrument developed to measure cognitive function. It consists of multiple domains, including short term memory, visuospatial abilities, attention and executive function. Scores range from 0-30 and higher scores indicate better cognition (Nasreddine et al., 2005).

A structured questionnaire was developed by the research team to collect sociodemographic characteristics: age, gender, marital status, education level, perceived income adequacy and living condition (alone or with the caregiver). We measured also clinical characteristics of our sample, including cognitive function and number and type of chronic conditions.

Ethical considerations

Ethical approval of the parent study was obtained by the Institutional Review Board of the regional health-care system (Protocol number: ComET ASReM 2017/138) and informed consent was obtained from all the participants.

Data analysis

The data were analyzed with SPSS Version 21.0 (Armonk, NY: IBM Corp.); a p -value < 0.05 was considered to indicate statistical significance. The sample was described using means and standard deviations (continuous variables) and frequencies and percentages (nominal or ordinal data). Differences in sociodemographic and clinical variables between the two groups of participants (depressed and not depressed) were analyzed using Chi square or independent sample t tests. Although a cut-point of 10 for the PHQ-9 is often used to discriminate between depressed and not depressed individuals (Levis, Benedetti, & Thombs, 2019; Manea, Gilbody, & McMillan, 2012), we used the cut-point of five to include also individuals with mild depressive symptoms (Kroenke, Spitzer, & Williams, 2001; Janssen et al., 2016).

We checked the data for univariate and multivariate outliers, normality, multicollinearity between the outcome variables, homogeneity of regression slopes and variance/covariance matrices. To investigate the association between depression and self-care, we performed two sets of analyses.

First set of analyses

The first set of analyses (exploratory in nature) was performed using: (i) an analysis of variance (ANOVA), adjusted for multiple comparisons (Bonferroni), to test the association between depression and each self-care dimension (self-care maintenance, monitoring and management); (ii) a multivariate analysis of variance (MANOVA) with depression as the explanatory variable and the three self-care scales as the outcome variables and (iii) the Roy-Bargmann step-down analysis (Tabachnick & Fidell, 2007), to assess which of the self-care scales contributed most to

differentiating the groups (depressed and non-depressed individuals). The step-down analysis was performed by ordering the scales as self-care maintenance followed by self-care monitoring, according to the theory (Riegel et al., 2012). We entered self-care maintenance first in a univariate ANOVA. Then, we added self-care monitoring in the second step in an ANCOVA, with the first outcome as a covariate. We did not add self-care management to the model because management was not significantly associated with depression. We also applied the step-down procedure in reverse, to determine if unique significant variance was available at later stages (Koslowsky & Caspy, 1991); self-care monitoring was entered first, followed by self-care maintenance.

Second set of analyses

The second set of analyses was performed to control for the number of chronic conditions, cognitive function and age. The choice of these covariates was based on previous literature.

We performed an analysis of covariance (ANCOVA) adjusted for Bonferroni, to test the association between depression and each separate self-care scale. Then a multivariate analysis of covariance (MANCOVA) tested depression as the explanatory variable and the three self-care scales as the outcome variable. Finally, the Roy-Bargmann step-down analysis was done according to the covariate-adjusted means. The step-down analysis was performed following the same procedure as the first set of analyses. We did not add self-care management scale in the model as this variable was not significant in the previous ANCOVA.

MANOVA and MANCOVA were chosen because these analyses increase the likelihood of detecting group differences by considering the intercorrelations between the outcome variables and at the same time, controlling for type I error (Warne, 2014). Additionally, there was a strong theoretical basis for including all the outcome variables in the analysis, since they all measure self-care behaviors (Riegel et al., 2012).

Validity, reliability and rigour

Both the SC-CII and the PHQ-9 have valid and reliable psychometric properties. The SC-CCI has shown adequate global reliability indexes for all the three scales

(maintenance = 0.67, monitoring = 0.81, management = 0.71) (Riegel et al., 2018). Measurement equivalence has been demonstrated among the Italian, Swedish and US populations (Maddalena De Maria et al., 2019). The PHQ-9, which has also been used in previous studies on people with MCC (Petersen, Rathod, Kathree, Selohilwe, & Bhana, 2019; Spangenberg, Forkmann, Brahler, & Glaesmer, 2011), has shown adequate internal consistency in our sample, with a Cronbach's alpha of 0.82. The MoCA is also valid and reliable (Cronbach's alpha of 0.83) and has been used widely across chronic conditions (Crisan et al., 2014; Hawkins et al., 2014; Mori et al., 2015). To ensure rigour of data collection, the principal investigator planned regular meetings with the research assistants and was available at any moment during the study.

RESULTS

Participants

Among the 369 people recruited, three cases were multivariate outliers and were therefore eliminated, leaving a total sample of 366. Descriptive data for the sample are reported in Table 1. In brief, the mean age was 76.39 (SD 7.28) and most participants were female (57%), partnered (65%) and with a low education level (81%). Slightly more than half of the sample resided with the caregiver (55%) and most perceived their income to be adequate to their needs (83%). DM was the most predominant primary chronic condition (75%), followed by HF (34%) and COPD (14%). About two thirds of the sample (66%) reported at PHQ-9 a score ≥ 5 and most of them presented a score ranging 5-9 (41.26%). The average MoCA score of 22.70 (SD 4.61) indicated only mild cognitive impairment in our sample. Scores of self-care behaviors were adequate only on the self-care monitoring scale (score: 74.41), although there was high score variability across participants. There were no significant differences between the depressed and non-depressed groups in terms of age, gender, education, marital status, co-residence with a caregiver, or number of chronic conditions. The groups differed significantly on perceived income ($p = 0.039$), prevalence of DM ($p < 0.001$), HF ($p < 0.001$) and COPD ($p = 0.002$) and cognitive function ($p < 0.001$) (Table 1).

Multicollinearity among the variables was not present, as correlations were not above the cut-off point of 0.80 (Grice & Iwasaki, 2007). Except for the relationship between self-care monitoring and management, the self-care scales showed moderate intercorrelations (Cohen, West, & Aiken, 2014) (Table 2). Assumptions of normality were not violated according to skewness and kurtosis values (Table 1). Homogeneity of variance, covariance matrices and regression slopes tests were all nonsignificant.

Main results

First set of analyses

ANOVA revealed a significant association between depression and self-care maintenance and monitoring but not with self-care management (Table 4).

MANOVA revealed a significant association between depression and the multivariate self-care scales (all three self-care scales) (Table 3). In the step-down analysis, self-care maintenance was significantly influenced by depression: [step-down $F(1,364) = 45.48, p < 0.001$]. When we used the reverse step-down procedure, both self-care monitoring and maintenance were significant [step-down $F(1,364) = 10.63, p = 0.001$; step-down $F(1,363) = 33.82, p < 0.001$, respectively], thus reinforcing the fact that self-care maintenance, although moderately correlated with monitoring ($r = 0.485, p = 0.01$) was the only variable that discriminated between depressed and non-depressed patients.

Second set of analyses

ANCOVA revealed a significant association between depression and self-care maintenance and monitoring after controlling for the number of chronic conditions, cognitive function and age (Table 4). In MANCOVA, depression was significantly associated with the multivariate self-care, after controlling for number of chronic conditions, cognitive function and age. These covariates were also significantly related to depression, except for cognitive function (Table 3). In the step-down analysis, self-care maintenance was a significant contributor in differentiating between depressed and not depressed patients: step-down $F(1,353) = 35.89, p < 0.001$. This finding was confirmed by the step-down analysis performed in reverse,

where both were significant [monitoring: step-down $F(1,353) = 6.78, p = 0.010$; maintenance: step-down $F(1,352) = 28.48, p < 0.001$].

DISCUSSION

The aim of this study was to determine whether depression was associated with self-care maintenance, monitoring and management in older MCC individuals. Our results illustrate that depression was significantly associated with self-care maintenance behaviors. This finding is consistent with earlier studies conducted in patients with specific chronic conditions. Gonzalez et al. (2007) demonstrated that depression was associated with fewer days of adherence to exercise, diet and medication in DM patients. A meta-analysis by Grenard et al. (2011) focusing exclusively on medication adherence, found that patients with depressive symptoms were 1.76 times more likely to be nonadherent than their counterparts.

The reason why depression is associated with self-care maintenance behaviors probably lies in the core symptoms of depression; fatigue, lack of energy and hopelessness combined with lower motivation lead to a loss of interest and pleasure in activities that should be performed constantly, including healthy behaviors (Bryant, Winer, Salem, & Nadorff, 2017; Buyukdura, McClintock, & Croarkin, 2011; Kasch, Rottenberg, Arnow, & Gotlib, 2002). It is interesting to note that in our study, most participants had only mild depressive symptoms. This finding reinforces the importance of identifying patients with mild depression because even mild symptoms can be associated with poor self-care maintenance behaviors.

Interestingly, our results show that self-care monitoring was not associated with depression. This finding differs from that of Mut-Vitcu et al. (2016) and Wagner et al. (2010) who demonstrated that specific DM-related self-care behaviors such as physical exercise, diet, foot care and glycemic monitoring, were hampered by depressive symptoms. There are several possible explanations for the discrepancy in findings. First, our analysis allowed us to account for the intercorrelations between the self-care behaviors. We demonstrated that initially self-care monitoring was significantly explained by depression but only when self-care maintenance was not taken into account. When self-care maintenance was controlled for, self-care monitoring was no longer affected by depression. Although the cross-sectional nature of this study requires caution in interpretation, depression may affect self-

care monitoring through its influence on self-care maintenance. Future studies conducted with mediation analyses could shed light on this relationship.

There is evidence that depressive disorders in chronic conditions are associated with more somatic symptoms, lower symptom adaptation and a general heightened awareness towards them (Katon, 2003; Tylee & Gandhi, 2005). This process might promote vigilance to anticipate and prevent an exacerbation. It is worth noticing that contrary to the other self-care dimensions, self-care monitoring scores were more likely to be adequate in our sample, which supports our explanation. In addition, the availability of caregivers (more than half of them resided with the patient) might have helped patients in daily self-care monitoring tasks. In other words, caregivers might have compensated for forgetfulness, inattentiveness and other depression-related cognitive symptoms (Richardson & Adams, 2018). Research analyzing the influence of caregivers' contributions to self-care is needed to identify the influence of their support on each element of patient self-care behaviors.

We found that self-care management behaviors were not associated with depression. Self-care management is essential for people with chronic conditions; after symptom recognition, people with chronic conditions must be able to make decisions and use specific strategies to deal with symptoms. We believe that since most of our participants had only mild depressive symptoms, these, probably were not strong enough to have a negative impact on their engagement in self-care management.

Limitations and strengths

Several limitations should be considered. First, the cross-sectional design hampers the inference of causality between depression and self-care behaviors; longitudinal studies are needed to confirm the influence of depression on self-care in older patients with MCC. Second, we used convenience sampling, so the sample may not be representative of the general MCC population. Third, this was a secondary analysis of data from a study aimed at describing self-care in adults with MCC and their caregivers; consequently, both patients and their caregivers were enrolled. Assuming that caregivers significantly helped these patients, their contributions may have distorted the estimates of the influence of depression on self-care behaviors.

Additional studies are needed to explain the reciprocal influence of caregivers on patient self-care behaviors. Fourth, we used a cut-point of five on the PHQ-9 and many of these participants had only mild depressive symptoms. The fact that we found that even low levels of depression were associated with self-care maintenance illustrates the importance of considering also chronically ill people with mild depression, at risk of poor self-care. Strengths of the study include the large sample size drawn from a wide range of community and outpatient settings across Central and Southern Italy and the adoption of a multidimensional measure of self-care, which allowed controlling for scale intercorrelations to obtain a better understanding of how self-care behaviors work together in real life.

Implications for research

Future research is recommended to gain a more in-depth understanding of the relationship between self-care and depression in MCC populations. It would be helpful to explore how self-care behaviors change at different levels of depression severity. In addition, future studies should determine if self-care maintenance effectively mediates the relationship between depression and self-care monitoring. With an increased understanding of these dynamics, health-care providers would be more aware of how best to intervene to improve the outcomes of these fragile populations.

CONCLUSION

Overall, our findings extend the results of prior self-care research conducted on specific chronic conditions, suggesting that patients with MCC and depression exhibit lower self-care maintenance behaviors than their non-depressed counterparts. Based on the results of this study, we encourage health care providers to systematically screen depressive symptoms in patients with MCC. If depressive symptoms are detected, specific self-care maintenance behaviors such as medication adherence, sleep, exercise behaviors and diet should be assessed, to detect issues that need to be addressed. We believe our results may be useful in focusing interventions for those needing support to improve self-care behaviors.

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Table 1. Sociodemographic and clinical characteristics of the sample (N=366).

Variable	Total (N=366)	Not depressed (N=126)	Depressed (N=240)		
	n (%)	n (%)	n (%)	χ^2	<i>p</i>
Gender					
Male	156 (42.62)	62 (49.21)	94 (39.17)	3.405	0.065
Female	210 (57.38)	64 (50.79)	146 (60.83)		
Education					
< middle school	298 (81.42)	99 (78.57)	199 (82.92)	1.031	0.310
≥ middle school	68 (18.58)	27 (21.43)	41 (17.08)		
Marital status					
Single/Never married	11 (3.00)	4 (3.17)	7 (2.92)	1.620	0.655
Married/Partnered	238 (65.03)	87 (69.05)	151 (62.92)		
Divorced/Separated	12 (3.28)	4 (3.17)	8 (3.3)		
Widowed	105 (28.69)	31 (24.60)	74 (30.83)		
Perceived income					
More than needed	47 (12.84)	16 (12.70)	31 (12.92)	6.510	0.039
Enough for a living	302 (82.51)	109 (85.51)	193 (80.42)		
Less than needed	17 (4.64)	1 (0.79)	16 (6.67)		
Living condition					
With the caregiver	201 (54.9)	77 (61.1)	124 (51.7)	2.997	0.084
Alone	165 (45.1)	49 (38.9)	116 (48.3)		
Primary chronic condition					
DM	273 (74.59)	98 (77.2)	176 (73.3)	23.188	< 0.001
HF	124 (33.88)	39 (31)	85 (35.42)	17.672	< 0.001

COPD	53 (14.48)	16 (12.6)	37 (15.42)	9.618	0.002
Depression level (PHQ-9)					
1-4 minimal depression	126 (34.43)	-	-	223.94	< 0.001
5-9 mild depression	151 (41.26)	-	-		
10-14 moderate depression	63 (17.21)	-	-		
15-19 moderately severe depression	23 (6.28)	-	-		
20-27 severe depression	3 (0.82)	-	-		
<hr/>					
	Mean (SD) <i>Sk/Ku</i>	Mean (SD) <i>Sk-Ku</i>	Mean (SD) <i>Sk-Ku</i>	<i>t</i>	<i>P</i>
<hr/>					
Age (years)	76.39 (7.28) <i>0.13/-0.92</i>	75.51 (6.56) <i>0.10/-0.93</i>	76.86 (7.61) <i>0.09/-0.98</i>	-1.769	0.08
Depression (PHQ-9)	6.70 (4.41) <i>0.92/0.89</i>	2.42 (1.31) <i>-0.37/-1.00</i>	8.94 (3.76) <i>1.26/1.55</i>	-24.23	< 0.001
Self-care maintenance	65.64 (14.08) <i>-0.26/-0.16</i>	72.11 (12.79) <i>-0.25/-0.29</i>	62.25 (13.55) <i>-0.29/-0.18</i>	6.744	< 0.001
Self-care monitoring	74.41 (19.45) <i>-0.61/0.39</i>	78.93 (17.90) <i>-0.71/0.40</i>	72.04 (19.84) <i>-0.54/0.40</i>	3.261	0.001
Self-care management	61.43 (16.88) <i>-0.31/-0.07</i>	64.76 (16.33) <i>-0.40/0.44</i>	61.43 (17.09) <i>-0.26/-0.25</i>	1.799	0.07
Number of chronic conditions	3.22 (1.28) <i>1.04/0.53</i>	3.09 (1.31) <i>1.28/1.24</i>	3.29 (1.27) <i>0.94/0.25</i>	-1.402	0.162
Cognitive function (MoCA)	22.70 (4.61) <i>-0.76/0.31</i>	24.38 (3.94) <i>-1.09/2.10</i>	21.83 (4.70) <i>-0.62/-0.07</i>	5.411	< 0.001
<hr/>					

Note. COPD, Chronic Obstructive Pulmonary Disease; DM, Diabetes Mellitus; HF, Heart Failure; Ku, Kurtosis; MoCA, Montreal Cognitive Assessment Scale; *p*, *p* value; PHQ9, 9-Item Patient Health Questionnaire; Sk, Skewness; *t*, independent sample *t* test; χ^2 , Chi Square test. Significant *p* values are in bold.

Table 2. Intercorrelations between the self-care behavior scales.

	Self-care Maintenance	Self-care Monitoring	Self-care Management
Self-care Maintenance	65.64 (14.08)	-	-
Self-care Monitoring	0.48	74.41 (19.45)	-
Self-care Management	0.43	0.53	61.43 (16.88)

Note. Correlations are significant at $P < 0.01$ level. The matrix diagonal reports the mean and the standard deviation (in brackets) for each self-care scale.

Table 3. MANOVA and MANCOVA results for the association between depression and self-care behaviors (N=366).

	Variable	Wilks's Lambda	<i>F</i>	d.f.	<i>p</i>	ηp^2
MANOVA	Depression	0.88	15.77	3, 362	<0.001	0.12
MANCOVA	Number of chronic conditions	0.96	5.05	3, 351	0.001	0.05
	Age	0.97	3.57	3, 351	0.014	0.03
	Cognitive status	0.99	1.80	3, 351	0.148	0.01
	Depression	0.90	13.10	3, 351	<0.001	0.10

Note. D.f., Degrees of freedom; *F*, Snedecor Fisher test; ηp^2 , Partial Eta Squared. *p*, *p* value. Significant *p* values are in bold.

Table 4. ANOVA and ANCOVA results for the association between depression and each self-care scale (N=366).

	Explanatory variable	Outcome variable	<i>F</i>	d.f.	<i>p</i>	ηp^2	Depressed group mean (SE)	Non-depressed group mean (SE)
ANOVA	Depression	Self-Care Maintenance	45.48	1, 364	<0.001	0.11	62.25 (0.86)	72.11 (1.184)
		Self-Care Monitoring	10.64	1, 364	0.001	0.03	72.04 (1.24)	78.93 (1.71)
		Self-Care Management	3.24	1, 364	0.073	0.01	61.43 (1.09)	64.76 (1.50)
ANCOVA	Number of chronic conditions	Self-Care Maintenance	4.54	1, 353	<0.001	0.09		
		Self-Care Monitoring	7.82	1, 353	0.005	0.02		
		Self-Care Management	1.05	1, 353	0.578	0.001		
	Age	Self-Care Maintenance	1.05	1, 353	0.306	0.003		
		Self-Care Monitoring	0.20	1, 353	0.655	0.001		
		Self-Care Management	4.44	1, 353	0.036	0.012		
	Cognitive status	Self-Care Maintenance	2.60	1, 353	0.107	0.007		
		Self-Care Monitoring	4.50	1, 353	0.035	0.013		
		Self-Care Management	0.72	1, 353	0.395	0.002		
	Depression	Self-Care Maintenance	35.90	1, 353	<0.001	0.09	62.36 (0.87)	71.46 (1.21)
		Self-Care Monitoring	6.78	1, 353	0.010	0.02	72.54 (1.24)	78.21 (1.75)
		Self-Care Management	1.05	1, 353	0.307	0.003	61.78 (1.10)	63.74 (1.54)

Note. D.f., Degrees of freedom; *F*, Snedecor Fisher test; ηp^2 , Partial Eta Squared; *p*, p value; SE, Standard Error. Significant *p* values are in bold.