



The mediator role of unmet needs on quality of life in myeloma patients

M. G. Pereira¹ · M. Vilaça¹ · M. Pereira¹ · G. Ferreira¹ · S. Monteiro^{2,9} · H. Coelho³ · C. Geraldes⁴ · C. Gonçalves⁵ · F. Leal da Costa⁶ · H. Marques^{7,9} · R. Bacalhau⁸

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Abstract

Purpose The diagnosis of multiple myeloma (MM) has a significant impact on patients. This study analyzed the mediating role of patients' unmet needs in the relationship between psychological morbidity/social support and quality of life (QoL).

Methods This study included 213 patients with MM recruited from the outpatient medical oncology and clinical hematology services from five hospitals. Patients who meet the study criteria were referred by physicians and invited to participate in the study by the researcher. All participants answered the following questionnaires: Hospital Anxiety and Depression Scale, Satisfaction with Social Support Scale, Short-Form Survivor Unmet Needs Survey, and The European Organization for Research and Treatment of Cancer's Multiple Myeloma Module. Descriptive statistics, bivariate correlations, and structural equation modeling were performed to analyze the data.

Results The indirect effect of psychological morbidity on patients' future perspectives (MYFP) was partially mediated by information unmet needs (INF), while the indirect effect of psychological morbidity on treatment side effects (MYSE) was partially mediated by relationship and emotional unmet needs (REH). In turn, the indirect effect of psychological morbidity on disease symptoms (MYDS) was fully mediated by REH. Social support had an indirect effect on MYDS and MYSE fully mediated by REH.

Conclusion Intervention programs tailored to promote MM patients' QoL should specifically address information and emotional needs, raising awareness and training health professionals, caregivers, and family members to attend MM patients' unmet needs.

Keywords Multiple myeloma · Patients · Quality of life · Unmet needs · Psychological morbidity · Social support

Introduction

Multiple myeloma (MM) is the second most prevalent hematologic cancer [1]. Described as a disease of the elderly population, with an average diagnosis at 70 years [2], it represents 1% to 2% of all types of cancer [2, 3], and it is possible

to estimate an increase in incidence due to population-aging [4, 5]. MM has a progressive evolution, usually characterized by relapse [6].

The diagnosis and physical manifestations of MM, as well as being an incurable type of cancer with a poor prognosis, although improving in the past 30 years, have a significant

✉ M. G. Pereira
gracep@psi.uminho.pt

¹ School of Psychology, Psychology Research Center (CIPsi), University of Minho, Braga, Portugal

² Department of Education and Psychology, University of Aveiro, Aveiro, Portugal

³ Centro Hospitalar de V.N. Gaia/Espinho, Gaia, Portugal

⁴ Faculty of Medicine of the University of Coimbra, Coimbra Institute for Clinical and Biomedical Research (ICBR), Coimbra, Portugal

⁵ Centro Hospitalar do Porto, Porto, Portugal

⁶ Myeloma Clinic, Portuguese Institute of Oncology, Lisbon, Portugal

⁷ Hospital de Braga, Clinical Academic Center - Braga, Association (2CA-Braga), Braga, Portugal

⁸ Portuguese Institute of Oncology, Lisbon, Portugal

⁹ Center for Health Technology and Services Research (CINTESIS), University of Porto, Porto, Portugal

impact on patients and their caregivers, who are their main source of support [6]. The experience of having cancer is a threat not only to life and physical functioning, but also to psychological well-being. Increased dependence on activities of daily living, anxiety about the future, roles, and lifestyle changes are some of the many stressors patients with MM are exposed that contribute to exacerbate distress [6].

According to the guidelines for supportive care in MM, published by the British Committee for Standards in Haematology and the UK Myeloma Forum, all patients should be assessed for unmet needs at key points in the course of their disease [7]. In fact, cancer patients report several unmet needs [8]. Psychological and psychosocial needs are the most expressed needs of cancer patients [9]. According to Molassiotis et al. [4], 26.5% of MM patients reported at least one unmet need, with the most commonly expressed needs being associated with access to the hospital car parking areas, obtaining life/ travel insurance, and managing their concerns regarding a relapse of myeloma. Depressed and anxious patients reported more unmet needs than MM patients without these symptoms [4].

Distress (e.g., depression and anxiety symptoms) not only interferes with the ability to cope with cancer and its treatment, but also impacts patients' health [10]. Considering the physical, social, and psychological stressors that MM triggers, MM patients show great psychological vulnerability [11]. A study conducted with survivors undergoing hematopoietic stem cell transplantation showed that patients manifested significant and persistent symptoms of anxiety and depression, fatigue, sexual dysfunction, and concerns about fertility [12]. Moreover, MM patients are exposed to many stressors (e.g., prolonged hospitalization, invasive medical procedures, isolation, change in appearance, fear that the transplant does not result, and fear of death) that worsen their psychological distress [13]. Molassiotis and colleagues [4] found that 25.2% of MM patients had symptoms of depression, while 27.2% reported symptoms of anxiety. Also, anxiety was found to be associated with a lower quality of life (QoL) in MM patients [14]. In a later prospective, longitudinal cohort study, Ramsenthaler et al. [15] found that general physical symptoms, pain, and anxiety predicted worse health-related QoL in patients with MM.

Patients with MM present moderate levels of anxiety and depression [4, 6, 9, 16] and reveal more unmet needs [4] and worse QoL [11, 16]. Similarly, Allart, Soubeyran, and Cousson-Gélie [17] found that QoL in patients with hematologic cancer was inversely related to emotional distress, information needs, general health perceptions, and social support.

The uncertainties and fears experienced by a person diagnosed with cancer are likely to result in an enhanced need for social support, a valuable coping resource to deal with cancer [18]. It has been suggested that patients often underestimate the level of received support in an attempt to preserve

their feeling of independence, providing lower estimates of available support than their caregivers [19]. Furthermore, Wilson and Cleary's [20] model, adapted to MM patients, showed that social support directly impacted on QoL [21] and patients with more social support reported less unmet needs [22]. Yet at this level, social support has been shown to be negatively associated with psychological distress and positively contribute to QoL [23]. Unmet needs also have an impact on psychological distress (anxiety and depression) and QoL in MM patients [15, 23] and played a mediating role in cancer patients [24, 25].

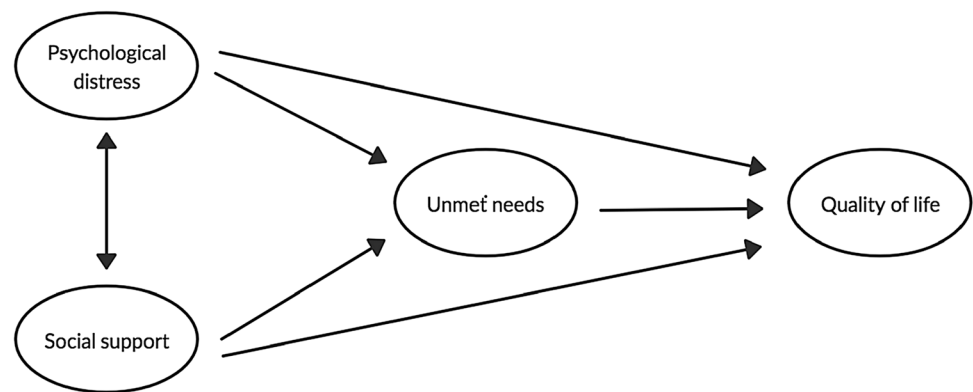
QoL has gained increasing importance in oncology [26]. However, few studies have focused on MM. It is known that patients with MM live with a complexity of symptoms, with a significant impact on their QoL [9]. Studies suggest that patients with MM reported lower QoL, particularly in terms of global QoL, physical, role, cognitive, and social functioning, as well as pain, breathlessness, loss of appetite, memory problems, insomnia, constipation, and financial difficulties [4]. Thus, in all phases of the disease trajectory (including premalignant stages), patients may present QoL's impairments related to physical and mental health [27].

In the absence of a theoretical model that considers the mediating role of unmet needs and its relationship with QoL in MM patients, and taking into consideration the previous theoretical and empirical literature highlighting the direct influence of psychological distress, social support and unmet needs on QoL in MM patients [4, 15, 17, 21–23], as well as the mediating role of unmet needs in cancer patients [24, 25], a conceptual model was designed. Overall, the proposed model (Fig. 1) supports that both psychological distress and social support influence QoL, and these relationships are mediated by unmet needs. In order to test the proposed conceptual model, this study analyzed the mediating role of unmet needs in the relationship between morbidity and social support, having QoL as the outcome, as well as the direct influence of psychological morbidity and social support on QoL. Thus, it was hypothesized that psychological morbidity influence unmet needs and QoL (H1 and H2, respectively); social support influences unmet needs and QoL (H3 and H4, respectively); and unmet needs play a mediator role in the relationship between psychological distress and QoL (H5), and between social support and QoL (H6).

Method

Participants

This study included 213 patients with symptomatic MM [28] recruited from the outpatient medical oncology and clinical hematology services from five hospitals throughout

Fig. 1 Hypothesized model

Portugal. The inclusion criteria for patients were (i) having MM diagnosis, (ii) without a diagnosis of any other cancer, (iii) being under treatment, (iv) 18 years of age or older, (v) Portuguese literacy, and (vi) with no cognitive deficit as assessed by the Mini Mental State Exam.

Instruments

Hospital anxiety and depression scale (HADS) [29]. It consists of 14 items that assess psychological morbidity in clinical and community contexts, through two subscales: Anxiety (7 items) and Depression (7 items). Each item is rated on a 4-point Likert scale and higher scores indicate greater anxiety and depression. A total score indicates emotional distress. Cronbach's alphas for the Portuguese version of HADS [30], used in this study, were 0.76 for Anxiety and 0.82 for Depression. In this study, only the total score was considered and the Cronbach's alpha was 0.81.

Satisfaction with social support scale (SSSS) [31]. The SSSS is a Portuguese instrument that assesses satisfaction with social support through 15 items divided into four subscales: Satisfaction with friends (SFrie), Intimacy (IN), Satisfaction with family (SF), and Social activities (SA). Items are evaluated on a 5-point Likert scale and, for each subscale, total scores are the sum of the respective items. Results for the global scale are also computed, with higher scores indicating greater satisfaction with social support. Cronbach's coefficients were 0.85 for the total score and 0.83 (SFrie), 0.74 (IN and SF) and 0.64 (SA) for the subscales. In this study, only the global score was used, with a Cronbach's alpha of 0.88.

Short-form survivor unmet needs survey (SF-SUNS) [32]. The SF-SUNS consists of 30 items that evaluate four domains: Information (INF; 3 items), Financial concerns (FIN; 8 items), Access and continuity of care (ACC; 6 items), and Relationship and emotional health (REH; 13 items). Each item is scored on a 5-point Likert scale and higher scores indicate more unsatisfied needs. The Portuguese version of SUNS [33], used in this study, includes 20

of the original items (INF=3 items; FIN=4 items; ACC=4 items; REH=9 items). Cronbach's alphas for the Portuguese version and the present study were 0.77 for INF, 0.92 for FIN, 0.73 for ACC and 0.81 for REH.

The European organization for research and treatment of cancer's (EORTC) Multiple Myeloma Module (QLQ-MY20) [34]. This myeloma module includes 20 items that assess particular aspects of QoL in MM patients. Items are allocated in two symptom scales—Disease symptoms (MYDS; 6 items) and Side effects of treatment (MYSE; 10 items)—and one functional scale—Future Perspective (MYFP; 3 items)—and one functional item—Body image (MYBI; 1 item), being assessed on a 4-point Likert scale. Higher scores on the symptom scales reflect a greater number of symptoms, while on the functional scale/ item, higher scores reveal better future prospects and body image. The Portuguese QLQ-MY version [35], used in this study, comprises 17 of the 20 original items (MYSE contains less 3 items) distributed among the same four scales, with good internal consistency (MYDS: $\alpha=0.86$; MYSE: $\alpha=0.68$; MYFP: $\alpha=0.91$). Cronbach's alphas in the present study were 0.86 for MYDS, 0.68 for MYSE and 0.95 for MYFP.

Procedure

Patients who meet the study criteria were referred by hospital physicians and invited to participate in the study by the researcher. All participants signed an informed consent. The study was approved by the Portuguese Data Protection Authority and the Ethics Committees of the five hospitals where data collection took place (Health Ethics Committee of Braga Hospital, Oporto Hospital Centre, Vila Nova de Gaia/Espinho Hospital Centre, Coimbra University Hospital, and Lisbon Portuguese Institute of Oncology).

Data analysis

Descriptive statistics and bivariate correlations (Pearson's r) were performed including all psychological variables.

Each variable was measured using the scale's sum score. A conceptual model was proposed to test the mediator role of unmet needs between psychological morbidity and social support (exogenous variables) regarding QoL variables (endogenous variables). Structural equation modeling using the maximum likelihood estimation method was conducted to assess the model. The following indices were considered: the chi-square statistics (χ^2), the goodness-of-fit index (GFI), the Tucker–Lewis index (TLI), the comparative fit index (CFI), the standardized root mean residual (SRMR), and the root mean square error of approximation (RMSEA). Nonsignificant χ^2 values, χ^2/df ratio less than 5, CFI and GFI values equal or greater than 0.95, and SRMR and RMSEA values below .08 reflect excellent fit of a specified model to the data [36]. According to Kline [37], TLI values greater than 0.90 are considered to be acceptable. The bootstrap estimates were calculated to derive unbiased confidence intervals and to test the indirect effect. The model's indirect effects were tested with 5000 bootstraps and a 95% confidence interval. A posteriori analysis was performed in order to assess the adequacy of the sample size, using the PROCESS macro from Preacher and Coffman [38]. Assuming a null hypothesis of close fit (H_0 : RMSEA = 0.052) and an alternative hypothesis of unacceptable fit (H_a : RMSEA = 0.10) [39], together with a significance level of $\alpha = 0.05$ and 18 degrees of freedom, the Web procedure indicated that the minimum sample size required to achieve the desired 0.8 level of power was 209 patients. Considering that the sample size included 213 patients, the desired statistical power was achieved.

All analyses were performed using the statistical package IBM SPSS v.25 and AMOS v.25.

Results

Participants' characteristics

A total of 213 MM patients participated in this study. Sociodemographic and clinical information of participants are detailed in Table 1. Clinical data, including MM stage [40], were collected from patients' clinical chart.

Relationship between variables

As expected, satisfaction with social support was negatively associated with psychological morbidity. There were significant negative associations between social support and INF, REH, and MYSE, and a positive significant association with MYFP. Psychological morbidity was positively associated with INF, REH, MYDS, and MYSE and negatively correlated with MYFP. Regarding the associations between unmet needs and QoL, results showed that INF was positively associated with MYDS and MYSE and negatively

Table 1 Sociodemographic and clinical variables

	Patients (<i>N</i> = 213) <i>n</i> (%) / <i>M</i> ± <i>SD</i>
Sociodemographic variables	
Gender	
Female	106 (49.8)
Male	107 (50.2)
Age	67.40 ± 10.52
Age group	
< 40	3 (1.4)
40–49	12 (5.6)
50–59	25 (11.6)
60–69	78 (36.6)
≥ 70	95 (44.6)
Education level	
≤ Elementary School	149 (69.9)
≤ High School	30 (14.1)
≤ College degree	34 (16.0)
Occupational status	
Employed	24 (11.3)
Unemployed	22 (10.3)
Retired	167 (78.4)
Marital status	
Single	10 (4.7)
Married or cohabiting	170 (79.8)
Divorced	10 (4.7)
Widow(er)	23 (10.8)
Clinical variables	
Myeloma type	
IgA/L	29 (13.6)
IgA/K	41 (19.2)
IgG/K	82 (38.5)
IgG/L	32 (15.0)
Other ^a	29 (13.6)
ISS ^b stage	
I	76 (35.7)
II	59 (27.7)
III	53 (24.9)
Treatments received	
Chemotherapy	63 (29.6)
Chemotherapy and transplant	52 (24.4)
Chemotherapy and bisphosphonates	22 (10.3)
Chemotherapy, bisphosphonates, and transplant	15 (7.0)
Others ^c	50 (23.5)
Without treatment	6 (2.8)
Current treatment	
Chemotherapy	83 (39.0)
Maintenance therapy	81 (38.0)
Others ^d	44 (20.7)
Disease duration (months)	46.16 ± 42.80

Table 1 (continued)

^aCLK, CLL, AL, indolent, and IgM/L
^bISS = International staging system
^cRadiotherapy, transplant, bisphosphonates, chemotherapy + radiotherapy, chemotherapy + radiotherapy + transplant + bisphosphonates, chemotherapy + radiotherapy + transplant, chemotherapy + radiotherapy + bisphosphonates, chemotherapy + immunotherapy + bisphosphonates
^dImmunotherapy, radiotherapy, chemotherapy, bisphosphonates, and transplant

associated with MYFP. FIN showed a positive association with MYDS, ACC presented positive associations with MYDS and MYSE, while REH was positively correlated with MYDS and MYSE, and negatively associated with MYFP.

Patients' age was positively associated with MYDS and MYSE, but negatively associated with MYFP. Regarding patients' clinical characteristics, MM stage was negatively associated with MYFP ($r = -0.153, p = 0.036$), and diagnosis duration was positively associated with MYSE ($r = 0.199, p = 0.004$). MM type, treatments received, and undergoing treatments did not correlate with QoL (Table 2).

Path analysis model

In order to understand the impact of social support, psychological morbidity, and unmet needs on QoL, the hypothesized model was analyzed through a path analysis (Fig. 2). The global fit of the hypothesized model was not adequate: $\chi^2_{(3)} = 48.225, p < 0.001, \chi^2/df = 16.075, GFI = 0.951, TLI = -0.203, CFI = 0.900, SRMR = 0.045, RMSEA = 0.267$. The χ^2 test was significant, the χ^2/df ratio was superior to the

expected, the TLI and CFI values were lower than 0.900 and 0.950, respectively, and the RMSEA value was considerably higher than the acceptable score.

Several pathways were explored, according to the modification indices, path coefficients' significance and the model adjustment. After removing the non-significant pathways ($p < 0.05$), one modification index remained and was taken into consideration, resulting in one single adjustment to the initial proposed model: the addition of a relationship between QoL variables (MYDS→MYSE). The final model (Fig. 3) showed that the adjustment statistics indicated a good fit ($\chi^2_{(18)} = 28.645, p = 0.053, \chi^2/df = 1.591, GFI = 0.971, TLI = 0.953, CFI = 0.976, SRMR = 0.046, RMSEA = 0.052$).

In terms of associations, the results showed that social support had a negative association with ACC ($\beta = -0.07, p = 0.012$) and REH unmet needs ($\beta = -0.09, p = 0.006$), while psychological morbidity revealed positive associations with INF ($\beta = 0.14, p < 0.001$), ACC ($\beta = 0.30, p < 0.001$), and REH ($\beta = 0.38, p < 0.001$). Significant negative associations were found for all the identified paths between mediators, except for the path between INF and REH ($\beta = 0.86, p < 0.001$). FIN unmet needs were positively associated with MYDS ($\beta = 0.20, p = 0.016$), while REH showed positive associations with MYDS ($\beta = 0.22, p < 0.001$) and MYSE ($\beta = 0.10, p = 0.048$) variables. Finally, INF was negatively associated with MYFP ($\beta = -0.18, p < 0.001$).

Table 3 presents the results of the mediation analysis. The indirect effect of morbidity on MYFP was partially mediated by INF unmet needs, as well as the indirect effect of morbidity on MYSE that was partially mediated by REH unmet needs. In turn, the indirect effect of morbidity on MYDS was fully mediated by REH. Finally, the indirect effect of social

Fig. 2 Path analysis for the hypothesized model. INF information; FIN financial; ACC access and continuity of care; REH relationship and emotional health; MYDS disease symptoms; MYSE side effects of treatment; MYFP future perspective

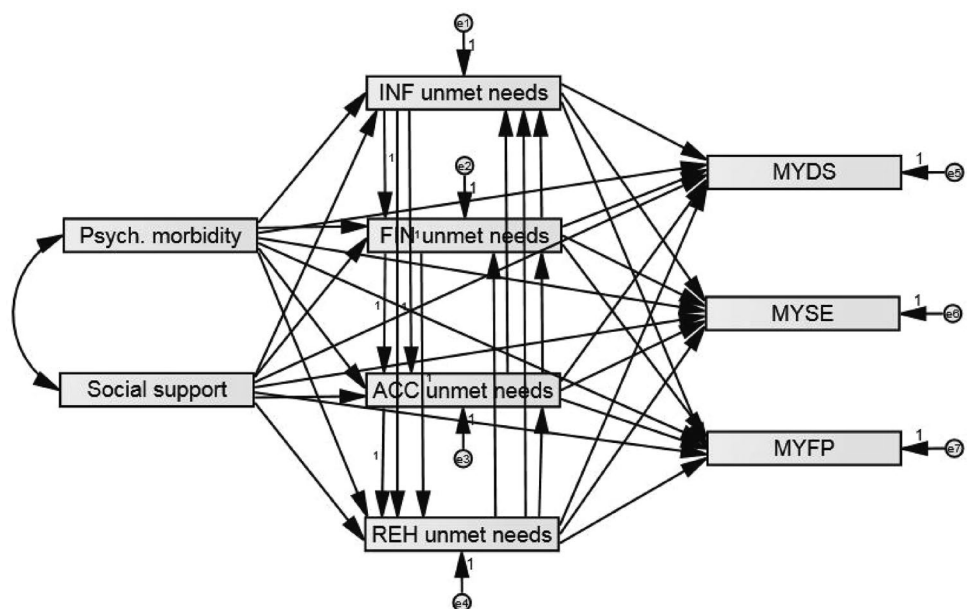


Table 2 Descriptive statistics and bivariate correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1. MYDS ^a															
2. MYSE ^b	0.404**	1													
3. MYFP ^c	-0.270**	-0.338**	1												
4. HADS ^d	0.244**	0.422**	-0.536**	1											
5. SSSS ^e	-0.129	-0.179**	0.335**	-0.472**	1										
6. INF ^f	0.260**	0.136*	-0.329**	0.281**	-0.220**	1									
7. FIN ^g	0.228**	0.083	-0.056	0.050	-0.002	0.279**	1								
8. ACC ^h	0.190**	0.153*	-0.127	0.106	-0.038	0.125	0.242**	1							
9. REH ⁱ	0.332**	0.412**	-0.454**	0.633**	-0.474**	0.485**	0.244**	0.199**	1						
10. Age	0.172*	0.154*	-0.229**	0.334**	-0.201**	0.115	-0.088	0.141*	0.259**	1					
11. MM type	0.014	-0.005	-0.017	-0.075	0.057	-0.089	-0.007	-0.077	0.000	-0.062	1				
12. ISS ^j stage	0.029	0.097	-0.153*	0.097	0.043	0.021	0.016	0.072	0.095	0.222**	-0.096	1			
13. Diagnosis duration	0.000	0.199**	-0.017	0.132	-0.094	0.158*	0.109	0.119	0.241**	0.064	-0.029	0.079	1		
14. Treatments received	0.004	0.068	0.020	-0.020	0.051	-0.053	0.172*	-0.055	-0.044	-0.289**	-0.047	0.076	0.149*	1	
15. Current treatments	0.060	-0.069	0.035	-0.025	0.126	0.081	-0.005	-0.051	-0.004	-0.033	-0.047	0.018	0.193**	0.173*	1
<i>M</i>	10.25	12.42	8.43	12.29	58.22	3.65	2.38	1.27	8.60	-	-	-	-	-	-
<i>SD</i>	4.54	3.76	2.93	6.35	11.63	3.11	3.51	2.16	6.02	-	-	-	-	-	-

* $p < 0.05$ level (2 tailed); ** $p < 0.01$ level (2 tailed)^aMYDS disease symptoms^bMYSE side effects of treatment^cMYFP future perspective^dHADS psychological morbidity^eSSSS satisfaction with social support^fINF information unmet needs^gFIN financial unmet needs^hACC access and continuity of care unmet needsⁱREH relationship and emotional health unmet needs^jISS International staging system

Fig. 3 Results of the path analysis for the adjusted hypothesized model. *INF* information; *FIN* financial; *ACC* access and continuity of care; *REH* relationship and emotional health; *MYDS* disease symptoms; *MYSE* side effects of treatment; *MYFP* future perspective

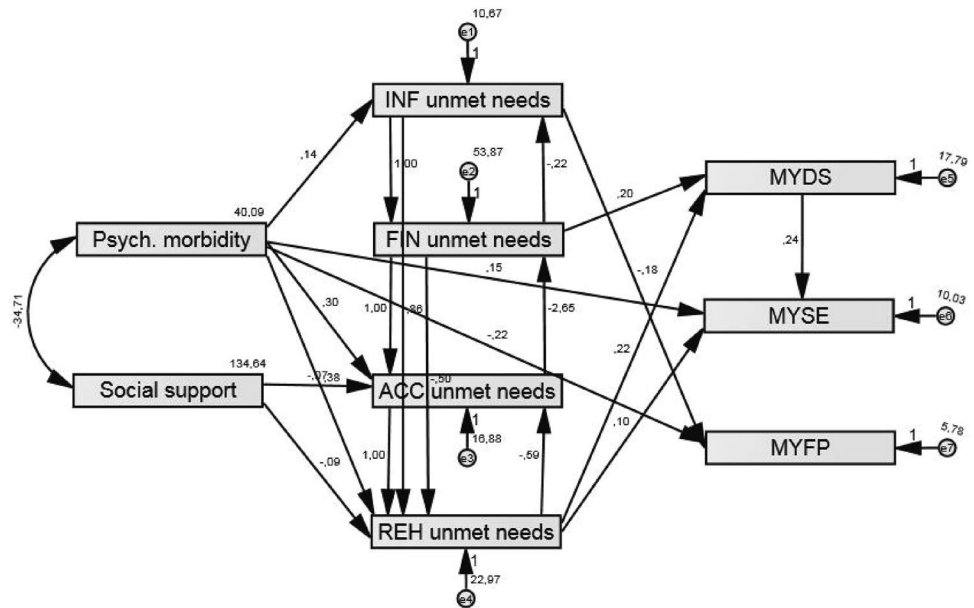


Table 3 Standardized indirect effects identified by the path model

Predictor	Mediator	Outcome	B ^a	CI ^b	p
Morbidity (HADS)	Information (INF)	Future perspective (MYFP)	-0.043	[-0.080, -0.017]	<0.001
Morbidity (HADS)	Relationship and emotional health (REH)	Disease symptoms (MYDS)	0.151	[0.084, 0.231]	<0.001
Morbidity (HADS)	Relationship and emotional health (REH)	Side effects (MYSE)	0.155	[0.099, 0.217]	<0.001
Social support (SSSS)	Relationship and emotional health (REH)	Disease symptoms (MYDS)	-0.061	[-0.097, -0.033]	<0.001
Social support (SSSS)	Relationship and emotional health (REH)	Side effects (MYSE)	-0.063	[-0.091, -0.040]	<0.001

^aIndirect paths tested with 5000 bootstraps
^bCI=95% confidence interval (lower and upper)

support on MYDS and MYSE was fully mediated by REH. Overall, FIN and ACC unmet needs did not play a mediator role between social support/ morbidity and QoL.

Discussion

This study examined the influence of psychological morbidity and satisfaction with social support on QoL, when mediated by unmet needs. The findings of this study indicated a negative association between social support and psychological morbidity, which is similar to other research indicating that higher levels of satisfaction with social support, provided by friends, family, and social activities, were associated with a decrease in psychological morbidity [6, 23]. In addition, since MM patients report several unmet needs [8] and depend on others to meet a huge variety of needs during the course of their disease [4], it is understandable that patients with higher levels of satisfaction with social support report lower psychological morbidity.

As expected, the results also showed positive contributions from psychological morbidity to unmet needs, since patients with higher levels of anxiety and depression often present greater unmet needs [8, 41]. However, these contributions were only significant in the case of INF and REH needs. In fact, the needs for information regarding the disease, emotional and financial support, represent common needs expressed by patients with MM and other oncological diseases [33, 42, 43]. The impact of morbidity on FIN needs was not significant, probably due to patients’ advanced age (M = 67 years) and professional status (78% were retired), combined with the fact that the Portuguese public health-care system covers the costs of cancer treatment. Thus, it is understandable that issues like “Worry about earning money” or “Having to take a pension or disability allowance” do not reflect primary needs in these patients. However, this may not be the case in countries where medical health services are not free, low-cost, or fully covered by private health insurance and, as such, cancer diagnosis may have a considerable financial impact [44]. As predicted, psychological morbidity had a negative impact on QoL [9, 14,

15]. Therefore, H1 was partially confirmed, while H2 was fully confirmed.

According to the literature, social support is associated with less unmet needs [22]. However, in this study, the impact of social support on INF and FIN needs was not significant. In fact, the need to obtain information is very prevalent in patients [45, 46] and, as shown in the results, external resources such as social support cannot mitigate this need. This fact emphasizes the importance of health services to provide more information, according to patients' needs. Financial needs were not influenced by social support, possibly because, as mentioned, the great majority of participants were retired and the Portuguese public medical services are free. Finally, social support did not have a direct effect on the MM patients' QoL, as advocated in the QoL model of Wilson and Cleary [20] adapted to MM patients, showing only indirect effects, mediated by REH unmet needs. Overall, H3 was partially confirmed and H4 was not confirmed.

Regarding the mediations of the hypothesized model, the indirect effect of psychological morbidity on MYFP was partially mediated by INF unmet needs. The need for information, especially about the treatment/ disease is, for many cancer patients, considered one of their main needs [41, 45, 46], probably due to the association between access to information and increased sense of control over the disease, decreasing anxiety [41]. However, this mediation was partial probably due to the association between higher levels of psychological morbidity and a more negative perspective of the future.

The indirect effect of psychological morbidity on treatment side effects and disease symptoms was mediated by REH unmet needs. This finding may be related to the fact that, often, when patients feel more depressive or want to ventilate their emotions regarding the disease prognosis, they feel their family and friends are uncomfortable or unable to cope with them [47]. Therefore, it may be expected that more depressive or anxious patients express more needs for relationship and emotional health. In turn, these unmet needs may be greater when patients have more treatment side effects and disease symptoms, since they significantly impair their QoL [9], may cause a greater limitation in their daily life [47], create a greater dependence on caregivers, family, health professionals, and negatively impact their social life [6]. REH unmet needs did not play a mediator role between psychological morbidity and MYFP, contrary to expectations, since psychological morbidity and emotional needs have been associated with worse future prospects [48].

The mediation of REH unmet needs in the relationship between psychological morbidity and MYSE is partial, in contrast to the full mediation between morbidity and MYDS. In fact, during the course of the disease, the difference between symptoms and side effects may be very tenuous, often being difficult to distinguish between the two.

However, in terms of the effect of mediation, this difference may be explained by the temporal chain of events: the side effects of treatment may occur in a transitory space with more temporary symptoms (e.g., nausea, vomiting, and hair loss), possibly with more impact on the patient's self-image and identity [47]. Disease symptoms are transverse to the course of the illness, and may extend for a longer time, such as pain symptoms (e.g., bone pain or back pain, hip pain, arm or shoulder pain, chest pain, and increased pain with the activity). Due to the long duration of the disease symptoms, patients may feel that their emotional health needs are greater [4] and therefore may feel more dissatisfied. In addition, once the prescribed treatments are concluded, institutional health care decreases and caregivers/families begin to resume their daily routine, which may indicate less willingness to provide emotional support. Overall, the hypothesis concerning the mediator effect of unmet needs between psychological morbidity and QoL (H5) was supported.

Regarding social support, the indirect effects on MYDS and MYSE were totally mediated by REH unmet needs. Cancer patients report needs for emotional support [4] probably due to the symptoms and treatment side effects, which triggers greater social isolation, reducing social relationships and received support [6]. Therefore, to satisfy patients' emotional needs, it is crucial for cancer patients to increase satisfaction with social support, as well as to decrease the perceived impact of symptoms and side effects. The last hypothesis (H6), regarding the mediator role of unmet needs on the effect of social support on patients' QoL, was, therefore, partially corroborated.

Limitations

While this study is one of the most comprehensive examinations of QoL and unmet needs of MM patients in Portugal, there were some limitations such as the cross-sectional design and the exclusive use of self-report questionnaires. Longitudinal studies are needed in order to replicate the results. The great majority of the sample included elderly patients, which limits the generalization of the findings to other long-term survivors. Pain intensity and pain medical control were not stratified. Further studies should also include MM duration, and the number of previous treatments. With the multi-institutional patients' sample and the diversity of treatments involved, the analysis of the effect of different schedules and medicines prescribed, was not possible. Nevertheless, an analysis of therapeutic strategies, namely the impact of all oral treatments on patients' QoL, is of interest. Future research should analyze the relationship between patient-reported outcomes (e.g., symptoms, QoL) and the biomedical variables that are related to the disease progression, i.e., physiological variables (e.g., hemoglobin,

albumin), and other variables that indicate disease activity, like dialysis dependency, in order to understand their impact on MM patients' unmet needs and QoL over time.

Conclusions

Although the literature stresses the importance of psychological morbidity, social support and unmet needs in the promotion of MM patients' QoL, this is the first study to analyze the contribution of those variables to the QoL of Portuguese MM patients. This study has reinforced the direct impact of psychological morbidity on QoL, while satisfaction with social support only showed indirect contributions. Furthermore, emotional and information unmet needs were the most expressive in this study, as highlighted in previous studies with MM patients [43, 46], mediating the effect of both morbidity and social support on patients' QoL.

Findings highlight the importance of continuously providing patients with information and emotional support in order to mitigate the adverse impact of psychological morbidity and reinforce the positive effect of social support. Intervention programs tailored to promote MM patients' QoL should specifically address information and emotional needs, raising awareness and training health professionals, caregivers, and family members to attend MM patients' unmet needs.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

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