Supportive Care in Cancer (2019) 27:257–263
https://doi.org/10.1007/s00520-018-4321-z

ORIGINAL ARTICLE

Is the relationship between social support and depressive symptoms mediated by hope among Chinese central nervous system tumor patients?

Yijun Bao[1] · Lizhuo Li[2] · Yanlei Guan[1] · Yan Liu[1] · Wei Wang[1] · Dan Zhao[1] · Shanwei Tao[1] · Yuhui Ling[1] · Yan Wang[3] · Bo Bi[3] · Anhua Wu[1] · Liu Cao[4]

Received: 15 January 2018 / Accepted: 13 June 2018 / Published online: 25 June 2018

Abstract

Background It is common for central nervous system (CNS) tumor patients to suffer from depressive symptoms. If unrecognized or untreated, CNS tumors may lead to many serious problems in these patients. This study examines the association of social support with depressive symptoms in CNS tumor patients and explores the extent to which hope mediates this relationship.

Methods A total of 269 CNS tumor patients in China were included in this study. We assessed depressive symptoms using the Epidemiologic Studies Depression Scale (CES-D), social support using the Perceived Social Support Scale (PSSS), and hope using the Herth Hope Index (HHI). Questionnaires were distributed to collect these data. Hierarchical linear regression analyses explored the interrelationship between social support, hope, and depressive symptoms.

Results After adjustment for demographic characteristics, patients with less social support exhibited more depressive symptoms ($\beta = -0.452$, $P < 0.01$). Social support explained 19.1% of the variance in depressive symptoms. After adding hope to the regression model, the effect size for social support was reduced by over half but remained significant (from $\beta = -0.452$ to $\beta = -0.218$, $P < 0.01$). In addition, a lower level of hope ($\beta = -0.386$, $P < 0.01$) was associated with more depressive symptoms, and this measure explained an additional 9.3% of the variance in depressive symptoms.

Conclusions Much of the relationship between social support and depressive symptoms is explained by hope. Thus, interventions boosting both social support and hope help to reduce depressive symptoms in patients with CNS tumors.

Keywords Depressive symptoms · Social support · Hope · Tumor

✉ Yijun Bao
yjbao@cmu.edu.cn

✉ Liu Cao
lcao@cmu.edu.cn

Lizhuo Li
lilizhuo66@hotmail.com

Yanlei Guan
guanyanlei_ns@163.com

Yan Liu
cwx0609@sina.com

Wei Wang
neurosurgeonweice@hotmail.com

Dan Zhao
arien_629@163.com

Shanwei Tao
382553633@qq.com

Yuhui Ling
1536293074@qq.com

Yan Wang
wangyanmail168@gmail.com

Bo Bi
skiffinbb@hotmail.com

Anhua Wu
wuanhua@yahoo.com

[1] Department of Neurosurgery, The First Hospital of China Medical University, No. 155, Nanjingbei Street, Heping, Shenyang 110001, Liaoning, People's Republic of China

[2] Department of Emergency Medicine, Xuanwu Hospital, Capital Medical University, No. 45, Changchun Street, Xicheng, Beijing 100053, People's Republic of China

[3] Department of Psychiatry, The First Hospital of China Medical University, No. 155, Nanjingbei Street, Heping, Shenyang 110001, Liaoning, People's Republic of China

[4] Key Laboratory of Medical Cell Biology, College of Translational Medicine, China Medical University, No. 77, Puhe Road, Shenbei New Distinct, Shenyang 110122, People's Republic of China

Background

The central nervous system (CNS) controls people's intentional thinking and essential body functions. There are two major types of CNS tumors: intracranial tumors and less common spinal cord neoplasms. Although CNS tumors are rare compared to other neoplasms, they result in a higher mortality rate, especially among children [1]. Moreover, the incidence of CNS tumors has been increasing. The International Agency for Research on Cancer (IARC) reported that the rate of incident CNS tumors increased worldwide from 3.2 per 100,000 persons to 4.0 per 100,000 persons over a 6-year period from 2002 to 2008 [2]. CNS tumors lead to various symptoms, including seizures and headache, and they can cause mental disorders, such as depression [3]. Janda et al. reported that 17% of brain tumor patients had depressed moods [4]. According to Pelletier et al., depressive symptoms are common among brain tumor patients and have serious consequences on patients' quality of life [5]. The Chinese people, influenced by traditional culture, have a deep-rooted fear of death [6]. At the same time, the fear of surgery, combined with concerns regarding the prognosis and the burden of treatment costs, makes it easy for Chinese tumor patients to develop negative emotions such as depression during long-term treatment [7]. If unrecognized or untreated, depression could lead to many problems. In particular, patients with depression have difficulty with symptom control, are less likely to comply with treatment, and have impaired quality of life [8]. However, little research has been carried out to understand the factors affecting depressive symptoms in CNS tumor patients.

Social support is generally defined as the physical and psychological assistance provided by family members, friends, neighbors, and institutions to an individual facing a difficult situation. In the case of disease, patients need increased social support [9]. This need becomes more evident for patients with CNS tumors because the disease may result in death and affect the patient and the family physically, emotionally, socially, and economically. Previous studies have reported the association between social support and mental disorders among cancer patients [10, 11]. Hu et al. indicated that lung cancer patients with higher social support experienced lower rates of psychological depression and anxiety [10]. Hughes et al. also showed that individuals with less social support prior to treatment are more likely to experience adverse effects, including more depressive symptoms among breast cancer survivors [11]. However, little research has been conducted to examine this association among Chinese CNS tumor patients.

In addition to external social resources, internal psychological constructs (e.g., hope, resilience, self-efficacy, or optimism) have also received increasing attention for combatting cancer-related distresses. Hope is a multidimensional dynamic concept that highlights confidence and uncertain expectations about achieving goals of personal significance [12]. Hope helps patients with a life-threatening illness to adjust for intense physical and psychological distress [12]. Previous studies have indicated that hope may help reduce depressive symptoms in cancer patients. For example, Chao et al. showed that hope had a significantly direct effect on depression in 144 newly diagnosed cancer patients [13]. Berendes et al. found that hope reduced psychological distress (e.g., depression) and major symptoms of cancer (e.g., pain, fatigue, and cough), even after adjusting for important demographic and medical confounders (i.e., age and cancer stage) [14]. However, few studies have examined the relationship between hope and depressive symptoms among CNS tumor patients, although the association between social support and hope has been considered. Liu et al., reported that social support was positively correlated with hope in Chinese patients with hematological malignancies [15], and a significant positive correlation was found between overall perceived satisfaction from social support and hope in people living with HIV/AIDS [16].

Although the respective associations of hope with social support and depressive symptoms have been confirmed by previous studies, the possible mediating role of hope in the relationship between social support and depressive symptoms has not yet been explored in CNS tumor patients. According to the transactional theory proposed by Lazarus and Folkma [17], external factors such as social support can modify people's internal psychological resources. For example, hope and internal psychological resources can mediate a person's responses to a stressful event. Thus, we hypothesize that hope might be a mediator in the relationship between social support and depressive symptoms among Chinese CNS tumor patients. In this study, we aim to verify the following two hypotheses: (1) social support is negatively associated with depressive symptoms in a group of Chinese patients with CNS tumors; (2) hope mediates the relationship between social support and depressive symptoms.

Methods

Recruitment and procedures

This study was conducted in the department of neurosurgery of the first hospital of China Medical University between February 2015 and June 2016. The participants were CNS tumor patients at least 18 years of age, who knew of their primary tumor diagnosis and had received surgery during their hospital stay. All participants had clear consciousness and cognition based on the assessments of the Mini Mental State

Examination (MMSE) and Montreal Cognitive Assessment (MoCA) [18, 19] and were able to communicate and answer the questionnaires in Chinese. Most patients were recruited within 2 weeks postoperation. Based on medical records, patients with intellectual problems, a history of antidepressant medication use, other non-CNS tumors, or recurrent tumors were excluded from the study. After obtaining written consent from each participant, a self-administered structured questionnaire with closed-ended questions was distributed to patients for completion. Patients were required to return the completed questionnaire to the doctor in charge within 48 h in person. Clinical information came from medical records. Of the 343 enrolled patients, 44 refused to participate, 4 did not meet eligible criteria due to other tumor types, and 26 were not included in the analysis due to excessive missing data (> 20% missing). Some of the patients refused because they thought the survey was time-consuming (about 20 min) and some refused just because they were not interested in it. The missing data were entirely random. There was no significant differences for demographic and clinical characteristics of participants who agreed and who refused to take part in this survey. Ultimately, 269 patients were included in this study and the effective response rate was 78.42%.

Measurement of depressive symptoms

Questions from the Center for Epidemiologic Studies Depression Scale (CES-D) [20] were translated into Chinese and used to assess depressive symptoms. Each of the 20 questions in the scale assessed how frequently a depressive symptom occurred in the past week. Individual questions were scored on a four-point Likert scale. An answer of "rarely or none of the time" was given 0 points while an answer of "most or all of the time" was given 3 points. The total score ranged from 0 to 60, with a higher score indicating more depressive symptoms. This Chinese version of the CES-D has satisfactory reliability and internal validity and has been widely adopted in the Chinese population [21]. The Cronbach's α for the measure was 0.892 in this study.

Measurement of social support

Questions from the Perceived Social Support Scale (PSSS) were translated into Chinese and used to assess social support [22]. Each of the 12 questions was scored on a 7-point scale, with a range from 1 (totally disagree) to 7 (totally agree), with a higher score indicating a greater level of perceived social support. This Chinese version of the PSSS also has good reliability and internal validity and has been widely adopted in Chinese population [23]. The Cronbach's α for the social support measure was 0.964 in this study.

Measurement of hope

The Herth Hope Index (HHI), adapted from the Herth Hope Scale (HHS) [24], was translated into Chinese and used to assess hope. Scoring for each of the 12 items in the index was on a 4-point scale (1 = strongly disagree; 4 = strongly agree). The total score ranges from 12 to 48, and a patient with a higher score indicating a greater level of hope. This Chinese version of the HHI has good reliability and validity in the Chinese population [25, 26]. The Cronbach's α for the hope measure was 0.858 in this study.

Statistical analysis

Pearson's correlations examined bivariate associations among depressive symptoms, social support, and hope.

Hierarchical multiple regression (HMR) analysis examined the incremental variance attributable to independent variables and the extent to which hope mediated the relationship between social support and depressive symptoms. Throughout the analysis, scoring of depressive symptoms was the continuous outcome. The regression analysis was performed in three steps, each of which involved a different block of independent variables. Briefly, the reference model included variables of age, sex, marital status, educational level, and household monthly income in block 1. Variables which were statistically related with depressive symptoms in univariate analyses were included. Time since diagnosis was not adjusted for because it was not significantly correlated with depressive symptoms in the present study. The model was augmented by adding a variable for social support (block 2). Finally, an additional variable for hope was added (block 3).

Following Baron and Kenny [27], three conditions must be satisfied to establish that hope mediates the association of social support with depressive symptoms: (1) the independent variable of social support is associated with the dependent variable of depressive symptoms, (2) social support is associated with the mediator of hope, and (3) with both social support and hope in the model, hope is significantly related to depressive symptoms, and the effect of social support is attenuated (partial mediation) or no longer significant (full mediation).

Bootstrapping was performed to further estimate the mediation effect of hope [28]. A bias-corrected and accelerated 95% CI (BCa 95% CI) was calculated for mediation effect. If the BCa 95% CI fails to exceed 0, this would indicate a significant mediation. In addition, the indirect effect of social support through hope relative to its total effect on depressive symptoms was calculated using bootstrapping technique. Prior to the regression analyses, we standardized all the continuous variables to avoid multicollinearity [29].

We conducted all analyses in SPSS 17.0 for Windows. Statistical significance was determined a priori at $\alpha = 0.05$ for the two-sided tests.

Results

Table 1 highlights the basic characteristics of the 269 patients. Their average age was 49.99 ± 14.19 years. The average time since CNS tumor diagnosis was 1.78 ± 2.43 months (range 0–24 months). Over 80% of the patients had a relationship status of "married/cohabitation," and 59.1% of the patients had secondary school education. Over 50% of patients had monthly household incomes ranging from 2001 to 4000 rmb (316~631 USD).

Correlations among depressive symptoms, social support, and hope

The bivariate correlations show that less social support ($r = -0.425$, $P < 0.01$) and lower hope ($r = -0.500$, $P < 0.01$) were correlated with more depressive symptoms (Table 2). Meanwhile, more social support was correlated with higher hope ($r = 0.602$, $P < 0.01$).

Social support and depressive symptoms

The results of the hierarchical multiple regression models are shown in Table 3. Each block of the independent variables significantly contributed to the variance in depressive symptoms ($P < 0.05$). After the adjustment for demographic characteristics, a lower level of social support was associated with more depressive symptoms ($\beta = -0.452$, $P < 0.01$), and social support explained an additional 19.1% of the variance in depressive symptoms (Table 3, column 3). This result satisfied the first condition for establishing the mediation, that is, there was a significant association between the predictor (social support) and the outcome (depressive symptoms).

Association between hope and depressive symptoms

The results from the regression model indicated that, after adjustment for demographic characteristics and social support, patients with lower levels of hope had more depressive symptoms ($\beta = -0.386$, $P < 0.01$). Hope explained an additional 9.3% of the variance in depressive symptoms (Table 3, column 4).

The mediating of hope

After the adjustment for demographic characteristics, a higher level of social support was associated with a higher level of hope ($\beta = 0.597$, $P < 0.01$), which satisfied the second condition for mediation.

With both social support and hope in the same regression model, the regression coefficient for social support was attenuated by more than half (from $\beta = -0.452$ to $\beta = -0.218$, $P < 0.01$), and hope was significantly associated with depressive symptoms. This result satisfied the final condition for mediation, suggesting that the relationship between social support and depressive symptoms is partially mediated by hope.

To further test these mediation effects, a bootstrapping method was used to estimate the indirect effect of social support on depressive symptoms through hope. The path coefficient of the indirect effect was − 0.236 (BCa 95% CI − 0.129, − 0.341), which accounted for 51.8% of the total effect of social support on depressive symptoms.

Table 1 Basic characteristics of patients

Patients characteristics	*N* (%)
Sex	
Male	108 (40.1%)
Female	161 (59.9%)
Marital status	
Single	37 (13.8%)
Married/cohabitation	219 (81.4%)
Divorced/widowed/separated	13 (4.8%)
Education	
Primary school	51 (19.0%)
Secondary school	159 (59.1%)
College or above	59 (21.9%)
Household monthly income	
≤ 2000 rmb	77 (28.6%)
2001~4000 rmb	158 (58.7%)
> 4000 rmb	34 (12.6%)

Discussion

Social support acts as a buffer to psychological problems, illness progression, and poor quality of life [30]. Previous studies have reported that higher levels of depressive

Table 2 Means, standard deviations (SD), and correlations of continuous variables

Variables	Mean	SD	1	2
1. Depressive symptoms	31.03	10.05		
2. Social support	60.14	13.85	− 0.425*	
3. Hope	35.74	6.23	− 0.500*	0.602*

*$P < 0.01$ (two-tailed)

Table 3 Results of social support, hope, and depressive symptoms

Variables	Depressive symptoms		
	Step 1(β)	Step 2(β)	Step 3(β)
Block 1			
Gender	− 0.026	0.080	0.083
Age	0.029	0.031	0.057
Single vs. married/cohabitation	− 0.121	− 0.090	− 0.085
Divorced/widowed/separated vs. married/cohabitation	0.072	0.089	0.091
Secondary school vs. primary school	− 0.078	− 0.086	− 0.087
College or above vs. primary school	0.032	0.049	0.064
Household monthly income	0.058	0.044	0.046
Block 2			
Social support		− 0.452*	− 0.218*
Block 3			
Hope			− 0.386*
R^2	0.028	0.218	0.311
ΔR^2	0.028	0.191	0.093

*$P < 0.01$ (two-tailed)

symptoms are associated with lower levels of social support [31], and perceived social support is a significant predictor variable, which functions as a "stress buffer" between stressful negative life events and the level of depressive symptoms [32]. In particular, it has been demonstrated that support from family members or partners helps to improve cancer patients' adjustment to physical illness and improves their quality of life [33]. In the present study, we found that social support was inversely related to depressive symptoms, which was consistent with our first hypothesis. After adjusting for demographic characteristics, patients with lower levels of social support had more depressive symptoms. Further, 19.1% of the variance in depressive symptoms is explained by social support. This finding is also in accordance with results from previous studies [10, 11]. Immune dysregulation may be one physical mechanism that links low social support and the development of depression [34]. Lower levels of social support have been reported to be associated with higher levels of inflammation [35], and inflammation is one of the mechanisms implicated in the pathophysiology of depression. Basal inflammatory markers include C-reactive protein (CRP), interleukin (IL)-6, and tumor necrosis factor (TNF)-α [36]. For example, Hughes et al. found that, among female breast cancer survivors, lower levels of social support prior to treatment led to higher levels of IL-6 over time, and the elevations in IL-6 were linked to an increase in depressive symptoms [11].

The present study showed that lower levels of hope were associated with more depressive symptoms, which is consistent with results from previous studies. Prior literature has linked hope to well-being, positive coping behaviors, as well as less anxiety and depression symptoms in cancer patients [37–39]. It has been proposed that human beings are inherently directed by goals, and in the pursuit of these goals, they are actively engaged in pathways thinking and agency thinking [40, 41]. Pathways thinking considers ways to reach goals while agency thinking involves the ability to initiate and maintain motivation toward goals. According to this pathways thinking and agency thinking theory, people with a high level of hope are capable of thinking about the pathways to goals and are confident about reaching their goals [42]. Studies have found that patients with high levels of hope are more likely to use coping strategies and to perceive their coping efforts as more effective [43].

Our study showed that the relationship between social support and depressive symptoms is partially mediated by hope. Patients with higher levels of social support have higher levels of hope, and consequently, they have fewer depressive symptoms. These findings suggest that increasing CNS tumor patients' social support and/or enhancing their levels of hope could help to reduce and prevent depressive symptoms. Herth developed a Hope Intervention Program consisting of four central attributes of hope, which include spiritual or transcendent process, experiential process, rational thought process, and relational process [44, 45]. Patients reported increased levels of hope and quality of life immediately after the 9-month Hope Intervention Program [44]. Rustoen et al. conducted an 8-week intervention program that focused on belief in oneself and in one's own ability, emotional reactions, relationships with others, active involvement, spiritual beliefs and values, and acknowledgment that there is a future. While the level of hope in patients increased immediately following the program, this increase dropped at the 3- and 12-month

follow-up assessments, suggesting that "booster sessions" are necessary to maintain the long-term effects of the intervention on the participants' level of hope [46].

Limitations of this study are noted. First, this is a cross-sectional study; therefore, the findings cannot be used to establish formal causal relationships or to determine the direction of causality. Longitudinal studies are needed to validate the current findings. In addition, the data were mainly obtained using self-administered questionnaires, which could introduce recall and reporting bias. Finally, this study focused only on associations among social support, hope, and depressive symptoms. As a result, other potential factors important to depressive symptoms may have been overlooked.

Despite these limitations, one important implication of the findings is that depressive symptoms can be reduced by promoting both external (i.e., social support) and internal (i.e., hope) factors rather than focusing on only one aspect. The Chinese culture values family intimacy and cohesiveness. Chinese people are motivated by the ideology of "family first" to maintain and improve the health of their family members. Indeed, family relationships in China are stronger and more supportive than those in many western countries [47]. A previous study found that Chinese cancer patients received higher levels of social support than the general population, and the patients perceived more support from family members, which is in line with Chinese cultural values [48]. Finally, to reduce the depressive symptoms of CNS tumor patients, interventions that aim to promote hope should be tailored to individual-specific needs and symptom presentation.

In conclusion, the present study demonstrated an inverse relationship between social support and depressive symptoms, which was partially mediated by hope. Patients with a higher level of social support and a higher level of hope generally had fewer depressive symptoms.

Acknowledgements The authors would like to thank the staff of the Department of Neurosurgery of the First Hospital of China Medical University, who helped to obtain the written informed consent about the conduct of this survey and to distribute the questionnaires to the patients.

Funding This project was sponsored by the Scientific Research Foundation for the Returned Overseas Chinese Scholars, State Education Ministry (No. 2013-1792), Liaoning Provincial Natural Science Foundation (No. 2015020460), Foundation for Science and Technology of Shenyang (No. 17-230-9-13), China Postdoctoral Science Foundation (No. 2016M590240), Fund for Scientific Research of The First Hospital of China Medical University (FSFH201722), and the National Natural Science Foundation of China (Grant Nos. 81660329 and 81302190).

Compliance with ethical standards

This study was reviewed and approved by the Ethics Committee on Human Experimentation of China Medical University. The study procedures followed ethical standards. Written informed consent was received from all the patients after they were orally informed about the study protocol. All participants were voluntary and anonymous. Confidentiality was ensured in processing personal data and maintaining individual records.

Conflicts of interest The authors declare that they have no conflicts of interests.

References

1. Porter KR, McCarthy BJ, Freels S, Kim Y, Davis FG (2010) Prevalence estimates for primary brain tumors in the United States by age, gender, behavior, and histology. Neuro-Oncology 12(6):520–527
2. Ferlay J, Bray F, Pisani P (2004) GLOBOCAN 2002: cancer incidence, mortality and prevalence worldwide, version 2.0. IARC cancerbase no 5. globocan.iarc.fr/Default.aspx. Accessed January 2004
3. Buckner JC, Brown PD, O'Neill BP, Meyer FB, Wetmore CJ, Uhm JH (2007) Central nervous system tumors. Mayo Clin Proc 82(10): 1271–1286
4. Janda M, Steginga S, Langbecker D, Dunn J, Walker D, Eakin E (2007) Quality of life among patients with a brain tumor and their carers. J Psychosom Res 63(6):617–623
5. Pelletier G, Verhoef MJ, Khatri N, Hagen N (2002) Quality of life in brain tumor patients: the relative contributions of depression, fatigue, emotional distress, and existential issues. J Neurooncol 57(1):41–49
6. Yang Y, Du JH, Qu Y (2014) The relationship between Confucianism, Buddhism, Taoism and improving hospice care of cancer patient. Med Philos 35(7B):94–97 (in Chinese)
7. Ding N, Hu CW, Tao Y (2015) Death anxiety in malignant tumor patients and its correlation with anxiety and depression. Med Philos 36(9):78–81 (in Chinese)
8. Yang YL, Liu L, Wang Y, Wu H, Yang XS, Wang JN, Wang L (2013) The prevalence of depression and anxiety among Chinese adults with cancer: a systematic review and meta-analysis. BMC Cancer 13:393
9. Merluzzi TV, Philip EJ, Yang M, Heitzmann CA (2016) Matching of received social support with need for support in adjusting to cancer and cancer survivorship. Psychooncology 25(6):684–690
10. Hu T, Xiao J, Peng J, Kuang X, He B (2018) Relationship between resilience, social support as well as anxiety/depression of lung cancer patients: a cross-sectional observation study. J Cancer Res Ther 14(1):72–77
11. Hughes S, Jaremka LM, Alfano CM, Glaser R, Povoski SP, Lipari AM, Agnese DM, Farrar WB, Yee LD, Carson WE, Malarkey WB, Kiecolt-Glaser JK (2014) Social support predicts inflammation, pain, and depressive symptoms: longitudinal relationships among breast cancer survivors. Psychoneuroendocrino 42:38–44
12. Dufault K, Martocchio BC (1985) Symposium on compassionate care and the dying experience. Hope: its spheres and dimensions. Nurs Clin North Am 20(2):379–391
13. Peh CX, Liu J, Bishop GD, Chan HY, Chua SM, Kua EH, Mahendran R (2017) Emotion regulation and emotional distress: the mediating role of hope on reappraisal and anxiety/depression in newly diagnosed cancer patients. Psychooncology 26(8):1191–1197
14. Berendes D, Keefe FJ, Somers TJ, Kothadia SM, Porter LS, Cheavens JS (2010) Hope in the context of lung Cancer: relationships of hope to symptoms and psychological distress. J Pain Symptom Manag 40(2):174–182

15. Liu L, Yang YL, Wang ZY, Wu H, Wang Y, Wang L (2015) Prevalence and positive correlates of posttraumatic stress disorder symptoms among Chinese patients with hematological malignancies: a cross-sectional study. PLoS One 10(12):e0145103
16. Yadav S (2012) Perceived social support, hope, and quality of life of persons living with HIV/AIDS: a case study from Nepal. Qual Life Res 19(2):157–166
17. Lazarus RS, Folkman S (1984) Stress, appraisal and coping. Springer, New York
18. Tombaugh TN, McIntyre NJ (1992) The mini-mental state examination: a comprehensive review. J Am Geriatr Soc 40(9):922–935
19. Nasreddine ZS, Phillips NA, Bedirian V, Charbonneau S, Whitehead V, Collin I, Cummings JL, Chertkow H (2005) The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. J Am Geriatr Soc 53(4):695–699
20. Berkman LF, Berkman CS, Kasl S, Freeman DH Jr, Leo L, Ostfeld AM, Cornoni-Huntley J, Brody JA (1986) Depressive symptoms in relation to physical health and functioning in the elderly. Am J Epidemiol 124(3):372–388
21. Wang Y, Yao LT, Liu L, Yang XS, Wu H, Wang JN, Wang L (2014) The mediating role of self-efficacy in the relationship between Big five personality and depressive symptoms among Chinese unemployed population: a cross-sectional study. BMC Psychiatry 14:61
22. Procidano ME, Heller K (1983) Measures of perceived social support from friends and from family: three validation studies. Am J Community Psychol 11(1):1–24
23. Qin HY, Zheng MC, Wen YS, Zhang HQ, Wang LY (2004) Affecting factors of quality of life of colostomy patients. Ai Zheng 23(11 Suppl):1589–1592
24. Herth K (1991) Development and refinement of an instrument to measure hope. Sch Inq Nurs Pract 5(1):39–51 discussion 53-36
25. Wang YH (2010) Study on feasibility of Chinese version of Herth Hope Index for cancer patients. Chin Nurs Res 24(1):20–21
26. Zhao CP, Fang LQ, Zhang HL (2011) Research on relationship among hope level, anxiety, depression and social support in gastric cancer patients. Chin Gen Pract 14:4048–4051
27. Baron RM, Kenny DA (1986) The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. J Pers Soc Psychol 51(6):1173–1182
28. Preacher KJ, Hayes AF (2008) Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. Behav Res Methods 40(3):879–891
29. Cohen J, Cohen P, West SG (2003) Applied multiple regression/correlation analysis for the behavioral sciences. Lawrence Erlbaum Associates, Hillsdale
30. Taskila T, Lindbohm ML, Martikainen R, Lehto US, Hakanen J, Hietanen P (2006) Cancer survivors' received and needed social support from their work place and the occupational health services. Support Care Cancer 14(5):427–435
31. Kaltiala-Heino R, Rimpelä M, Rantanen P, Laippala P (2001) Adolescent depression: the role of discontinuities in life course and social support. J Affect Disord 64(2–3):155–166
32. Miloseva L, Vukosavljevic-Gvozden T, Richter K (2017) Perceived social support as a moderator between negative life events and depression in adolescence: implications for prediction and targeted prevention. EPMA J 8:237–245
33. Gustavsson-Lilius M, Julkunen J, Hietanen P (2007) Quality of life in cancer patients: the role of optimism, hopelessness, and partner support. Qual Life Res 16(1):75–87
34. Uchino BN, Vaughn AA, Carlisle M (2012) Social support and immunity. In: Segerstrom S (ed) The Oxford handbook of psychoneuroimmunology. Oxford Press, New York
35. Lutgendorf SK, Anderson B, Sorosky JI, Buller RE, Lubaroff DM (2000) Interleukin-6 and use of social support in gynecologic cancer patients. Int J Behav Med 7:127–142
36. Gaspersz R, Lamers F, Wittenberg G (2017) The role of anxious distress in immune dysregulation in patients with major depressive disorder. Transl Psychiatry 7(12):1268
37. Felder BE (2004) Hope and coping in patients with cancer diagnoses. Cancer Nurs 27(4):320–3247
38. Herth KA (1989) The relationship between level of hope and level of coping response and other variables in patients with cancer. Oncol Nurs Forum 16(1):67–72
39. Wonghongkul T, Moore SM, Musil C, Schneider S, Deimling G (2000) The influence of uncertainty in illness, stress appraisal, and hope on coping in survivors of breast cancer. Cancer Nurs 23(6):422–429
40. Snyder CR, Harris C, Anderson JR, Holleran SA, Irving LM, Sigmon ST, Yoshinobu L, Gibb J, Langelle C, Harney P (1991) The will and the ways: development and validation of an individual-differences measure of hope. J Pers Soc Psychol 60(4):570–585
41. Snyder CR (2000) The past and possible futures of hope. J Soc Clin Psychol 19(1):11–28
42. Rand KL (2009) Hope and optimism: latent structures and influences on grade expectancy and academic performance. J Pers 77(1):231–260
43. Griggs S, Walker RK (2016) The role of hope for adolescents with a chronic illness: an integrative review. J Pediatr Nurs 31(4):404–421
44. Herth K (2000) Enhancing hope in people with a first recurrence of cancer. J Adv Nurs 32(6):1431–1441
45. Herth KA (2001) Development and implementation of a Hope Intervention Program. Oncol Nurs Forum 28(6):1009–1016
46. Rustoen T, Cooper BA, Miaskowski C (2011) A longitudinal study of the effects of a hope intervention on levels of hope and psychological distress in a community-based sample of oncology patients. Eur J Oncol Nurs 15(4):351–357
47. Wang XL (2009) The differences between Chinese and western cultures from family values. Henan Economy and Trade Vocational College (in Chinese)
48. Zhang J (2006) The relationship of hope, coping style and social support in patients with cancer. China union medical college (in Chinese)