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Research Article

Factors Influencing Resilience in Primary Brain Tumor Patients

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ARTICLE INFO

Article history:

Received 14 June, 2018

Accepted 29 June, 2018

Published 16 July 2018

Keywords:

Resilience

physical function

brain tumor

ABSTRACT

Objective: The purpose of the present study was to evaluate the factors influencing resilience in primary brain tumor patients in Taiwan.**Methods:** A total of 95 participants completed the cross-sectional survey. All of the participants had undergone surgical, chemotherapy, or radiotherapy treatments for their brain tumors at least one month prior to data collection. The instruments that were used in data collection included the Resilience Scale (RS), a baseline characteristics datasheet, and the Karnofsky Performance Status (KPS) scale.**Result:** KPS score correlated significantly and positively with resilience ($r = .49, p < .01$). Moreover, financial means ($t = 3.31, p < .01$), mode of tumor treatment ($t = 2.10, p < .05$), and tumor recurrence status ($t = -2.03, p < .05$) were found to be significant predictors of resilience, accounting for 11% ($R^2_{inc} = .11, p < 0.01$), 5% ($R^2_{inc} = .05, p < 0.05$), and 12% ($R^2_{inc} = .12, p < 0.001$) of the total variance, respectively.**Conclusion:** Health professionals may use the findings of the present study to assess the relevant baseline characteristics and physical abilities of their patients in order to better identify the presence of significant protective or risk factors for resilience.

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Introduction

Brain tumors are an important cause of morbidity and mortality in cancer patients worldwide [1-3]. The prevalence of brain tumors has been on an upward trend for many years [4]. A combination of surgery, chemotherapy, and/or radiotherapy is typically used to treat both benign and malignant brain tumors [5, 6]. Patients with brain tumors therefore suffer multiple symptoms that are caused by both the tumors and tumor-related treatment [7, 8]. For example, patients may encounter symptoms such as aphasia, cognitive deficits, and/or motor deficiencies [9, 10]. These symptoms influence the physical functions of patients [11]. Additionally, patients are commonly concerned about tumor recurrence [12]. These issues affect the psychological, social and behavioral functioning of patients and may severely degrade their quality of life [13]. Therefore, the recovery of psychological and physical wellbeing in

terms of the patient acquiring the means and capabilities to adjust effectively to their brain tumor plays a significant role in sustaining an acceptable quality of life [14, 15].

Resilience is identified as the recovery, rebounding, or resistance of physical and mental wellbeing subsequent to a stressful life circumstance [16]. Resilience has been identified as a crucial capacity or trait affecting health during periods of critical adversity [17]. Persons with sufficient levels of resilience may overcome distress and adjust better to adversity [18]. Thus, resilience has the potential to help individuals deal with distress related to tumor diagnoses and tumor-related treatments [19]. Particularly, resilience has been shown to be an important factor in enhancing the success of treatments and improving quality of life in rehabilitation-medicine settings for patients with brain diseases [20].

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Prior research has shown that age is a factor contributing to resilience, although there is a lack of consensus regarding whether older or younger individuals have higher resilience levels. In addition to age, additional factors that possibly relate to resilience include gender, education, household income, employment status, and tumor recurrence [21-24]. Understanding the factors that contribute to resilience may facilitate improvements in treatment success and psychological and physical wellbeing for brain tumor patients. The present study was designed to evaluate resilience scores and to explore potential factors influencing resilience in primary brain tumor patients.

Materials and methods

Sample and Procedures

This descriptive study comprised a convenience sample of 95 participants and was conducted in an outpatient department of a neurosurgery unit in the one teaching hospital in Taipei City, Taiwan. Convenient sampling was used to recruit patients who: (1) had been diagnosed with a benign or malignant primary brain tumor; (2) had already undergone a related operation, chemotherapy, or radiotherapy treatment (3) were at least one-month post-treatment; (4) were aged 20 or over and were conscious enough to sign a consent agreement. All of the patients signed the informed consent form prior to being enrolled as participants. The present study was approved by the institutional ethics committee of the participating hospital.

Measures

Sociodemographic Variables

Age, marital status, education, gender, household income, and employment status were collected as sociodemographic variables. In addition, type of brain tumor, tumor treatment, and recurrence status were collected as medical variables. Furthermore, the Karnofsky Performance Status scale (KPS) was used to assess physical function, with scores ranging from 0 (dead) to 100 (normal). Full details of the sample and the survey instrument used in this study have been reported elsewhere [25, 26]. For the purposes of this paper, data obtained using the following instruments were analysed:

Resilience Scale

The Resilience Scale (RS), a 25-item questionnaire that was developed by Wagnild and Young, was used to measure the resilience of the participants [27]. Item scores range from 1 (strongly disagree) to 7 (strongly agree) and the total possible score for the scale ranges from 25 to 175, with higher scores indicating higher resilience. Scores of ≥ 147 signify high resilience, 121 to 146 signify mid-range resilience, and < 121 signify weak resilience. The RS comprises two-dimension scales, including personal competence and acceptance of self and life. The Chinese version of the RS earned a Cronbach's alpha coefficient of .95 in a prior study and ranged from .92 to .96 for the total scale and the subscales in the present study [28]. The concurrent validity was significantly associated with life satisfaction ($r = .30$) [29]. Illustrations of items to improve understanding included "I feel that I can handle many things at one time," "I feel proud that I have accomplished things in life," and "keeping interested in things is important to me."

Statistics

Data were analyzed using the Statistical Package for the Social Sciences for Windows version 18.0 (SPSS, Chicago, IL, USA). Mean, standard deviation (SD), frequency, and percentage were computed to summarize the sociodemographic and medical variables, KPS score, and resilience of the sample. ANOVA and t-test were used to examine the group differences in resilience for sociodemographic and medical variables. In addition, Pearson product-moment correlation was used to examine the relationships between KPS score and resilience. Hierarchical multiple regressions were used to explore how much variance in resilience were accounted for by the sociodemographic and medical variables and the KPS score. Only demographic and medical variables with statistically significant relationships with resilience were included in the hierarchical multiple regressions.

Results

The Influence of Demographic Variables, Medical Variables, and KPS Score on Resilience

The sample consisted of 95 brain tumor outpatients. Participants included 37 (38.9%) men and 58 (61.1%) women. Participants ranged in age from 21 to 68 years with a mean age of 47.7 years ($SD = 12.15$). Most were married ($n=55$, 57.9%), had a college / university or higher education ($n=59$, 62.1%), and were not working ($n=54$, 56.8%). Most were financially supported by other family members ($n=56$, 58.9%) and 42.1% ($n=40$) had a household income NTD (New Taiwan Dollar) of 40000-80000/month. Major groups of participants included having a benign brain tumor diagnosis ($n=49$, 51.6%), no tumor recurrence ($n=61$, 64.2%), and having received surgery only ($n=53$, 55.8%). The participants earned a mean KPS score of 90.32 ($SD = 11.71$, range = 60-100). One-quarter (23.2%; $n=22$) of the participants reported high resilience (score ≥ 147), 42.1% ($n=40$) reported mid-range resilience (score =121-146), and 34.7% ($n=33$) reported low resilience (score ≤ 120).

Association between Demographic/Medical Variables and KPS Score and Resilience

Independent-sample t-tests or ANOVAs were conducted to compare differences in resilience among different demographic and medical subgroups. These results found significant differences in resilience among participants of different financial means ($t = 3.31$, $p < .01$), tumor treatment modes ($t = 2.10$, $p < .05$) and tumor recurrence status ($t = -2.03$, $p < .05$). Participants who were financially independent, who received surgery-only treatment, and whose tumor had not recurred earned significantly higher scores for resilience than their peers in other subgroups. While not statistically significant, participants who were currently employed displayed higher resilience than their unemployed peers ($t=1.97$, $p=0.052$). In addition, a significant difference was identified in the personal-competence-related resilience of participants with different education levels ($t = -2.05$, $p < .05$) and financial means ($t = 3.06$, $p < .01$). Moreover, significant differences in the resilience-related acceptance of self and life were identified for the variables of employment status ($t = 2.10$, $p < .05$), financial means ($t = 3.49$, $p < .001$), mode of tumor treatment ($t = 2.27$, $p < .05$) and tumor recurrence status ($t = -2.28$, $p < .05$; see Table 1).

Table 1: Demographic characteristics, by resilience (N = 95)

Variables	Groups	Resilience			Personal Competence			Acceptance of Self and Life		
		M	SD	t/F	M	SD	t/F	M	SD	t/F
Gender	Male	124.59	28.73	t = -0.24	55.27	12.02	t = -0.97	69.32	17.10	t = 0.31
	Female	126.05	28.65		57.81	12.69		68.24	16.36	
Age	< 40	130.94	20.36	F = 1.08	59.23	8.76	F = 1.12	71.71	12.63	F = 1.01
	40-49	127.57	26.49		57.77	11.42		69.80	15.45	
	50-59	119.15	34.56		53.65	15.07		65.50	19.75	
	> 60	118.00	37.64		54.00	16.68		64.00	21.24	
Married	No	123.64	27.46	F = 0.92	56.43	11.40	F = 1.02	67.21	16.56	F = 0.83
	Yes	124.15	27.17		55.98	11.95		68.16	15.72	
	Other	135.92	36.68		61.58	16.48		74.33	20.45	
Education level	Senior high school or below	118.86	31.27	t = -1.79	53.53	13.64	t = -2.05*	65.33	18.05	t = -1.54
	Diploma/Bachelor or above	129.53	26.19		58.83	11.29		70.69	15.40	
Employment status	Employed	131.54	18.19	t = 1.97	59.24	7.98	t = 1.80	72.29	11.13	t = 2.02*
	Unemployed	120.89	33.83		54.98	14.77		65.91	19.38	
Household income	① < 40000	117.62	35.48	F = 1.92	53.92	15.03	F = 1.19	63.69	20.78	F = 2.50
	② 40000-80000	125.45	24.64		57.08	11.01		68.38	14.32	
	③ > 80000	132.59	25.58		59.07	11.63		73.52	14.25	
Financial means	Self-supported	136.51	23.33	t = 3.31**	61.13	10.21	t = 3.06**	75.38	13.66	t = 3.49**
	Supported by others	117.80	29.48		53.82	13.03		63.98	16.91	
Tumor type	Benign	126.08	23.62	t = 0.21	56.98	10.41	t = 0.13	69.10	13.77	t = 0.26
	Malignant	124.85	33.24		56.65	14.40		68.20	19.26	
Tumor treatment	Surgery only	130.85	27.82	t = 2.10*	58.83	12.28	t = 1.79	72.02	16.13	t = 2.27*
	Surgery plus CTx or RTx or both	118.71	28.29		54.29	12.30		64.43	16.33	
Tumor recurrence	Yes	117.65	30.89	t = -2.03*	54.06	13.46	t = -1.63	63.59	17.86	t = -2.28*
	No	129.85	26.39		58.36	11.66		71.49	15.23	

Note: *p < 0.05, **p < 0.01

Pearson's correlations were conducted to assess the relationship between KPS score and resilience. The results showed that KPS was significantly and positively correlated with resilience ($r = .49$, $p < .001$), resilience-related personal competence ($r = .47$, $p < .001$), and acceptance of self and life ($r = .49$, $p < .001$).

The Predictive Power of Demographic/Medical Variables and KPS Score on Resilience

Three separate hierarchical multiple regression analyses were performed to establish how much variance in resilience, personal competence, and acceptance of self and life may be accounted for by the variables of

financial means, employment status, education level, tumor treatment, tumor recurrence, and KPS score, respectively. Those variables that were initially discrete or nominal were dummy coded. Next, all of these variables were entered into the hierarchical multiple regression analysis to predict the resilience of the participants. These variables were selected based on their revealing significant associations with resilience in the results of ANOVA, t-test, and Pearson product-moment correlation. One variable was entered for each step. For resilience, the results showed that the model was significant ($F = 7.21$, $p < .001$) and that financial means ($R^2_{inc} = .11$, $p < .01$), tumor treatment ($R^2_{inc} = .05$, $p < .05$), and KPS score ($R^2_{inc} = .12$, $p < .001$) were significant predictors of resilience in the sample. For personal competence, the results showed that the model was

significant ($F=10.40$, $p<.001$) and that financial means ($R^2_{inc}=.08$, $p<.01$), education level ($R^2_{inc}=.04$, $p<.05$), and KPS score ($R^2_{inc}=.13$, $p<.001$) were likely predictors. For acceptance of self and life, the results showed that the model was significant ($F=7.79$, $p<.001$) and that

financial means ($R^2_{inc}=.12$, $p<.01$), mode of tumor treatment ($R^2_{inc}=.06$, $p<.05$), and KPS score ($R^2_{inc}=.11$, $p<.001$) were likely predictors (see Table 2).

Table 2: Hierarchical Multiple Regression Analysis for Variables Predicting Resilience (N=95)

Variable	B	SE B	β	R ²	R ² increment	F increment
Criterion: Resilienc						
Step 1: Financial means	-14.04	6.47	-.24*	0.11	0.11	10.93**
Step 2: Employment status	3.21	6.27	.06	0.11	0.00	0.00
Step 3: Tumor treatment	-2.63	5.88	-.05	0.16	0.05	5.39*
Step 4: Tumor recurrence	4.60	5.85	.08	0.17	0.02	1.81
Step 5: KPS score	.96	.25	.40***	0.29	0.12	14.56***
Overall model	R ² = 0.29 (F (5, 89)=7.21, p=0.000))					
Criterion: Personal Competence						
Step 1: Financial means	-4.37	2.38	-.17	0.84	0.08	8.58**
Step 2: Education level	2.71	2.38	0.11	0.12	0.04	4.12*
Step 3: KPS score	0.42	0.10	0.39***	0.26	0.13	16.08***
Overall model	R ² = 0.26 (F (3, 91)=10.40, p=0.000))					
Criterion: Acceptance of Self and Life						
Step 1: Financial means	-8.93	3.71	-.27*	0.12	0.12	12.18**
Step 2: Employment status	2.04	3.60	.06	0.12	0.00	0.00
Step 3: Tumor treatment	-1.97	3.38	-.06	0.17	0.06	6.39*
Step 4: Tumor recurrence	3.44	3.36	.10	0.20	0.02	2.44
Step 5: KPS score	.54	.15	.38***	0.31	0.11	13.94***
Overall model	R ² = 0.31 (F (5, 89)=7.79, p=0.000))					

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; KPS: Karnofsky Performance Status

Discussion

The purpose of the present study was to explore the association between sociodemographic variables, medical variables, and KPS score and resilience in patients and to evaluate how much of the variance in resilience among brain tumor patients is accounted for by sociodemographic and medical variables and KPS scores. The results identified a significant relationship between resilience and the variables of financial means, education level, employment status, mode of tumor

treatment, tumor recurrence status, and KPS score, respectively. In particular, the present study suggests that financial means, mode of tumor treatment, and KPS score significantly predicts patient resilience. The present research contributes to existing knowledge by identifying baseline characteristics and KPS score, which may be protective or risk factors affecting the recovery of physical and mental wellbeing after treatment for a brain tumor.

The findings showed that participants had on average a middle-level resilience with a low trend score of resilience (average score=125.48). Indeed, around one-third of the participants reported having a low level of resilience, despite having high functional abilities ($KPS \geq 90$). Ferreira Filho et al., which focused on outpatients with various solid tumors who had received chemotherapy, found that patients reported an average middle level of resilience with a high trend score (average score=141) [30]. Strauss et al., which focused on patients with various solid tumors who had received radiotherapy, found that patients reported an average high level of resilience (average score=148.2) [31]. Manne et al., which focused on patients with gynecological cancers, found that patients had a high average level of resilience [32]. Moreover, Dubey et al. found that patients with pancreas, head and neck, and gastrointestinal cancers reported the lowest resilience scores [23]. Resilience may vary in line with different cancer diagnoses and may have effects on patient coping styles that vary with their cancer experience. More research is needed to clarify this issue.

The present study analyzed the relationship between patient resilience and demographic/medical variables and KPS score, respectively. The results indicate that higher KPS scores were significantly associated with higher resilience and that the KPS score is a predictor of resilience, personal competence, and acceptance of self and life, a result that is consistent with previous research [32, 33]. Prior research has concluded that subjects with higher levels of resilience struggle with fewer disabilities [34]. Perhaps their results reflect the fact that patients who are more resilient typically engage more frequently in physical activity. Indeed, higher KPS score is an indicator of better neurological status and physical function. The results of the present study suggest that resilience may vary according to level of physical function.

With respect to the relationship between demographic variables and resilience, the results of the present study show that patients who were employed had significantly higher acceptance of self and life than their unemployed peers. This finding is consistent with the suggestions of Dong et al. and Rosenberg et al., which indicated that patients who worked outside of the home reported higher resilience scores than those who were unemployed [21, 33]. It is thus likely that employment helps brain tumor patients build external resources such as social support and positive adjustment.

In addition, the present results show that participants who were financially self-sufficient had significantly higher resilience than their peers who relied financially on others. Financial means was found to be a predictor of resilience, personal competence, and acceptance of self and life, echoing prior research suggesting that resilience is not related to household income [32]. Limited research has focused on the association between resilience and financial means. Indeed, financial self-sufficiency may facilitate the development of various resources and the reduction of psychosocial stresses that are related to the burden of treatment costs borne by family members. The present results suggest that financial self-sufficiency contributes to patient resilience.

Furthermore, participants with tumors that were treated using surgery only had significantly higher resilience than their peers who were treated using surgery plus chemotherapy or radiotherapy or both. Only surgery was a positive predictor of patient resilience and acceptance of self and

life. This finding contradicts that of an earlier study, which indicated no relationship between treatment type and resilience [23, 32]. This inconsistency may be due to the different classification of tumor treatment in different studies. The current study potentially included patients with newly diagnosed benign brain tumors who had received surgery only. However, several participants may have experienced tumor recurrence and accepted surgery plus chemotherapy and radiotherapy. Thus, the experience of tumors as a life-threatening disease may cause a significant difference in patient resilience.

Participants with higher levels of education were found to have higher personal competence in the present study. This finding partially contradicted that of a previous study that indicated that level of education did not relate to resilience [24, 32]. However, other researchers have suggested that higher levels of education contribute to resilience [22, 35]. Patients with higher education may be better enabled to acquire disease-related information and other useful resources that may bolster resilience [36].

The present results reveal that participants who had experienced tumor recurrence had significantly lower resilience and acceptance of self and life compared to their non-recurrent peers. This result contradicts a study that indicated no relationship between resilience and tumor recurrence [24]. However, Dubey et al. suggested that patients with tumor recurrence exhibited relatively high resilience [23]. This inconsistency among findings may reflect different tumor pathologies among the different sample groups in terms of tumor sites, tumor stage, and metastatic status. Indeed, the related treatments of recurrent brain tumors may impact patient cognitive and motor abilities in terms of reducing the daily activity capabilities of patients.

The present study has several implications for clinical practice. Our identification of financial means, mode of tumor treatment, and KPS score as factors affecting resilience suggests that conducting assessments of these baseline characteristics in practice settings may help healthcare providers assess the resilience-related risk of their patients in terms of these factors. Moreover, resilience is an adaptable variable that may be used in prospectively helpful interventions to improve psychosocial outcomes such as the involvement of more adaptable beliefs beyond strengthening skills of acceptance, compassion, forgiveness, gratitude, and higher meaning and purpose [37].

The present study is limited by the cross-sectional design that was used on collected data. Thus, the results are unable to determine causality within the relationship between baseline characteristics and resilience. Besides, patients were convenience sampled from one teaching hospital in an urban setting, which may limit the generalizability of findings.

Conclusion

The findings of the present study revealed several baseline characteristics that significantly affect resilience. Health professionals should assess existing resilience-related factors and involve strategies that reinforce patient resilience in their regular care of brain tumor patients. Additionally, further study is necessary to establish causality between resilience and individual factors such as physical ability and

returning to work due to financial necessity after treatment for brain tumor.

Conflict of interest

No conflicts of interest were involved in the preparation or execution of the present study.

REFERENCES

- American Cancer Society. Cancer Facts and Figures 2002.
- Cancer Research UK (2010) Statistics and Outlook for Brain Tumours (online) (accessed 24.11.11.).
- Deltour I, Johansen C, Auvinen A, Feychting M, Kjaerboe L, et al. (2009) Time trends in brain tumor incidence rates in Denmark, Finland, Norway, and Sweden, 1974–2003. *J Natl Canc Inst* 101: 1721-1724. [[Crossref](#)]
- Health Promotion Administration, Ministry of Health and Welfare, Taiwan, ROC. (2016) Research & Statistic.
- Akeyson EW, McCutcheon IE (1996) Management of benign and aggressive intracranial meningiomas. *Oncol* 10: 747-756. [[Crossref](#)]
- Wen PY, Quant E, Drappatz J, Beroukhi R, Norden AD (2010) Medical therapies for meningiomas. *J Neuro-Oncol* 99: 365-378. [[Crossref](#)]
- Molassiotis A, Aapro M, Dicato M, Gascon P, Novoa SA, et al. (2014) Evaluation of risk factors predicting chemotherapy-related nausea and vomiting: results from a European prospective observational study. *J Pain Symptom Manage* 47: 839-848.e4. [[Crossref](#)]
- Shahid S (2016) Review of hematological indices of cancer patients receiving combined chemotherapy & radiotherapy or receiving radiotherapy alone. *Crit Rev Oncol Hematol* 105: 145-155. [[Crossref](#)]
- Mukand JA, Blackinton DD, Crincoli M, Lee JJ, Santos BB (2001) Incidence of neurologic deficits and rehabilitation of patients with brain tumors. *Am J Phys Med Rehabil* 80: 346-350. [[Crossref](#)]
- Ullrich NJ, Scott RM, Pomeroy SL (2005) Craniopharyngioma therapy: Long term effects on hypothalamic function. *Neurologist* 11: 55-60. [[Crossref](#)]
- Okita Y, Narita Y, Miyahara R, Miyakita Y, Ohno M, et al. (2015) Health-related quality of life in long-term survivors with Grade II gliomas: the contribution of disease recurrence and Karnofsky Performance Status. *Jpn J Clin Oncol* 45: 906-913. [[Crossref](#)]
- Baker F, Denniston M, Smith T, West MM (2005) Adult cancer survivors: How are they faring? *Cancer* 104: 2565-2576. [[Crossref](#)]
- Janda M, Steginga S, Langbecker D, Dunn J, Walker D, et al. (2007) Quality of life among patients with a brain tumor and their carers. *J Psychosom Res* 63: 617-23. [[Crossref](#)]
- Edward K (2013) Chronic illness and wellbeing: using nursing practice to foster resilience as resistance. *Br J Nur* 22: 741-746. [[Crossref](#)]
- Garnezy N (1991) Resiliency and vulnerability to adverse developmental outcomes associated with poverty. *Am Behav Sci* 34: 416-430.
- Szanton SL, Gill JM (2010) Facilitating resilience using a society-to-cells framework : a theory of nursing essentials applied to research and practice. *Adv Nurs Sci* 33: 329-343. [[Crossref](#)]
- Luthar SS, Cicchetti D, Becker B (2007) The construct of resilience: a critical evaluation and guidelines for future work. *Child Dev* 71: 543-562. [[Crossref](#)]
- Luthar SS, Sawyer JA, Brown PJ (2006) Conceptual issues in studies of resilience: past, present, and future research. *Ann N Y Acad Sci* 1094: 105–115. [[Crossref](#)]
- Molina Y, Yi JC, Martinez-Gutierrez J, Yi-Frazier JP, Rosenberg AR (2014) Resilience among patients across the cancer continuum: Diverse perspectives. *Clin J Oncol Nurs* 8: 93-101. [[Crossref](#)]
- Bertisch H, Rath J, Long C, Ashman T, Rashid T (2014) Positive psychology in rehabilitation medicine: a brief report. *NeuroRehabil* 34: 573-585. [[Crossref](#)]
- Dong X, Li G, Liu C, Kong L, Fang Y, et al. (2017) The mediating role of resilience in the relationship between social support and posttraumatic growth among colorectal cancer survivors with permanent intestinal ostomies: A structural equation model analysis. *Eur J Oncol Nurs* 29: 47-52. [[Crossref](#)]
- Cohen M, Baziliansky S, Beny A (2014) The association of resilience and age in individuals with colorectal cancer: An exploratory cross-sectional study. *J Geriatr Oncol* 5: 33-39. [[Crossref](#)]
- Dubey C, De Maria J, Hoeppli C, Betticher DC, Eicher M (2015) Resilience and unmet supportive care needs in patients with cancer during early treatment: A descriptive study. *Eur J Oncol Nurs* 19: 582-588. [[Crossref](#)]
- Matzka M, Mayer H, Köck-Hódi S, Moses-Passini C, Dubey C, et al. (2016) Relationship between Resilience, Psychological Distress and Physical Activity in Cancer Patients: A Cross-Sectional Observation Study. *PLoS One* 11: e0154496. [[Crossref](#)]
- Karnofsky DA, Abelmann WH, Craver LF (1978) The use of the nitrogen mustards in the palliative treatment of carcinoma. *Cancer* 1: 634-656.
- Pan CJ, Liu HC, Liang SY, Liu CY, Wu WW, et al. (2017) Resilience and Coping Strategies Influencing the Quality of Life in Patients with Brain Tumor. *Clin Nurs Res*. [[Crossref](#)]
- Wagnild GM, Young HM (1993) Development and psychometric evaluation of the Resilience Scale. *J Nursing Meas* 1: 165-178. [[Crossref](#)]
- Wu WW, Tsai SY, Liang SY, Liu CY, Jou ST, et al. (2015) The mediating role of resilience on quality of life and cancer symptom distress in adolescent patients with cancer. *J Pediatr Oncol Nurs* 32: 304-313. [[Crossref](#)]
- Yang HL (2009) Depressive Symptoms, Self-Esteem, Resilience and Related Factors Among Older Adults with Cancer. Thesis, Taipei Medical University.
- Ferreira Filho AF, Junior Jr OC, da Silva DL, de Souza MA, Tavares Cavalcante IM, et al. (2009) Analysis of resilience scores in a cohort of solid tumors ambulatory cancer patients in chemotherapy treatment. *J Clin Oncol* 27: e20736.
- Strauss B, Brix C, Fischer S, Leppert K, Fuller J, et al. (2007) The influence of resilience on fatigue in cancer patients undergoing radiation therapy (RT). *J Cancer Res Clin Oncol* 133: 511–518. [[Crossref](#)]
- Manne SL, Myers-Virtue S, Kashy D, Ozga M, Kissane D, et al. (2015) Resilience, Positive Coping, and Quality of Life Among Women Newly Diagnosed with Gynecological Cancers. *Cancer Nurs* 38: 375-382. [[Crossref](#)]
- Rosenberg AR, Syrjala KL, Martin PJ, Flowers ME, Carpenter PA, et al. (2015) Resilience, health, and quality of life among long-term survivors of hematopoietic cell transplantation. *Cancer* 121: 4250-4257. [[Crossref](#)]
- Manning LK, Carr DC, Kail BL (2016) Do higher levels of resilience buffer the deleterious impact of chronic illness on disability in later life? *Gerontologist* 56: 514-24. [[Crossref](#)]
- Wu Z, Liu Y, Li X, Li X (2016) Resilience and Associated Factors among Mainland Chinese Women Newly Diagnosed with Breast Cancer. *PLoS One* 11: 1-13. [[Crossref](#)]
- Wagnild G (2009) A review of the Resilience Scale. *J Nurs Meas* 17: 105-113. [[Crossref](#)]
- Loprinzi CE, Prasad K, Schroeder DR, Sood A (2011) Stress Management and Resilience Training (SMART) Program to Decrease Stress and Enhance Resilience Among Breast Cancer Survivors: A Pilot Randomized Clinical Trial. *Clin Breast Cancer* 11: 364–368. [[Crossref](#)]