

The role of tumor grade, demographics and psychological factors in Cancer survivorship

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Abstract

Introduction: The aim of this study was to predict cancer survival according to the role of demographic determinants, psychological factors and tumor grade.

Methods: In this cross-sectional retrospective study, 350 patients with blood, breast, prostate, lung, stomach and colon cancers (173 patients with cancer survival for more than 2 years and 177 patients with cancer survival for 2 years or less) were selected by convenience sampling method among patients who referred to the Semnan Kosar Hospital and Specialized Cancer Treatment Centers in Semnan. Data was collected by the Posttraumatic Growth Inventory (PTGI), Inner Strength Questionnaire (ISQ), Bell Object Relations and Reality Testing Inventory (BORRTI), Self-Efficacy Scale for Self-Management (SESSM) and disease-demographic characteristics questionnaires. Data were analyzed by binary logistic regression analysis using the SPSS 20 software.

Results: Age ($P < 0.001$) and low-grade tumors ($P < 0.01$) have reverse correlation and the post-traumatic growth has positive significant correlation ($P < 0.01$) with cancer survival for more than 2 years survival group. Age ($Exp = 1.10$), low-grade tumors ($Exp = 4.37$) and post-traumatic growth ($Exp = 1.06$) can predict cancer survival for more than 2 years in the cancer patients ($P < 0.01$).

Conclusion: Considering the role of age, tumor grade and post-traumatic growth in the prediction of cancer patients' survival, it can be suggested that preventive programs are important to detect and diagnose cancer and administer tailored interventions in the critical time period.

Key words: Demographic Factors, Psychological Factors, Cancer, Tumor Grade

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Introduction:

Cancer is one of the Life-threatening diseases and the third leading cause of death after cardiovascular diseases (1,2). The incidence of new

cancer cases and the death from cancer every year is increasing in Iran (3). Cancer survival and its factors is an important aspect of psycho-oncological studies that affected by demographics, psychological factors and tumor grade (4-6).

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Cancer survival means the lives of cancer patients from diagnosis until death with a focus on physical, psychological, and socioeconomic issues (7). Exact methods of diagnosis, improved treatment and supportive care of cancer have increased survival rate (8). In the meantime, demographic factors such as age, gender, and income have an effect on the survival rate (9-11). More survival rate of cancer is associated with lower age, higher socioeconomic status, increased income and female gender (9,12). In addition, according to the tumor stage, grade 1 cancer shows a minimum of malignant tumors and is associated with long-term survival and grade 4 tumors are fully malignant that are associated with lower survival in the patients (13).

Early detection of cancer in the lower grades and lower age leads to better post-traumatic growth and longer survival in patients that indicating the importance of timely cancer screening (13). Various psychological factors have a role in the survival of cancer patients (14,15). Self-efficacy for self-management affects health-related behaviors, promotes higher self-efficacy and patient survival (16). Self-efficacy for self-management refers to feeling the patient's ability to self-care behaviors in disease control (17). High self-efficacy and self-care for cancer patients increase duration of survival in cancer patients (17). Also, the inner strength improves self-management, internal stability, quality of life and survival of cancer patients (4,18).

In addition, disruption in early object relations, especially outside world as a real person and the internalized image of the person is conducive to the development of psychopathology which can have a negative impact on health (19). More desirable object relations, including interpersonal relationships and higher family support improve survival of cancer patients (20). As well as, post-traumatic growth is positive psychological changes as a result of the struggle with cancer and its negative consequences (21,22).

According to the Tallman (2011), cancer-related traumatic experiences lead to positive changes in post-cancer life and the subsequent increased patient survival (23). Danhauer et al. (2013) showed post-traumatic growth is linked with demographic factors such as age, marital status, education, race and religion (22). According to numerous evidence,

demographic factors such as age, sex, socioeconomic status affect survival and post-traumatic growth, self-management and cancer survival (9,11,24). In previous research, the role of object relations in the survival and development of post-traumatic growth accompanied with these factors not addressed and it seems essential. This study is designed to enrich the theoretical basis or empirical evidence to affordable health interventions. According to the research vacuum in the relationship between demographic, psychological and tumor grade with cancer survival in Iran and the need for evidence-based interventions, the study appears in this field is necessary.

The aim of this study was to predict survival in cancer survivors due to the decisive role of demographic (gender, age, and income) and psychological factors (self-efficacy for self-management, inner strength, object relations and post-traumatic growth) and tumor grade. According to this aim, the problem of this study is whether the determinants of demographic, psychological and tumor grade affect survival of cancer survivors.

Methods:

In this retrospective study, of all 20 to 45 years old patient with blood, breast, prostate, lung, stomach and colon cancers that referred to the Semnan Kosar Hospital and Specialized Cancer Treatment Centers in the period of March 2016 to August 2016 studied. Initially, 368 patients were selected by the convenience sampling method. Inclusion criteria included age of 20 and 45 years old, suffering from blood, breast, prostate, lung, stomach or colon cancers, having reading and writing ability, and the willingness of participation in the study. On the basis of the inclusion criteria, 18 subjects (4.89%) were excluded and finally 350 patients, including 173 patients (49.4%) with confirmed survival of more than 2 years and 177 patients (50.6%) with survival of less than or equal to 2 years were investigated. Exclusion criteria included a comorbid diagnosis of cancer with other medical conditions, severe psychiatric disorders by diagnosis of the specialist psychiatrist and non-completed instruments in the study.

The two groups were examined by researchers self-constructed inventory for demographic factors. In addition, the instruments were applied to assess variables as follow. Posttraumatic Growth Inventory (PTGI) was made to examine the post-traumatic growth that has 21 items to determine five domains of psychological growth after a traumatic stressor (25). PTGI scored in 6-point Likert scale. The total score is 105 and the higher score means more posttraumatic growth. Heidarzadeh et al. (2014) reported Cronbach's alpha coefficient for the entire tool, 0.87 and for subscales among 0.64 to 0.75 (26). In this study, the Cronbach's alpha coefficient for the entire tool is 0.84. Inner Strength Questionnaire (ISQ) was introduced by Dingley and Roux (2014) to assess the concept Inner Strength (4). ISQ has 27 items and Likert 5 points for scoring in the range of strongly disagree (score 1) to strongly agree (score 5). The items of 14 and 20 are reverse scored. The ISQ includes four dimensions and total score for the scale is 135 and the highest score on this scale means more inner strength. The Cronbach's alpha coefficients for the entire questionnaire were 0.80 and for dimensions of the ISQ vary from 0.85, 0.95, 0.85, 0.83 and 0.89 (4). In this study, Cronbach's alpha for the total Questionnaire was 0.87. The Bell Object Relations and Reality Testing Inventory (BORRTI) was developed to verify the object relations and reality testing (27). BORRTI has 90 items that will be answered by yes or no. Object relations scale (Form O) contains 45 items that scored with Yes (1 point) and no (zero points). In this subscale, items 1, 7, 8, 15, 21, 30, 37, 42 and 45 in reverse scored. In the subscale, a higher score means a worse performance and poor relationships. The test-retest reliability coefficients for the four-week and 13-week object relations subscale were 0.90, 0.58, 0.8 and 0.65, respectively (27). Hadinezhad et al. (2013) reported 21-week test-retest reliability coefficients in a scale of object relations 0.85, 0.75, 0.74 and 0.68 (28). In this study, the Cronbach's alpha coefficient for the entire tool is 0.70. Self-Efficacy Scale for Self-Management (SESSM)

provided by Lee et al. (2012) to assess self-efficacy for self-management in breast cancer patients (29). SESSM consists of 21 items and scored on a Likert scale (strongly disagree=1 to strongly agree=5). SESSM has five factors and total score of the scale is 105 and higher scores indicate better self-efficacy for cancer self-management. The Cronbach's alpha coefficient for the total scale was 0.84 and for the subscales was 0.62 to 0.77 (29). In this study, Cronbach's alpha for the total instrument was 0.74. In addition, the self-constructed questionnaire was used to assess the contextual and demographic factors.

Ethical standards, including written informed consent for participation in the study, respecting the principle of confidentiality, protect the rights of participants in the study and the possibility of leaving the study were taken into consideration. The data were analyzed by descriptive statistics (correlation, mean and standard deviation and frequency and percent) and binary logistic regression analysis using SPSS 20 software. The biserial correlation test was used to evaluate the intensity and direction of predictor variables and the dichotomous criterion variable (Survival less or greater than 2 years old). Binary logistic regression analysis was used to calculate the odds ratio in comparing the two groups on the basis of dichotomous criterion variable. A significance level of 0.05 was calculated for statistical significance.

Results:

Participants consisted of 214 (61.1%) women and 136 (38.9%) male. The participants' age ranged from 27 to 45 years old with an average age of 39.18 years old (SD=4.298). All patients were receiving chemotherapy. Frequency and percentage of demographic and disease characteristics as a basis for the statistical analysis are presented in Table 1.

Table 1. Demographic characteristics and disease characteristics of the study participants (n=350)

Demographic characteristics and disease characteristics	Frequency (percent)	
Marital	Single	28 (8%)
	Married	311 (88.8%)
	Divorced and Separated	11 (3.2%)
Educational status	Illiterate and elementary	44 (12.5%)
	third grade middle school	72 (20.5%)
	Diploma	179 (51.2%)
Employment status	College/university education	55 (15.8%)
	Full-time	93 (26.6%)
	Part-time	146 (41.7%)
Monthly income	Retired	20 (5.7%)
	Unemployed	91 (26%)
	Under \$750	105 (30%)
	\$750 to \$1,000	185 (52.9%)
Insurance status	\$1,000 to \$2,000	50 (14.3%)
	More than \$2,000	10 (2.9%)
	Covered by health insurance	305 (87.1%)
Survival duration	Uninsured	45 (12.9%)
	Less than 2 years	177 (50.5%)
	More than 2 years	173 (49.5%)
Type of cancer	Blood	105 (30%)
	Breast	98 (28%)
	Prostate	87 (24.9%)
	lung	11 (3.1%)
	Stomach	28 (7.7%)
	Colon	21 (5.9%)
Tumor grade	grade 1	112 (32%)
	grade 2	210 (60%)
	grade 3	25 (7.1%)
	grade 4	3 (0.9%)
	Under \$2,000	190 (54.3%)
Monthly cost of treatment	\$2,000 to \$3,000	132 (37.7%)
	\$3,000 to \$4,000	23 (6.6%)
	More than \$4,000	5 (1.4%)
	Treatment location	Hospital
Specialized Cancer Treatment Centers		249 (71.1%)

Table 2. Accuracy percent on cancer survival for more than 2 years and cancer survival for 2 years and lower

Step	Group	Predicted survival cancer survival for more than 2 years	Cancer survival for less than or equal to 2 years	Accuracy percent less than or equal 2 years
1	cancer survival for more than 2 years	85	81	51.2
	cancer survival for 2 years and lower	62	111	64.2
	Total			57.8
2	cancer survival for more than 2 years	90	76	54.2
	cancer survival for 2 years and lower	61	112	64.7
	Total			59.6
3	cancer survival for more than 2 years	104	62	62.7
	cancer survival for 2 years and lower	59	114	65.9
	Total			64.3
4	cancer survival for more than 2 years	102	64	61.4
	cancer survival for 2 years and lower	59	114	65.9
	Total			63.7

Table 3. Wald test and regression coefficients of variables of gender, age, income, inner strength, object relations, self-management self-efficacy, tumor grade and post-traumatic growth

Step	Variable	B	S.E.	Wald	Exp (B)	P-value
1	Gender	0.06	0.24	0.06	1.06	0.82
	Age	0.10	0.02	13.55	1.10	0.001*
	Income less than \$1,000	-0.22	0.35	0.40	0.79	0.53
	Income more than \$1,000	0.45	0.31	2.03	1.57	0.15
2	Gender	0.04	0.24	0.03	1.04	0.86
	Age	0.10	0.03	11.89	1.10	0.001*
	Income less than \$1,000	-0.18	0.36	0.25	0.83	0.61
	Income more than \$1,000	0.49	0.32	2.35	1.64	0.12
	Inner strength	-0.02	0.02	1.22	0.97	0.27
	Object relations	-0.04	0.04	1.33	0.95	0.25
3	Self-management self-efficacy	-0.01	0.02	0.59	0.98	0.44
	Gender	-0.03	0.26	0.01	0.97	0.92
	Age	0.09	0.03	10.13	1.09	0.001*
	Income less than \$1,000	-0.32	0.38	0.71	0.73	0.41
	Income more than \$1,000	0.44	0.34	1.72	1.56	0.19
	Inner strength	-0.02	0.02	0.71	0.98	0.42
	Object relations	-0.05	0.04	1.60	0.95	0.22
	Self-management self-efficacy	-0.02	0.02	0.56	0.98	0.45
	Low-grade tumors (grades I and II)	1.65	0.55	9.14	5.20	0.003*
	High-grade tumors (grades III and IV)	0.80	0.52	2.33	2.33	0.13
4	Gender	-0.15	0.26	0.32	0.86	0.57
	Age	0.10	0.03	10.92	1.10	0.001*
	Income less than \$1,000	-0.21	0.38	0.30	0.81	0.58
	Income more than \$1,000	0.46	0.34	1.80	1.58	0.18
	Inner strength	-0.04	0.02	3.16	0.96	0.07
	Object relations	-0.05	0.04	1.35	0.95	0.24
	Self-management self-efficacy	-0.03	0.02	2.10	0.97	0.15
	Low-grade tumors (grades I and II)	1.48	0.56	7.05	4.37	0.008*
	High-grade tumors (grades III and IV)	0.70	0.53	1.70	2	0.19
	Post-traumatic growth	0.06	0.02	7.32	1.06	0.007*

* P<0.05

To obtain summary predictive relations between the variables of the model, binary logistic regression analyses were used. The results of the test show that the model coefficients are fitted to the data. In the fitness test of the model, the change in the -2Log likelihood in each step was compared with the previous step and tested with the chi-square test. In steps one, the change in -2Log likelihood compared to the original model with no predictors is statistically significant.

The Chi-square test indicates that this change is in the level of statistical significance ($X^2=22.50$, $P<0.05$). In the second step, compared with the first step the change is statistically significant ($X^2=25.86$, $P<0.05$). In the third step compared to the second step, the change is statistically significant ($X^2=42.10$, $P<0.05$).

Finally, in the fourth step as compared with the third step, the change was statistically significant ($X^2=49.78$, $P<0.05$).

The fit of the model data at each step was analyzed by chi-square in Hosmer & Lemeshow test and the results show that the model in step one is not a good fit to the data ($X^2=6.53$, $P>0.05$). In the second step, model recovered and has been fitted ($X^2=18.65$, $P<0.05$). In the third step, the model had low fitness ($X^2=3.39$, $P<0.05$). Finally, the model fitted to the data in the fourth step ($X^2=44.4$, $P<0.05$). The power of the logistic regression model also shows that a model in step has 9% role in the prediction (R^2 Nagelkerke=0.09, -2Log Likelihood=447.30). In addition, the model prediction ability in the second, third and fourth step increased 10%, 16% and 18%, respectively (R^2 Nagelkerke=0.10, -2Log Likelihood=443.94; R^2 Nagelkerke=0.16, -2Log Likelihood=427.70; R^2 Nagelkerke=0.18, -2Log Likelihood=420.02). In the final step of regression model (Step 4) age, tumor grade and post-traumatic growth significantly predicted 18% of the variance in the survival of patients with cancer.

The model power on the correct classification of cancer survival for more than 2 years and cancer survival for 2 years and lower than is reported in Table 2. The findings suggest that in step 1 model has been able to differentiate the two groups with an accuracy of 57.8%. The model predicts survival in separate groups with cancer survivor for 2 years and lower than ($P=64.2$) more than the forecast

with cancer survival for more than 2 years ($P=51.2$). In the second and third step, the power of the prediction model in the group classification increased and reached 59.6% and 64.3%. But in the fourth step, the power of the prediction model to separate groups did not change and remained at around 64%. The forecast model can be in separate groups shows the predicted survival of the group with cancer survivor for 2 years and lower than predicts greater in comparison with the model predicted cancer survival for more than 2 years ($P=0.05$).

In the final model (Table 3), results show that there was no significant difference in two patient group in terms of gender ($P=0.57$), income more than \$1,000 ($P=0.18$), income less than \$1,000 ($P=0.58$), inner strength ($P=0.07$), object relations ($P=0.24$), self-management self-efficacy ($P=0.14$) and high-grade tumors ($P=0.19$). But, based on age ($P<0.001$), the high-grade tumors ($P<0.008$) and post-traumatic growth ($P<0.007$) a significant difference was observed between the two groups. According to the findings (Table 3), in step one important variable in predicting cancer survival is the age with regression coefficient 0.10 (Wald=13.55, $P<0.05$). The odds ratio for this variable is 1.10 shows that for one unit increase in age, the chances 1.10 increased for being in the cancer survival for 2 years and lower than. In the second step, age with regression coefficient 0.10 has a significant role in predicting (Wald=11.89, $P<0.05$). In the third step, the low-grade tumors (grades I and II) with regression coefficient 1.65 along with age have a significant role in predicting the cancer survival (Wald=9.14, $P<0.05$). The odds ratio for the low-grade tumors (grades I and II) is 5.20 shows that for one unit increase in cancer with grade 2, chance increased 5.20 for being in cancer survival for 2 years and lower than. In the final step (step 4), post-traumatic growth with regression coefficient 0.06 associated with the low-grade tumors (grades I and II) and age had a significant role in predicting cancer survival (Wald=7.32, $P<0.05$). The odds ratio for post-traumatic growth is 1.06 shows that for every one unit increase in post-traumatic growth, the chances of being in the group with a cancer survival for more than 2 years increase to 1.06.

Conclusion:

According to the study, in terms of gender, higher incomes at or below \$1,000, inner strength, object relations, self-efficacy for self-management and low-grade tumors (grades I and II) there was no significant difference in the patients. Also, results showed that only age, low-grade tumors (grades I and II) and post-traumatic growth predict the cancer survival for more than 2 years. Age and grade of cancer conversely and post-traumatic growth directly predicts cancer survival for more than 2 years and gender, income, inner strength, self-efficacy for self-management and object relations had no role in predicting cancer survival for more than 2 years. The findings of the present study were not in line with Sakurai et al. (2010) showed that women than men have a more cancer survivor (12). For reasons in this study, gender did not significantly predict cancer survival. In one explanation, survival of cancer is greatly under the influence of gender-based health behaviors than gender and because the necessity of the treatment such behavior exists in both genders. In a possible explanation, gender in this study was investigated along with other factors such as tumor grade and can lose its significance along with other factors including the cancer grade. Sakurai et al. (2010) and Heidarzadeh et al. (2014) showed that increased income increases survival of cancer (12,26), but in this study, income had no significant role in predicting survival. In a possible explanation, in this study, most patients had low income that accompanied with the higher cost of medical treatment and psychological stressor-induced by chemotherapy reduce survival from cancer.

The self-efficacy and inner strength have no significant role in the survival of cancer patients. The result of the study is inconsistent with Jenkinson and Cantrell (30) and it is in line with García-Jimenez et al. (31). In this study, self-efficacy for self-management and inner strength had no significant role in predicting cancer survival. In line with previous studies (16,18), self-efficacy for self-management can not only be effective for survival and self-management actions result in improved survival. The patients in the present study did not receive the psychological interventions which could explain the lack of relationship

between self-management self-efficacy and survival of patients. According to previous evidence (32) regard the role of inner strength in the survival of cancer patients, only spirituality is effective. Possible explanation is that self-efficacy for self-management and inner strength are psychological constructs that facilitate treatment and alone will not lead to increased survival. Object relations also have no role in the survival of cancer patients in this study. In the one previous study, Gospodarek (2009) presented the consistent results (33). According to previous explanations (20,33), symptoms of fatigue and pain, inability to cope with illness and poor social support lead to cancer recurrence and decreased survival. A possible explanation could be that patients receive chemotherapy in addition to high costs and expensive treatment and fatigue have no social support that has potential adverse effects on their survival (34).

In this study, post-traumatic growth was a significant role in the survival of cancer. This result is in line with research by Morris et al. (35), Presant et al. (21), and Tallman et al. (23). Tallman et al. (2014) argues that the quality of life and coping skills can lead to post-traumatic growth and afterwards increase patient survival (23). In addition, patient effort to survive, grow and improve living conditions can lead to greater patient survival (23). In another explanation, post-traumatic growth by strengthening internal resources and enhances life expectancy affected to increase survival in patients

In this study, age and tumor grade have reversed roles in predicting the survival of cancer patients. The results of this study showed cancer were patients with older age and higher grade has lower survival. The result of this study in line with the Rosenberg et al. (2005) indicates the direct association of a high degree of tumor and cancer survival (13). It can be argued that early diagnosis of cancer in the early grades and received effective treatment increases the life span. On the other hand, patients with high-grade tumors (grades III and IV) so that tumor has spread to other areas of the body and treatment resistant, they have low survival. This study developed the results of previous studies to predict survival of patients with cancer. With regard to the relationship between age and cancer

survival, the study results are consistent with the study results by Zhang and Sun (36). As Zhang and Sun (2015) suggest cancer survival decreased with increasing age, and vice versa (36). Hence, this study confirmed the results of previous research in this field and develops new ideas.

In this study, age, low-grade tumors (grades I and II) and post-traumatic growth predicted cancer survival for more than 2 years. To date, this is the first study to examine the determinants of survival in cancer patients in Iran. The final model of the study identifies potential underlying mechanisms of how these factors affect the survival of cancer. The findings provide information for clinicians to develop interventions to improve survival in Iranian patients with cancer.

Chemotherapy, related costs and fatigue caused by it can weaken family ties and the object relations and reduces cancer survival. However, the study offers important insights into the relationship between cancer survival with post-traumatic growth, tumor grade, age, gender, income, self-management self-efficacy, and the object relations, but had several limitations. First, the causal relations between the variables identified in this cross-sectional design are limited. Second, the generalization of the results of this study is limited to patients examined in this study population. In addition, the convenience sampling method limits the generalizability of results. Third, the use of self-report instruments in this study may be underestimated or overestimated the answers which may effect on the findings.

It is noteworthy suggestions. Repeat the rules and principles of the study in other population may provide more information about these relationships among these variables. The study carried out in the Semnan Kosar Hospital and Specialized Cancer Treatment Centers in Semnan. It is suggested, researcher repeats the rules and principles of the study of cancer patients on the other urban and rural areas to further validate these findings. Also, clinical trial studies to assess the effectiveness of intervention programs by combining these factors are necessary. Given the role of age, tumor grade and post-traumatic growth in predicting the survival of patients with cancer, it is suggested preventive programs used for early detection and diagnosis of

cancer and planned actions applied to improve these factors.

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