Tuijin Jishu/Journal of Propulsion Technology
ISSN:1001-4055
Vol. 44 No. 4 (2023)

"The Interaction Effects of Age of the Patients and Stages of the Disease on Hope among Hematology Cancer Patients: A two-Way Analysis of Varriance"

Sapna Paliwal* RitaKumar Dinesh Bhurani*** Reema Singh******

**Research scholar, Amity Institute Psychological and Allied Sciences, Amity University, Noida, India.*

** *Research Guide, Professor, Amity Institute Psychological and Allied Sciences, Amity University, Noida. India.*

****Research Co-Guide, director, Hematology Oncology/BMT, Rajiv Gandhi Cancer Hospital and Research Institute, New Delhi, India.*

*****Medical Writer, Hematology Oncology/BMT, Rajiv Gandhi Cancer Hospital and Research Institute, New Delhi, India.*

Abstract:

***Introduction*:** Whenever the patient is being diagnosed with cancer they lose their hope. Hope is very vital component for uplifting the psychological health. There are few researches found on interaction effect of age and stages of the cancer disease on hope of the hematology cancer patients. The present study focused on to explore the interaction effects of age of cancer patients and stages of the cancer disease on hope among hematology cancer patients.

Methods: Two-way factorial research design has been used for the present study. The purposive sampling data was collected, Stage I and Stage II hematology cancer patients (age group 21-35 years and 50- 75 years) were included as sample size. To measure hope- Adult Hope Scale was used. For data analysis, SPSS version 20 was used for descriptive statistics, t-test, and two-way ANOVA.

Result: A two-way ANOVA was run on a sample of 71 hematology cancer patients to examine the effect of age groups and stage category of the disease on level of hope in hematology cancer patients, F (1,67) = 12.90, p = .001. Simple main effects analysis showed that age groups have statistically significant effect on level of hope (p = .000). Simple main effects analysis showed that stage category of cancer have a significant effect on level of hope (p = .000).

Conclusion: It is indicated that similar level of hope was found at stage I in both the age groups but there was declined in level of hope in stage II, whereas older aged patients have shown better level of hope.

Keywords: *Hope, Hematology Cancer, Stages I – II Cancer, Age.*

Introduction:

Hematologic cancer, also called blood cancers, start in the bone marrow, which is where blood is produced. There are three main types of blood and bone marrow cancer, which are Leukemia, Lymphoma, and Myeloma(*Blood Cancer Types, Symptoms & Treatment*, 2022). Leukemia is a blood cancer that originates in the blood and bone marrow. The Type of Leukemia is: 1) Acute Lymphocytic leukemia (ALL), 2) Acute Myelogenous leukemia (AML), 3) Chronic Lymphocytic leukemia (CLL), 4) Chronic Myelogenous leukemia (CML), and 5) Other types: Other, rare types of leukemia exist, including hairy cell leukemia, mylodysplastic syndromes and myeloproliferative disorders. On the basis of metastasis, hematology cancer stages are separated. Depending on the signs and the rate of metastasis, there are various scales to identify the various stages. Cancer stages are often split into four categories: the blood cancer, Stage 1 the lymph nodes grow during the first stage

and this occurs as a result of a rapid rise in lymphocyte density. Since the cancer has not yet progressed or impacted any other bodily organs, the danger is quite minimal at this point. Stage 2, Spleen, liver, and lymph nodes grow, although not all of these organs must be afflicted simultaneously; one of them is in undoubtedly affected at this stage. At this stage, lymphocyte proliferation is highly rapid. Stage 3, anemia develops although the aforementioned organs are still determined to be enlarged. It is certain that at this level, more than two organs are impacted. Stage 4, the final stage with the greatest risk ratio, is blood cancer. Blood platelet count starts quickly declining. The lungs are impacted by malignant cells in addition to the other organs that have already been affected.

Hope

Cancer has been viewed as a fatal condition for many years and patients frequently seeking to alternative sources for help in dealing with the stress, and from uncertain future.According to Ebright& Lyon (2022) and Herth (1987, 1989), hope is regarded as a powerful coping mechanism for cancer patients, giving them the adaptive strength they need to get through the trying circumstances and accomplish their goals. In a recent analysis of the research, Chi, (2007)also found that one of the single most crucial factors for living patients dealing with a cancer diagnosis was hope (Chi, 2007). Hope helped them deal with the distress and uncertainty of their diagnosis.Hope is a complex and dynamic construct that is impacted by numerous circumstances, and it is described as the prospect of a better future from an uncertain and challenging present (Duggleby et al., 2010). Hope is described as the belief that one can find a method to reach their goals and utilize agency thinking to inspire them to do so. The adult and child hope scale that is derived from hope theory. Better success in academics, athletics, physical health, psychological adjustment, and psychotherapy are consistently correlated with higher hope.

A hope theory given by Snyder et al. received more attention from researchers and clinicians in both medical and non-medical populations (Cheavens et al., 2005; Bryant et al., 2004;Peleg et al., 2009). Hope theory is predicated on the idea that people are naturally goal-directed and that, in pursuing their goals, they engage in two related cognitive processes: 1) pathways thinking, which means thinking about ways to reach goals, and 2) agency thinking, which entails thinking about the ability of one to initiate and sustain motivation towards a goal (Rand et al., 2009).

Age of the hematology cancer patients and hope

In literature review, few studies were found about demographical characteristics as age in relationship with hope. In study of 78 adolescent with diagnosis of cancer, Verna Hendricks-Ferguson et al reported, that middle adolescent were more hopeful in comparison to late adolescent. In study of 131 recently diagnosed cancer patients,Rustoen&Wiklund, (2000) reported that younger persons who lived alone had lower level of hope than their older counterparts.Duggleby et al., (2013) had studied the relationship between hope and demographical variables (age and gender) in newly diagnosed cancer patients. They studied the relationship between two age group; one is younger age group (below 65years) and another is older age group (65years and above 65 years), and inverse relationship was found that those were below 65 years of age had higher hope than those who were above 65 years of age. Li et al., (2016) had stated in their study that bladder cancer patients above aged over 75 years had lower level of quality of life (QOL), physical well-being (PWB), social /familial well-being (SWB), emotional well-being (EWB), and functional well-being (FWB) and It was also observed that educated people have higher level of QOL. In study of 131 recently diagnosed cancer patients, Rustoen&Wiklund, (2000) reported that younger persons who lived alone had lower level of hope than their older counterparts.

Stage of the hematology cancer and hope

There are majority of researchwhich have focused on terminally ill , advanced stage of cancer and newly diagnosed cancer in relation to hope, but very few researches have been found stages wise in relation to hope. In a cross-sectional survey of 200 advanced cancer patients, Finkelstein, suggested that advanced cancer patient succumb to several cognitive biases which are exacerbated by greater level of hope. Higher level of hope associated with greater odd of believing their illness is curable, longer expected survival, higher probability of believing that survival outcomes are better and believing primary treatment is curative (Finkelstein, 2021).

However, little is known about the interaction effects of age of the patients and stages of the disease on hope among adult hematologic cancer patients. This exploratory study aimed to investigate the interaction effects of age of the patients and stages of the disease on hope among adult hematological cancer patients. We hypothesized that older patients and those in early stages of the disease would report better hope than younger patients and those in advanced stages of the disease.

Objective:

- To study the difference in hope between younger (20 – 35years old)and older (55- 75 years old) age group of adult hematologic cancer patients.
- To study the difference in hope between Stage I and Stage II adult hematologic cancer patients.
- To study the interaction effect between of patient's age and different stages of the disease on level of hope among adult hematologiccancer patients.

Hypothesis:

- There will be a significant difference in hope between younger (20 – 35years old) and older (55- 75 years old) age group of adult hematologic cancer patients.
- There will be significant difference in between Stage I and Stage II adult hematologic cancer patients.
- There will be significant interaction effect between different age group of cancer patients and different stages of the disease on level of hope among hematologic cancer patients.

2. Methodology:

2.1 Research design and participant

The data was collected between June 30th, 2021 and Dec 30th 2021. Due to the physical and medical conditions of the disease, the purposive sampling method has been used to collect the data from hematology cancer patients. All patients who met the inclusion criteria and gave their consent to take part in the study were assigned to the experimental or control group. Inclusion criteria: 1) diagnosed with hematologic cancer and were receiving chemotherapy; (2) age above 20 years; (3) conscious and has the ability to speak and read the scales or understand the measurement; (4) Stage Iand Stage II cancer patients. Exclusion criteria: (1) under-going emergencies, (2) having cognitive impairment, (3) Other than hematology cancer patients; and (4) palliative and terminal patients.

Power analysis was used to compute a sample size. The sample size was determined based on the effect size of a recent meta-analysis (Khoury et al., 2015). According to the two – sample means comparison and the statistical calculation, and the coefficients in the calculation are the following: α is 0.05 and 1- β is 0.80; the estimated effect is 0.70.The sample size was decided as 35in each group.

Total 71 hematology cancer patients were participated in this present study, where 33 (46%) were female and 38(54%) were male and from stage I 30 (42%) and stage II 41 (58%). The sample data were divided into two age group category, one belong to younger age group (age range from 20 to 35 years, 34 (43%)) and another belong to older age group (age range from 55 to 70 years, 41 (57%)) without male and female significant difference were found.

The demographic and clinical characteristics of the cancer patients are diverse in terms of age, gender, marital status, religion, economic status, types of cancer, stages of cancer, pain conditions, and theists or atheists are given in table 1.

Table 1 Demographical and clinical characteristics of the leukemia cancer patients:

Characteristics		Number	Percentage %
Gender	Male	38	53%
	Female	33	47%

Stage	I	30	42%
	II	41	58%
Age Category	20 – 35 years	34	48%
	55 – 75 years	37	52%
Marital Status	Married	52	73%
	Unmarried	19	27%
Type of Hematology	AML	42	59%
	CLL	15	21%
	CML	14	20%
Religion	Hindu	35	49%
	Muslim	16	23%
	Sikh	10	14%
	Christian	10	14%
Economical Status	High Income	11	15%
	Middle Income	43	60%
	Low Income	17	25%
Theist/Atheist	Theist	37	52%
	Atheist	34	48%

2.2. Data Collection & Instruments:

Adult Hope Scale

A 12-item adult hope scale is used to assess a respondent's level of hope. Snyder's cognitive model of hope is specifically separated into two subscales that make up the scale: (1) Agency (i.e., goal-directed energy) and (2) Pathways (i.e., planning to attain objectives). Four of the twelve items comprise the Agency subscale and four of them the Pathways subscale. The remaining 4 items are fillers. An 8-point Likert-type scale from Definitely False to Definitely True is used to rate each item's response (Snyder, 2000).

2.3. Data Analysis:

To determine the differences between age groups and between stages of the disease in hope level among adult hematology cancer patient, t-test was used. Descriptive statistics obtained for the dependent variable hope level among two different stages (stage I and Stage II) of the disease in two different age category (20 to 35 years and 55 to 75 years) among adult hematology cancer patients. To examine the main effects of age group, stages of the disease and their interaction effects on hope level among adult hematology cancer patients, 2 x 2 two ways ANOVA analysis was conducted.

2.4. Ethical considerations:

The research proposal has been sent to the institution's research ethics committee to get approval before implementing the actual data collection.The research participants were adult hematology cancer patients at stages I to II of two age groups younger age group and older age group were informed of the purpose of the research and the research procedure. Participants were informed of their right to terminate at any time without giving any consequence and what would be expected from them. The potential participant's participation in this

study was completely voluntary. The participants have given their written informed consent, which was kept confidential.

3. Result:

The study was conducted to see if the level of hope is different at the two different agegroups of the hematologiccancer patients, it was also intends to study the level of hope at two different stages of the disease among hematologic cancer patients. Likewise this study, also intend to explore the interaction effect of the age and stage of the disease on level of hope. It was hypothesized that the level of hope are significantly different at two age category (young (20 to 35 years) and old (55 to 75 years) and hope level are significantly different at two different stage of the disease among hematologiccancer patients.There will be significant interaction effect between different age group of cancer patients and different stages of the disease on level of hope among adult hematologiccancer patients.

The younger age group was made up of patients aged 20 to 35 years (n = 34, 48%), while the older age group was made up of patients aged 55 to 75 years (n = 37, 52%). The majority of patients were women (n = 33, 47 %) and men (n = 38, 53 %). The majority of patients were married (n= 52, 73%) and unmarried (n= 19, 27%). The economic status was described as low (n = 17, 25%), middle (n = 43, 60%) and high income groups (n = 11, 15%).With regards of cancer stages, the total group included (n = 30, 42%) stage I and (n = 41, 58%) stage II hematology cancer patients.

3.1t-test:

To determine the differences between age groups and between stages of the disease in hope level among adult hematology cancer patient t-test was used. The data were analyzed with the help of t-test and the results are given in Table 2. The first objective was to compare the age wise mean score of hope in younger and older aged hematology cancer patients. The significant difference between younger and older age hope level among hematology cancer patient, can be seen in Table 2 that shows the t-value is -5.09 which is significant at .000 levels with df = 69. It indicates that there is significant difference in mean score of hope among younger and older age cancer patients. Thus the first hypothesis of this study that there is significant difference of hope in younger and older age of hematology cancer patients is approved. Further, the mean score of hope of younger cancer patients is 17.35, which is significantly lower than those of older aged of cancer patients whose mean score of hope is 23.73. It may be said that older aged cancer patients were found to possess significantly higher hope as compared to younger aged cancer patients.

Table 2: Age group wise scores of hope level in hematology cancer patients

Age – Group category	N	Mean	SD	t-value
20 to 35 years	34	17.35	6.049	-5.09*
55 to 75 years	37	23.729	4.45	

*Significant @ .000 level

The second objective was to compare the mean difference of hope between stage I and stage II of hematology cancer disease. The significant difference between stage I and stage II among hematology cancer patient was found. It can be seen in Table 3 that the t-value is 7.35 which is significant at .000 levels with df = 69. It indicates that there is significant difference in mean score of hope among stage I and stage II hematology cancer patients. Thus the second hypothesis of this study that there is significant difference of hope in Stage I and Stage II of hematology cancer patients is approved. Further, the mean score of hope of stage I hematology cancer patients is 25.40, which is significantly higher than those of stage II hematology cancer patients whose mean

score of hope is 17.22. It may be said that stage I hematology cancer patients were found to possess significantly higher hope as compared to stage II hematology cancer patients.

Table 3 Stages wise score on hope level of hematology cancer patients

Cancer Stages	N	Mean	SD	t-value
Stage I	30	25.400	5.308	7.346*
Stage II	41	17.219	4.077	

*Significant @ .000 level

3.2 Two – Way ANOVA

Before calculated the two- way ANOVA analysis, the assumptions of normality and homogeneity of the variance was checked. Table 4 has shown that the data for the level of hope on stage I and stage II among younger and old age category was normally distributed.

Table 4 Test of Normality

Variables		Kolmogorov- Smirnov			Shapiro- Wilk		
		Statistics	df	Sig.	Statistics	Df	Sig.
Stage I	20 to 35 years	.289	7	.080	.787	7	.031
	55 to 75 years	.212	23	.009	.941	23	.184
Stage II	20 to 35 years	.204	27	.005	.892	27	.009
	55 to 75 years	.160	14	.200	.968	14	.842

Table 5 also shows the assumption of two-way ANOVA analysis wasthe homogeneity for the data of the level of hope among stage I and stage II in younger and old age category of the cancer patients was approved. Which was determined using Levene's test, which resulted in F (3, 67) = 16.983, p = .000. No violation was found and the assumption of homogeneity was met.

Table 5: Levene's Test of homogeneity Variances

F	df1	df2	Sig.
16.983	3	67	.000

Homogeneity of the variance of data was significant

The third objective was to study the interaction effect between different age group of cancer patients and different stages of the disease on level of hope among hematologic cancer patients. It has been shown in table 6, the main effects of age groups (F (1, 1083) = 5.584, p = 0.05) and stages of the disease (F (1,1083) = 47.313, p = 0.05) on hope level of hematologic cancer patients was significant. However, there is significant interaction effect of age group and stages of the diseases (F (1, 1083) = 12.904). The analysis showed that older patients with early-stage cancer reported higher levels of hope compared to younger patients with late-stage cancer. This finding suggests that a patient's age and disease stage have a combined influence on their level of hope.

Table 6 two-way ANOVA result to measure interaction effect of age category and stage of the disease

Source	Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1558.509[a]	3	519.503	32.138	.000
Intercept	26277.838	1	26277.838	1625.623	.000
Cancer_Stage	764.808	1	764.808	47.313	.000
AgeCat	90.261	1	90.261	5.584	.021
Cancer_Stage * AgeCat	208.585	1	208.585	12.904	.001
Error	1083.040	67	16.165		
Total	32994.000	71			

Furthermore, the results provide the insight that hope may be impacted by the age of the cancer patients and also impacted by the stage of the disease.

Discussion

The objective of this present study was to study the difference in hope between younger (20 – 35years old) and older (55- 75 years old) age group of adult hematologic cancer patients. It was found that the difference in hope between younger (20 – 35years old) and older (55- 75 years old) age group of adult hematologic cancer patients was significant. The researches evident also support the present study.Duggleby et al., (2013) had studied the relationship between hope and demographical variables (age and gender) in newly diagnosed cancer patients. They studied the relationship between two age group; one is younger age group (below 65years) and another is older age group (65years and above 65 years), and inverse relationship was found that those were below 65 years of age had higher hope than those who were above 65 years of age. The second objective to study the difference in hope between Stage I and Stage II adult hematologic cancer patients was significant. In this study, it was found that hope was higher at stage I hematologic cancer patients in comparison to stage II hematologic cancer patients. There are majority of research which have focused on terminally ill , advanced stage of cancer and newly diagnosed cancer in relation to hope, but very few researches have been found stages wise in relation to hope. In a cross-sectional survey of 200 advanced cancer patients, Finkelstein, (2021) suggested that advanced cancer patient succumb to several cognitive biases which are exacerbated by greater level of hope. Higher level of hope associated with greater odd of believing their illness is curable, longer expected survival, higher probability of believing that survival outcomes are better and believing primary treatment is curative.

The third objective was to study the interaction effect between of patient's age and different stages of the disease on level of hope among adult hematologic cancer patients.This indicated that age of the cancer patients and stages of the disease influence the hope in hematologic cancer patients. However, there are very limited studies were found that focused on the interaction of the age and stages of the disease to evaluate the hope among hematology cancer patients.

Thus, It is indicated age of the cancer patients effect the hope in hematologic cancer patients, it is also indicated that stage of the disease also play an important role in maintained the hope levels. Present study explored the interaction effects between age of cancer patients and stage of the disease on hope.

Conclusion

According to this study, patients who belong to younger age group and had diagnosed at stage I, have higher hope in comparison to those are belong to older age group and had diagnosed with stage II. It is recommended that an intervention can be developed that addresses the age specific and stage specific multidimensional aspect of hematologic disease and help to elevate hope in patients with cancer.

References

[1] *Blood Cancer Types, Symptoms & Treatment*. (2022, June 21). Cancer Treatment Centers of America.https://www.cancercenter.com/blood-cancers.

[2] Bryant, F. B., &Cvengros, J. A. (2004). Distinguishing hope and optimism: Two sides of a coin, or two separate coins?. *Journal of social and clinical psychology*, *23*(2), 273-302.

[3] Cheavens, J. S., Michael, S. T., & Snyder, C. R. (2005). The correlates of hope: Psychological and physiological benefits. *Interdisciplinary perspectives on hope*, 119-132.

[4] Chi, G. C. H. L. (2007, January 1). The Role of Hope in Patients With Cancer. *Oncology Nursing Forum*, *34*(2), 415–424. https://doi.org/10.1188/07.onf.415-424

[5] Clayton, J. M., Butow, P. N., Arnold, R. M., & Tattersall, M. H. (2005).Fostering coping and nurturing hope when discussing the future with terminally ill cancer patients and their caregivers. *Cancer*, *103*(9), 1965-1975.

[6] Duggleby, W., Holtslander, L., Kylma, J., Duncan, V., Hammond, C., & Williams, A. (2010).Metasynthesis of the hope experience of family caregivers of persons with chronic illness. *Qualitative Health Research*, *20*(2), 148-158.

[7] Duggleby, W., Ghosh, S., Cooper, D., &Dwernychuk, L. (2013, November). Hope in Newly Diagnosed Cancer Patients. *Journal of Pain and Symptom Management*, *46*(5), 661–670. https://doi.org/10.1016/j.jpainsymman.2012.12.004

[8] Ebright, P. R., & Lyon, B. (2002, January 1). Understanding Hope and Factors That Enhance Hope in Women With Breast Cancer. *Oncology Nursing Forum*, *29*(3), 561–568. https://doi.org/10.1188/02.onf.561-568

[9] Farran, C. J., Herth, K. A., &Popovich, J. M. (1995). *Hope and hopelessness: Critical clinical constructs*. Sage Publications, Inc.

[10] Finkelstein, E. A., Baid, D., Cheung, Y. B., Schweitzer, M. E., Malhotra, C., Volpp, K., ...&Somasundaram, N. (2021). Hope, bias and survival expectations of advanced cancer patients: a cross-sectional study. *Psycho-Oncology*, *30*(5), 780-788.

[11] Hendricks-Ferguson V. Relationships of Age and Gender to Hope and Spiritual Well-Being Among Adolescents With Cancer. Journal of Pediatric Oncology Nursing. 2006;23(4):189-199. doi:10.1177/1043454206289757

[12] Herth, K. (1992). Abbreviated instrument to measure hope: development and psychometric evaluation. *Journal of advanced nursing*, *17*(10), 1251-1259.

[13] Olver, I. N. (2012).Evolving definitions of hope in oncology. *Current Opinion in Supportive and Palliative Care*, *6*(2), 236-241.

[14] Peleg, G., Barak, O., Harel, Y., Rochberg, J., &Hoofien, D. (2009).Hope, dispositional optimism and severity of depression following traumatic brain injury. *Brain Injury*, *23*(10), 800-808.

[15] Rand, K. L., &Cheavens, J. S. (2009). Hope theory. *Oxford handbook of positive psychology*, *2*, 323-333.

[16] Rustøen, T., &Wiklund, I. (2000). Hope in newly diagnosed patients with cancer. *Cancer Nursing*, *23*(3), 214-219.

[17] Snyder, C. R. (2002). Hope Theory: Rainbows in the Mind. Psychological Inquiry, 13, 249-275. https://doi.org/10.1207/S15327965PLI1304_01

[18] Snyder, C. R. (2000). The past and possible futures of hope. *Journal of social and clinical psychology*, *19*(1), 11-28.