



# Quality of life and symptom burden in hematological cancer patients receiving hematopoietic stem cell transplantation: an observational study at Regional Cancer Centre, India

Neethu Susan Abraham<sup>1</sup> · Seema Mishra<sup>1</sup> · Sushma Bhatnagar<sup>1</sup> · Lalit Kumar<sup>2</sup> · Atul Sharma<sup>2</sup> · Rakesh Garg<sup>1</sup> · Sachidanand Jee Bharati<sup>1</sup> · Nishkarsh Gupta<sup>1</sup> · Vinod Kumar<sup>1</sup>

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## Abstract

**Purpose** Hematopoietic stem cell transplant (HSCT) is an intense form of treatment, resulting in major symptom burden but can prove curative. The quality of life (QOL) is a major endpoint for these patients as the survival rate in them has improved over time. The aim of the study is to assess the QOL and symptom burden of hematological malignancy patients at admission to hospital for HSCT, at 1 month and at 3 months following HSCT.

**Methods** This prospective observational study was done on hematological malignancy patients who were admitted for HSCT in a regional cancer center. The study subjects were assessed by the Functional Assessment of Cancer Therapy–Bone Marrow Transplant Scale (FACT–BMT Scale), Edmonton Symptom Assessment Scale-revised (r-ESAS), and Depression, Anxiety and Stress Scale—21 Items (DASS-21) at the time of hospital admission for transplantation, on day 30 (~1 month) and day 100 (~3 months) of transplantation.

**Results** A total of 68 patients were included in this study. FACT–BMT scores have decreased from baseline (F0) to the first follow-up (F1) and then increased in the third follow-up (F2). The maximum r-ESAS mean score was for tiredness among all other symptoms at F0 as well as at F1 and at F2. The DASS 21 scores for depression, anxiety, and stress were maximum during F1 and minimum during F2.

**Conclusion** Symptom burden is maximum during the first month of BMT, which improves later and QOL becomes improved with time.

**Keywords** Hematopoietic stem cell transplant · Quality of life · Hematological malignancy · Symptom burden · Depression · Anxiety · Stress

## Introduction

Hematopoietic stem cell transplant (HSCT) can be considered a curative treatment modality available for many malignant as well as non-malignant conditions [1]. It is one of the most intense forms of treatment followed

by medical oncologists requiring high-dose chemotherapy preconditioning [2, 3]. According to the Indian Society for Blood and Marrow Transplantation (ISBMT) registry data, approximately 19,000 transplants have been reported for various indications [4]. The data from the Indian stem cell transplant registry (ISCTR) of November 2017 says that per year, there is a 10% increase in the number of transplants [5]. The highest incidence of hematological cancers is reported in Delhi and Mumbai [6]. The capacity of India is suboptimal to meet these needs [7]. Quality of life (QOL) gives a more vivid picture of the treatment outcome in patients undergoing bone marrow transplantation (BMT) [8]. There are many adverse effects following BMT which compromise the QOL in patients who undergo it [9]. Most of the patients at many transplant centers are being assessed only before transplant [10]. After HSCT, patients tend to

✉ Seema Mishra  
seemamishra2003@gmail.com

<sup>1</sup> Department of Onco-Anaesthesia and Palliative Medicine, Dr B.R. Ambedkar, Institute Rotary Cancer Hospital, All India Institute of Medical Sciences, Ansari Nagar, New Delhi, India 110029

<sup>2</sup> Department of Medical Oncology, Dr B.R. Ambedkar, Institute Rotary Cancer Hospital, All India Institute of Medical Sciences, Ansari Nagar, New Delhi, India

have a sudden decline towards the end of life [11]. Palliative care can be utilized in these patients to help increase the QOL as the long-term survival rate following the procedure has improved [12, 13]. As of now, only a few studies have examined the predictors for QOL in patients undergoing HSCT, so identifying them is imperative as a measure to improve the QOL in them [14, 15].

## Materials and methods

### Aims and objectives

#### Aim

To assess the QOL and symptom burden of the hematological malignancy patients undergoing HSCT.

#### Primary objective

To assess the QOL and symptom burden of hematological malignancy patients at admission to hospital for HSCT(F0), at 1 month (F1), and at 3 months following HSCT(F2), using the FACT-BMT Scale and r-ESAS.

#### Secondary objectives

To assess depression, anxiety, and stress in hematological malignancy patients receiving HSCT at F0, F1, and F2 using the DASS 21 scale.

#### Setting

The prospective observational study was conducted in a regional cancer center in India to assess the QOL and symptom burden of hematological malignancy patients who underwent HSCT at F0, F1, and F2. The study was carried out for a duration of 18 months.

This study was conducted after obtaining ethical clearance from the Ethics Committee of our Institute. Informed consent was obtained from those participating in the study. All information regarding the subjects was kept confidential.

#### Participants

Unbiased convenience sampling was done. The total sample size for the study was calculated to be 70, after taking into account the attrition rate of approximately 20%. Patients recruited for the study included patients with hematological malignancies admitted to the regional cancer center for hematopoietic stem cell transplantation, both males and females more than or equal to 18 years of age, patients who were willing to participate in the study, and those patients

who were able to understand the questionnaires and comprehend. Patients under psychiatric treatment and patients who were not able to come for desired follow-ups for the study were excluded. During the study, 70 patients were found eligible, out of which two patients could not continue in the study owing to disease progression. Thus, a total of 68 patients participated in the study.

At F0, there were 68 participants; at F1 there, were 63 participants (four patients expired and one patient lost to follow-up); and at F2, there were 59 participants (four more patients expired). A total of eight patients expired during the study period, and one patient was lost to follow-up.

### Instruments and study tools

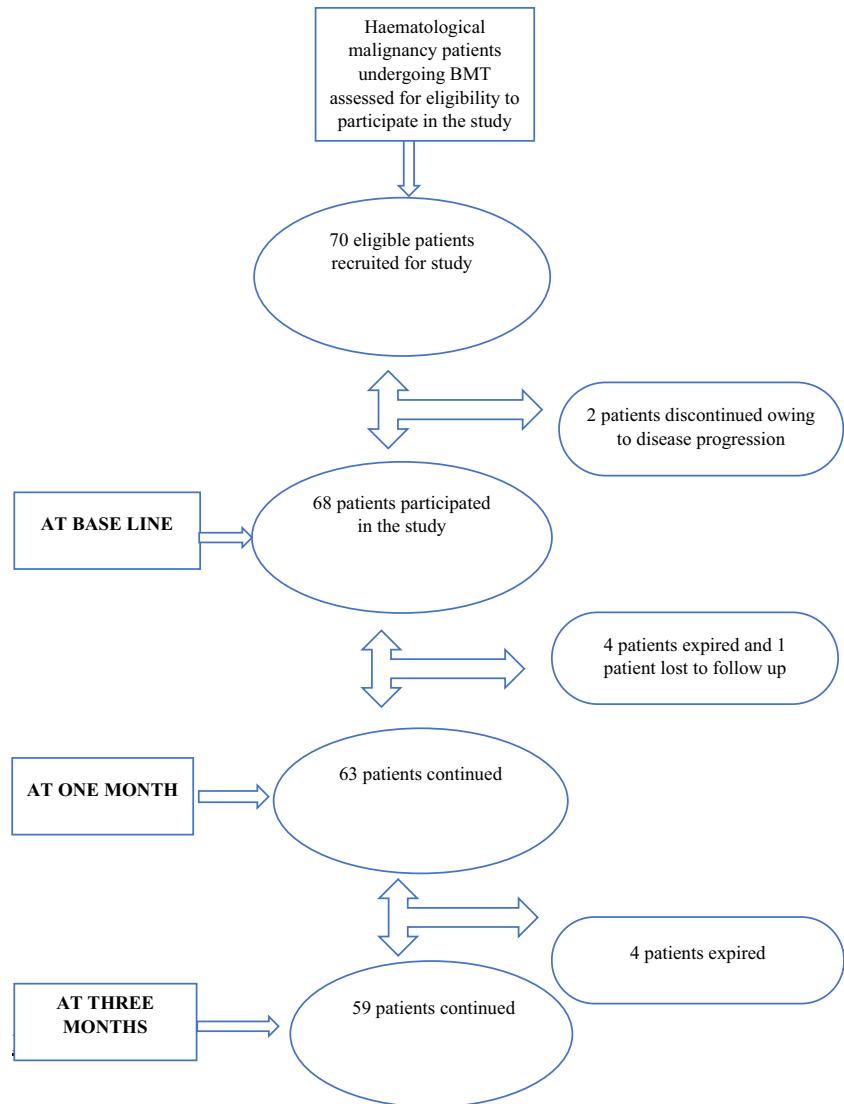
Socio-demographic Proforma for assessing various socio-demographic variables was used. Semi-structured Proforma was used to assess the clinical details of the patient. FACT-BMT scale, validated in patients with a bone marrow transplant was used which provided an overall QOL score. ESAS-r with ten symptoms given on a 0 to 10 scale was used where 0 represented the absence of symptoms, and 10 represented the worst possible severity of symptoms. DASS 21 SCALE was also used, which measured the emotional states of depression, anxiety, and stress in patients.

### Study procedure

Those patients who met the criteria were given a Participant Information Sheet, which provided adequate information to the patients regarding the objectives of the study and the study procedure. Those who were willing to give written informed consent were included in the study. The study subjects were assessed by socio-demographic proforma and another semi-structured proforma containing the clinical details of the patient. Patient's symptom burden, QOL, and psychological aspects were assessed using the FACT-BMT, DASS 21, and r-ESAS scale on admission. Patients were again assessed using the above-mentioned questionnaires in subsequent follow-ups at 1 month and 3 months following HSCT, as shown in Fig. 1.

### Data analysis

Socio-demographic and clinical data were tabulated and central tendencies computed. Data were analyzed using the statistic software Stata 14.0. Categorical variables were expressed as frequency and percentage. Quantitative variables that followed normal distribution were expressed as mean and standard deviation. The chi-square/Fisher exact test was used to test the proportion of categorical variables. Repeated measure ANOVA analysis was performed to observe the change from baseline to 1 month and 3 months.

**Fig. 1** Flow chart on study procedure

A pairwise comparison was performed with the help of Bonferroni correction. Friedman test was performed to observe the change followed by the Wilcoxon signed rank test with an adjusted  $p$ -value (0.05/3). A  $p$ -value  $< 0.05$  was considered statistically significant.

## Results

The mean age of the sample was  $42.9 \pm 14.8$ . There were 44 (64.7%) males and 24 (35.3%) females. The majority of the patients were unemployed 53 (77.9%). A total of 76.5% ( $n = 52$ ) patients were from nuclear families, 23.5% ( $n = 16$ ) from joint families and none lived alone. Fifty-five (80.9%) patients had earning members in their families whereas 13 patients (19.1%) did not. Graduates accounted for 35.3% ( $n = 24$ ). A total of 14.7% ( $n = 10$ ) of the BMT candidates were never married, 82.4% ( $n = 56$ ) were married

and staying together, 2.9% ( $n = 2$ ) were divorced, and there were no widowers. Thirty-one (45.6%) patients were residing in urban areas and 37 (54.4%) in rural areas, as shown in Table 1. Out of the 68 patients enrolled, the most common primary diagnosis was multiple myeloma (48.5%,  $n = 33$ ) followed by non-Hodgkin lymphoma (22%,  $n = 15$ ). A total of 16.2% of patients ( $n = 11$ ) had Hodgkin lymphoma, 8.8% of patients had AML ( $n = 6$ ), and 4.4% of patients had POEMS syndrome ( $n = 3$ ). The most common preconditioning chemotherapy received was Melphalan in 57.4% of patients ( $n = 39$ ). The majority of the patients underwent autologous transplantation 94.1% ( $n = 64$ ), and the rest 5.9% of patients underwent an allogenic transplant ( $n = 4$ ). Seven patients spent between 15 and 24 days in the BMT ward (54.4%), 27 patients spent between 25 and 34 days in the BMT ward (39.7%), and only 4 patients spent 35 or more days in the BMT ward (5.9%). Comorbidities were present for 27.9% of patients ( $n = 19$ ), as shown in Table 2.

**Table 1** Socio-demographic details

Demographic variables	Frequency
Age (mean $\pm$ SD, years)	42.92 $\pm$ 14.78
Range of age (years)	(18–69)
Sex	
Male	44 (64.7)
Female	24 (35.3)
Current employment status	
Unemployed	53(77.9)
Employed	15(22.1)
Current living arrangement	
Nuclear	52 (76.5)
Joint	16 (23.5)
Alone	0 (0)
Earning family members	
Present	55 (80.9)
Absent	13 (19.1)
Educational Qualifications	
Illiterate	4 (5.9)
Up to 10th class	16 (23.5)
Up to 12th class	9 (13.2)
Graduate	24 (35.3)
Postgraduate	15 (22.1)
Marital Status	
Never married	10 (14.7)
Married and staying together	56 (82.4)
Divorced	2 (2.9)
Widower	0 (0)
Place of residence	
Urban	31 (45.6)
Rural	37 (54.4)

**Table 2** Disease characteristics and clinical details of hematological malignancy patients who had undergone HSCT

Disease characteristics and clinical details	Frequency(%)
Diagnosis	
Multiple myeloma	33 (48.5)
Hodgkin lymphoma	11 (16.2)
Acute myeloid leukemia	6 (8.8)
Non-Hodgkin lymphoma	15 (22.1)
POEMS syndrome	3 (4.4)
No of days in BMT Ward	
Up to 14 days	0
15 to 24 days	37 (54.4)
25 to 34 days	27 (39.7)
35 or more days	4 (5.9)
Comorbidities	
Present	19 (27.9)
Absent	49 (72.1)
Type of transplantation	
Autologous	64 (94.1)
Allogenic	4 (5.9)

As per the FACT BMT scale, we studied patients' quality of life categorized into multiple domains: physical well-being (PWB), social well-being (SWB), emotional well-being (EWB), and functional well-being (FWB). The scores that were calculated were the physical well-being subscale score (PWBS), social well-being subscale score (SWB-SS), emotional well-being subscale score (EWB-SS), functional well-being subscale score (FWB-SS), bone marrow transplant subscale score (BMT-SS), FACT BMT Trial Outcome Index (FACT BMT TOI), FACT G total score, and FACT BMT total score (FACT BMT TS). All the scores had decreased from baseline (F0) to the first follow-up (F1) and then increased in the second follow-up (F2). Among BMT-SS, FACT BMT TOI, FACT G TS, and FACT BMT TS, all mean scores had significant differences at F0 to F2 and F1 to F2 ( $p$ -value =  $< 0.001$ ). But at F0 to F1,  $p$ -values were not significant for these subscales, as shown in Table 3.

The maximum r-ESAS mean score was for tiredness among all other symptoms at F0, F1, and F2 followed by anxiety at F0, lack of appetite at F1, and pain at F2. Overall well-being mean score was maximum at F2. The  $p$ -values for overall well-being mean scores were significant between F0 and F2 ( $p = < 0.001$ ) and between F1 and F2 ( $p = < 0.001$ ), as shown in Table 4.

The DASS 21 scores for patients were calculated at F1, F2, and F3. The mean score for depression was maximum at F1 and minimum at F2. The mean anxiety and stress scores also had similar trends with a maximum score at F1 and a minimum score at F2. The  $p$ -values were significant for mean scores of depression, anxiety, and stress between F0 and F1, between F1 and F2, and between F0 and F2, as shown in Table 5.

In the interpretation of DASS 21 scores, a depression score of 0–9 is considered normal, 10–12 is mild depression, 13–20 is moderate depression, 21–27 is severe depression, and 28–42 is extremely severe depression. Similarly, anxiety scores of 0–6 are considered normal, 7–9 is mild anxiety, 10–14 is moderate anxiety, 15–19 is severe anxiety, and 20 to 42 is extremely severe anxiety. A stress score of 0–10 is considered normal, 11–18 is mild stress, 19–26 is moderate stress, 27–34 is severe stress, and 35–42 is extremely severe stress. The interpretation of DASS 21 scores from our study as mild, moderate, severe, and extremely severe during various time points is depicted in the figures (Figs. 2, 3, and 4).

## Discussion

Few studies were done to assess the QOL in patients undergoing HSCT abroad, but no relevant studies were found pertaining to the Indian population. Through this study, we tried to explore the extent of symptom burden and QOL in hematological malignancy patients who underwent HSCT in

**Table 3** FACT BMT score of hematological malignancy patients who had undergone HSCT

Variables	Baseline (F0) (n=68) Mean ± SD (min-max)	At 1 month (F1) (n=63) Mean ± SD (min-max)	At 3 months (F2) (n=59) Mean ± SD (min-max)	Overall p-value	p-value between baseline and 1 month (F0 vs F1)	p-value between baseline and 3 months (F0 vs F2)	p-value between 1 and 3 months (F1 vs F2)
PWBSSS	23.45 ± 4.07 (11-28)	12.65 ± 6.97 (0-27)	24.86 ± 5.20 (4-28)	< 0.001	< 0.001	0.372	< 0.001
SWBSSS	26.86 ± 2.13 (18-28)	25.02 ± 3.04 (16-28)	26.81 ± 2.16 (15.16-28)	< 0.001	0.468	< 0.001	< 0.001
EWBSSS	20.64 ± 3.56 (10-24)	17.79 ± 5.25 (2-24)	22.42 ± 3.27 (9-24)	< 0.001	0.025	< 0.001	< 0.001
FWBSSS	22.98 ± 3.96 (9-28)	13.65 ± 4.85 (5-26)	23.45 ± 5.00 (6-28)	< 0.001	1.000	< 0.001	< 0.001
BMTSSS	34.96 ± 3.85 (24.4-40)	23.79 ± 6.66 (12-39)	35.74 ± 5.53 (14.22-40)	< 0.001	1.000	< 0.001	< 0.001
FACT BMT TOI	81.40 ± 10.64 (54-94)	50.09 ± 17.19 (17-88)	84.06 ± 15.08 (28-96)	< 0.001	1.000	< 0.001	< 0.001
FACT G TS	93.94 ± 11.40 (59-108)	69.12 ± 16.85 (36-102)	97.56 ± 13.81 (44.16-108)	< 0.001	0.590	< 0.001	< 0.001
FACT BMT TS	128.91 ± 14.67 (86-145)	90.05 ± 27.91 (0-140)	128.93 ± 30.37 (0-148)	< 0.001	1.000	< 0.001	< 0.001

the context of the Indian population. BMT clinicians generally focus on the transplant part whereas the overall functionality of the patient including physical, social, emotional, cognitive, vocational, and recreational aspects are side-lined and ignored. This ignorance may maintain the poorer status of quality of life of these patients. Targeting such aspects in an appropriate manner and time might help improve the quality of life of patients and may achieve optimal physical, emotional, psychological, and social function in them. Early integration of palliative care in HSCT patients helps in clarifying their goals of care and in initiating advance care planning. It enhances the quality of care for both patients and their families.

During the study, eight patients (11.7% of the sample size) died. In a longitudinal observational study to evaluate the QOL of HSCT patients, 55 of them were enrolled out of which 20 patients died (36.4% of the sample size) [16]. BMT is a very aggressive modality of treatment which is complex, and there are many variables to be controlled so as not to jeopardize the QOL of the patients who undergo it.

In our study, the mean age of patients was 42.92 ± 14.78 with patients ranging from 18 to 69 years which was similar to many of the published data. In the study conducted by Bevans et al. to observe the symptom experience in BMT patients, the mean age of the patient group was 40.2 ± 13.5 with age ranging from 18 to 71 years [3]. In the study by McQuellon et al. to observe the QOL in BMT patients, the age range of the study population was 18 years to 63 years [10].

In our study, the maximum number of patients had undergone autologous transplantation compared to allogeneic. This observation was probably due to the difficulties in obtaining a match for transplantation or due to the side effect profile of the latter. Similar findings were observed in other studies [10, 17]. There were other studies where allogeneic transplantation was more common than autologous [18, 19].

In various publications across the world using different scales, the observed trend was the dropping of QOL immediately after the procedure and improvement after the acute period [10, 20]. In our study, we have found a trend which corresponded to this. An increase in the symptom burden could be the causative factor behind the decrease in the QOL of patients after transplantation. For the assessment of QOL, in our study, we used the FACT BMT scale. In the study conducted by Jawahri et al. in 2016, FACT BMT scores at 2 weeks and 3 months were calculated, and scores were seen separately in the standard care group and palliative care intervention group. QOL was found to decrease 2 weeks posttransplant [12]. Garcia et al. in their study used FACT BMT scores to calculate the QOL in BMT patients, observed a decline in QOL scores during transplant, and returned scores to baseline values around discharge [21].

**Table 4** ESAS-r scores of hematological malignancy patients who had undergone HSCT

Symptoms	ESAS-r (baseline F0) <i>n</i> = 68	ESAS-r (1 month F1) <i>n</i> = 63	ESAS-r (3 months F2) <i>n</i> = 59	Overall <i>p</i> -value	Pairwise comparisons	
	Mean ± SD (min–max)	Mean ± SD (min–max)	Mean ± SD (min–max)	<i>p</i> -value	<i>p</i> -value between baseline and 1 month (F0 vs F1)	<i>p</i> -value between baseline and 3 months (F0 vs F2) and 1 and 3 months (F1 vs F2)
Pain (ESAS 1)	1.41 ± 1.67 (0–6)	2.79 ± 2.33 (0–8)	0.94 ± 1.5 (0–5)	<0.001	<0.001	0.0589
Tiredness (ESAS 2)	2.13 ± 2.03 (0–7)	5.31 ± 2.29 (0–9)	1.27 ± 1.98 (0–8)	<0.001	<0.001	0.0082
Drowsiness (ESAS 3)	0.61 ± 1.38 (0–7)	1.14 ± 1.74 (0–5)	0.05 ± 0.28 (0–2)	<0.001	0.0425	0.0013
Nausea (ESAS 4)	0.45 ± 1.07 (0–5)	2.14 ± 2.29 (0–8)	0.44 ± 1.31 (0–6)	<0.001	<0.001	0.7816
Lack of appetite (ESAS 5)	1.38 ± 1.67 (0–6)	4.92 ± 2.34 (0–10)	0.61 ± 1.56 (0–8)	<0.001	<0.001	0.0033
Shortness of breath (ESAS 6)	0.42 ± 1.05 (0–5)	0.57 ± 1.55 (0–7)	0.13 ± 0.70 (0–5)	0.049	0.5900	0.0755
Depression (ESAS 7)	1.33 ± 1.53 (0–5)	2.20 ± 2.25 (0–9)	0.55 ± 1.32 (0–6)	<0.001	<0.001	0.0027
Anxiety (ESAS 8)	1.52 ± 2.01 (0–8)	2.77 ± 2.51 (0–10)	0.62 ± 1.33 (0–6)	<0.001	<0.001	0.0067
Over all well being (ESAS 9)	7.70 ± 1.03 (5–9)	6.00 ± 1.75 (0–9)	8.00 ± 1.43 (3–9)	<0.001	0.246	<0.001

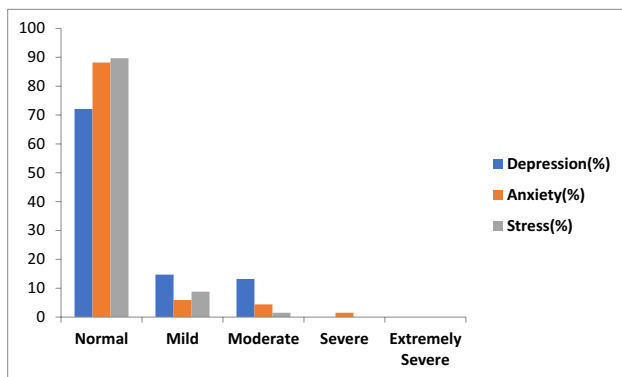
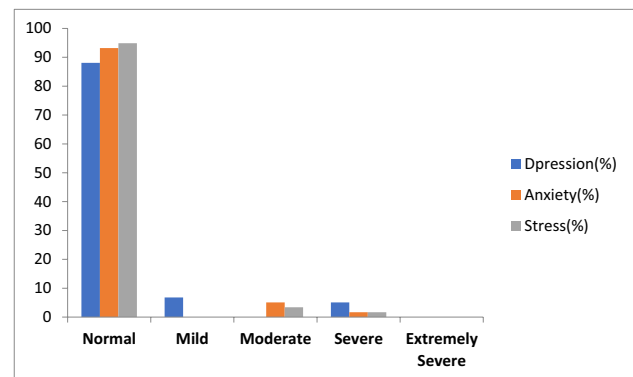
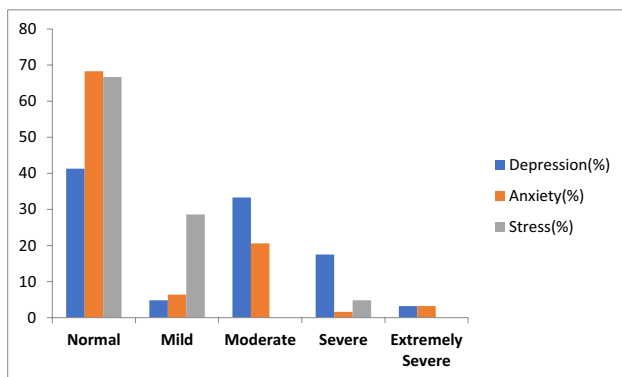
Cohen et al. found that QOL was well correlated with symptom burden [18].

ESAS-r scale was used to assess symptom burden in our study. Among all the parameters studied, the mean score was maximum for tiredness at F0, F1, and F2 followed by anxiety at F0, lack of appetite at F1, and pain at F2. In the study conducted by Owayolu et al. in 2013, the most intense symptoms experienced by the patients were fatigue followed by anxiety at both pretransplant and posttransplant periods using the ESAS scale. This observation was consistent with our study. The increase in symptoms also corresponded to a decline in QOL in these patients and thus concluded that an increment in the symptom severity could be the cause for the decline in QOL which was observed after transplantation, especially in the initial period following transplantation [19]. This was supported by many studies [10, 16, 18, 21]. Jawahri et al. in 2016 calculated ESAS scores at 2 weeks and 3 months and observed a decrease in symptom burden score and an increase in the QOL life score 3 months post-transplant compared to 2 weeks which corresponded to our observation [12]. In the study conducted by Anderson et al. in 2007 to observe the symptom burden in HSCT patients' blood and marrow transplantation module of the MD, Anderson Symptom Inventory was used, and the general pattern was an increase in the symptom intensities after transplantation which came down later, consistent with our observation [22]. The palliative care approach should start from the pre-transplant period itself right from early assessment of the symptom burden and if needed early referral to supportive services. Symptom management forms the mainstay of palliative care intervention. Palliative care can aid in dealing with the complications of transplant, both acute and chronic ones. Also, the support for patients and caregivers needed during discharge is provided by the team. In the case of end-of-life care, active symptom management as well as advance care planning is aided. Grief and bereavement care are also provided to the BMT patients and families after death [23].

In our study, we used the DASS 21 scale to assess depression, anxiety, and stress in BMT patients. In our study, the mean scores for depression, anxiety, and stress were maximum at 1 month and minimum at 3 months. The score trend corresponded to FACT BMT mean EWBSSS. This was also consistent with the finding of symptom burden from mean ESAS Anxiety and Depression scores. This finding could be attributed to the increased emotional disturbance as a consequence of increased symptom burden. We could not find many studies that used the DASS 21 scale in BMT patients. This observation may imply that palliative care is needed from the day of admission in the BMT ward and throughout the course of the hospital stay and beyond. As patients have a prolonged course of hospitalization of a minimum of 4 weeks and more than that in the case of an allogeneic transplant, they spend themselves in isolation at hospitals

**Table 5** DASS 21 scores of hematological malignancy patients who had undergone HSCT

Variables	Baseline (F0) (n = 68) Mean ± SD (min–max)	At 1 month (F1) (n = 63) Mean ± SD (min–max)	At 3 months (F2) (n = 59) Mean ± SD (min–max)	Overall <i>p</i> -value	Pairwise comparisons		
					<i>p</i> -value between baseline and 1 month (F0 vs F1)	<i>p</i> -value between baseline and 3 months (F0 vs F2)	<i>p</i> -value between 1 and 3 months (F1 vs F2)
Depression	5.82 ± 4.93 (0–18)	12.98 ± 8.33 (0–28)	2.50 ± 5.74 (0–24)	<0.001	<0.001	<0.001	<0.001
Anxiety	2.64 ± 3.46 (0–16)	5.17 ± 5.57 (0–28)	1.28 ± 3.53 (0–16)	<0.001	<0.001	0.0010	<0.001
Stress	3.11 ± 4.94 (0–22)	7.55 ± 7.72 (0–32)	1.55 ± 5.35 (0–30)	<0.001	<0.001	0.0039	<0.001

**Fig. 2** DASS 21 score categories at baseline (F0)**Fig. 4** DASS 21 score categories at second follow-up (F2)**Fig. 3** DASS 21 score categories at first follow-up (F1)

which can lead to emotional exhaustion. Also, dependence and many of the physical adverse effects may lead to psychological issues in this set of patients. There can be depression, anxiety, and poor QOL in them. The psychological symptom trajectory therefore should be well explored over the BMT course. Communication skills should be improved with respect to social, psychological, and spiritual concerns [24].

Thus, the major palliative care interventions found may be building rapport, management of symptoms, and providing aid in coping with HSCT which can help the patients

improve their skills of effective management of disease and treatments. Therefore early integration of palliative care in BMT is imperative [25].

The main limitation of our study was that the patients included were from a single center. The study population lacked racial and ethnic diversity thus limiting the generalizability of the results to be applied in all settings with different practices. Symptom burden and QOL scores could be affected by differences in the timing of assessment for example during treatment, just after treatment, during maintenance, etc.

## Conclusion

QOL improves with time. Symptom burden was the highest in the first month after BMT, which came down later. Depression, anxiety, and stress were most prevalent in the first month which improved with time. It is very necessary to have an assessment of symptom burden to provide good QOL. Further studies in this group of patients can help us with their better management and an understanding of the disease course. As the HSCT patients may have prolonged hospitalization for at least 1 to 4 weeks throughout the phases of harvesting, conditioning, transplant, and recovery,

they may have various physical and emotional symptoms throughout their journey which may be unaddressed or partially addressed by the primary BMT team as they may have other primary priorities for the patient. Palliative care referral and early integration can help assess and manage such physical and emotional symptoms effectively. Palliative care can be incorporated at various time points throughout the hospital course of BMT. Especially when the symptom burden is highest after the first month of transplant, specific palliative care interventions can be planned to take care of the symptom burden. Physical symptoms as well as psychological symptoms need to be taken care of. Social and spiritual support can be provided to these patients whenever necessary. End-of-life care, bereavement care, and caregiver support are to be initiated at the time of need. Altogether, palliative care can bring about a significant change in the quality of life of BMT patients if initiated timely.

**Author contribution** Neethu Susan Abraham: Detailed literature study, Analysis and synthesis of information, Design of the work, Preparation of manuscript including figures & tables.

Seema Mishra: Revision of draft copy, synthesis of information, critical revision for important intellectual content.

Sushma Bhatnagar, Lalit Kumar, Atul Sharma, Rakesh Garg, Sachidanand Jee Bharati, Nishkarsh Gupta, Vinod Kumar: Overall supervision of the work, critical revision for important intellectual content.

## Declarations

**Ethics approval** This study was conducted at Dr B. R. Ambedkar, Institute Rotary Cancer Hospital, All India Institute of Medical Sciences, Ansari Nagar, New Delhi 110029, India. This study was carried out in line with the institutional ethics committee of AIIMS, New Delhi (Ref. No.: IEC PG-174/28.02.2019, RT-26/27.03.2019).

**Consent to participate** Informed consent was obtained from those participating in the study. All information regarding the subjects was kept confidential.

**Competing interests** The authors declare no competing interests.

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