Effect of Educational Guidelines on Patients' Knowledge and Practices regarding Complications Post Bone Marrow Transplantation

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Abstract

Background: Educational guidelines after bone marrow transplantation provide patients with sufficient knowledge and practices to reduce expected complications. **Aim:** This study aimed to determine the effect of educational guidelines on patients' knowledge and practices regarding complications post-bone marrow transplantation. **Research design:** A quasi-experimental design was utilized to achieve the aim of this study. **Setting:** The study was conducted at Oncology Center affiliated with Mansoura University, Egypt. **Subject:** A convenient sample that included (50)patients post bone marrow transplantation. **Tools**: (I) Patient's assessment sheet, (II) Patient's knowledge, and III: Patient's reported practices (pre and post). **Results**: This study revealed that there was a statistically significant improvement in patients' knowledge and reported practices respectively pre and post-educational guidelines. There was a positive correlation between knowledge and practice at pre, post, and follow-up implementation of the educational guidelines regarding complications post bone marrow transplantation. **Conclusion:** The current study concluded that educational guidelines regarding complications post-bone marrow transplantation have a positive effect on improving patients' knowledge and reported practices. **Recommendation:** Provide continuous educational guidelines regarding complications post-bone marrow transplantation.

Keywords: Complications post bone marrow transplantation**,** educational guidelines**,** knowledge, and practices

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Introduction

Many deadly diseases can now be treated with the life-saving treatment known as bone marrow transplantation (BMT). Over the past 20 years, BMT has expanded quickly and seen constant technological advancement **(Daikeler and Hirano, 2019).** Hematopoietic stem cell transplantation, which is frequently performed using bone marrow, peripheral blood, or umbilical cord blood, was described by **Felfy, et al. (2014**) as the transplantation of multipotent hematopoietic stem cells.

Hematopoietic stem cell transplantation (HSCT) can be broadly classified into two types: autologous **(Felfy, 2014),** in which a patient donates his or her bone marrow stem cells, and allogeneic (**Park, 2015**), a more complex procedure in which a patient receives the stem cell graft from a healthy person (**Hashemi, 2017**). Because hematopoietic stem cell transplantation is still a dangerous procedure with multiple possible side effects, it is only carried out on patients with serious illnesses. With the procedure's success rate rising, its use has expanded beyond the treatment of cancer to include the management of autoimmune conditions and inherited skeletal dysplasias, most notably malignant infantile osteopetrosis (**Hashemi, 2017**). Patients who are near the end of their life or have chronic illnesses can live longer thanks to stem cell transplantation. Initially stem. The first stem cell transplant took place in the United States in 1968, and since then, this technology has advanced significantly thanks to scientific research and medical technology (**Mendes, 2019**).

In adults, red bone marrow generates all of the red blood cells, platelets, and roughly 60–70% of the lymphocytes. Red bone marrow is one of two forms of bone marrow. Along with the liver and spleen, red bone marrow is involved in the elimination of old red blood cells, as do other lymphocytes, including those that begin life in the red bone marrow and mature in the lymphatic tissues such as the thymus, spleen, and lymph nodes (**Bishop and Keating 2019**).

The other variety is yellow bone marrow, which serves as a fat storage area. It contributes to sustaining the appropriate conditions for the bone to operate. The yellow marrow may, however, become damaged under some circumstances, such as significant blood loss or fever, the yellow marrow may revert to red marrow, yellow marrow tends to be located in the central cavities of long bones and is generally surrounded by a layer of red marrow with long trabeculae within a sponge-like reticular framework**(Clancy and Mcvicar, 2017).**

Allogeneic, autologous, and syngeneic BMT are the three different subtypes. Autologous cells are those derived from the patient; allogeneic cells are those obtained from a source other than the patient. Patients undergoing syngeneic BMT receive cells from an identical (monozygotic) twin. The type of BMT a patient receives (allogeneic, syngeneic, or autologous) depends on the disease that needs to be treated, the stage of the disease (e.g., initial treatment vs. treatment of recurrent disease), the urgency with which the disease needs to be treated, the availability of a donor, and the amount of time required to obtain HSCs from a donor **(Bishop and Keating 2019).**

Considering that nursing is a field that is always changing, in-service training is a requirement for nurses. Instructional guidelines for in-service training are defined as learning activities that are formal or informal and work-related that are provided for employed professionals, paraprofessionals, and other practitioners through opportunities or is a successful training or effort for staff development, where experts are trained in their work with others to obtain new knowledge, enhanced skills, more effective, efficient, and competent service in various fields and to differ. The highest-quality nursing care can only be provided in a setting where nurses are kept up to date on new advancements through in-service training, which should be viewed as a crucial component of the work (**Alex et al, 2020**).

These patients require basic nursing care, specialized technical care, and intensive pre-discharge education on subjects like drugs, chemotherapy, bone marrow transplant limits, lab findings, catheter management, and the

importance of follow-up. Additionally, they provide support and guidance to other nurses who work in the medical field (**Diezn, et al., 2017).** Nursing workers who care for BMT patients should consistently practice good hand hygiene to prevent exposing patients to bacterial infections. Additionally, warnings for patients who have come into contact with certain dangerous diseases, such as MRSA and VRE, as well as guidelines for visitors in cases of diarrhea or a respiratory illness **(Oliansk et al., 2017).**

Nurses should be held to professional and ethical requirements to maintain current knowledge and skills in the field of bone marrow transplantation to perform safely and competently at all times (Royal College of Nursing, 2019). Education regarding infection prevention and control was therefore one of the main objectives of the infection control program, especially in the healthcare system where nurses make up the majority of employees (**WHO, 2018**).

Significance of the study:

Not only is the adoption of educational recommendations for patients undergoing BMT a critical step for nursing practice, but it also has a major impact on nursing science. Along with ensuring that patients receive all the necessary information in an easily understandable manner to ensure minimal discomfort at each stage of the BMT procedure and reduce the likelihood of problems (**El- Gazzar et al., 2019).**

There were 15 confirmed cases of recipients of bone marrow transplants at the cancer institute in southern Egypt between 2016 and 2018. According to **McCann (2016**), bone marrow (BM) from killed animals may have given Homo sapiens nutrient-rich sustenance during their evolution. BM has long been utilized medicinally. It was first recognized as the primary hematopoietic organ in adulthood and the source of circulating blood cells in the middle of the nineteenth century (Schmajuk et al., 2019). The nurses required practice and training to provide those patients with high-quality care and lessen post-transplant issues.

Aim of the study:

This study aimed to determine the effect of educational guidelines on patients' knowledge and practices regarding complications post-bone marrow transplantation through:

1- Evaluate patients' knowledge and practices regarding complications post-bone marrow transplantation

Design, and implement educational guidelines based on the needs of the patients.

Assess the effect of educational guidelines on patients' knowledge and practices.

Research hypothesis:

H1: patients' knowledge score regarding complications post bone marrow transplantation is expected to significantly improve after educational guidelines implementation than their score before.

H2: patients' practices score regarding complications post bone marrow transplantation is expected to significantly improve after educational guidelines implementation than their score before.

Subjects and Methods:

Design:

A quasi-experimental design was utilized to achieve the aim of this study

Setting:

The study was conducted at Oncology Center affiliated with Mansoura University, Egypt.

Subjects:

A convenient sample that included (50) patients post bone marrow transplantation who attended the previously selected setting within six months.

Tools of data collection:

Tool (I): Patient's assessment sheet: it was adapted from **(Mohamed et al, 2017)** it included three parts as following:

Part (1): Patients' demographic characteristics, this part are concerned with the assessment of patients' demographic characteristics related to their age, gender, occupation, and level of

education.

Part (2): Patients' health history: It was designed by the researcher to assess medical history which includes: the nature of the disease, years of disease, previous treatments, previous medical intervention, and genetic diseases.

Part (3): Patients' sheet for early and late complications after BMT: This tool was adapted from **(Kirsch, et al., 2014)** to assess early and late complications after the BMT process. It included the following parameters: heart rate, oxygenation pattern, heart sounds, blood pressure monitoring, respiratory rate, breathing sounds, temperature, alertness and hemodynamic monitoring, intake and output monitoring, and urine and stool culture. Early complications: (low cell count, oral mucositis, breathing problems, infection signs, hemorrhage, numbness and tingling in hands and feet, immunodeficiency, toxicity, neuropsychiatric problems (sleep disturbance, depression, and fears). Late complications: (Graft – Versus – Host Disease (GVHD) acute & chronic, heart problems, kidney problems, liver problems, secondary solid tumors, relapse, and death.)

Tool (II): Patient's Knowledge Assessment Sheet:

This part will be developed by the researchers after reviewing the related literatures **(Lima, & Bernardino, 2014)** to assess nurses' knowledge before, and after the implementation of instructional guidelines regarding bone marrow transplantation about the definition, sources of stem cells, types of the donor, indication, complication, drugs, precaution, nursing care of the patient in bone marrow transplantation unit such as care for catheter, care for skin, care for mouth and care after discharge. It included the following: - general knowledge (Ten true or false questions, Fourteen multiple-choice questions, and Three open-ended questions.

Scoring system of nurses' knowledge: Two levels of scoring for questions were as the following:

Correct answer scored one Don't' know or incorrect answer scored zero. The total scoring system of nurses' knowledge was 34 and it was categorized into two levels -Satisfactory of the total score of knowledge ≥ 60% of the total score. Unsatisfactory total score < 60% of the total score.

Tool III: Patient's reported practices (pre and post): This tool was used before and after the implementation of the designed educational guidelines to evaluate the effect of the designed guidelines. **(Bhatia, & Bhatia, 2011 and Goodwin, 2015),** this tool will be developed by the researcher after reviewing the literature to assess the skills level of critical care nurses regarding BMT such as education about a discharge plan, methods of preventing pollution such as hand washing, personal condoms, intravenous catheterization and care, nursing interventions to reduce complications such as skin care, mouth care, breathing exercises, follow up of kidney functions, and monitor liver function, the appropriate diet for the

.

The scoring system for nurses' practice was as the following: -Done practices correctly scored (one point) or done practices incorrectly scored (zero) and it was categorized into two levels – Satisfactory of the total score ≥ 60% and Unsatisfactory of the total score ≤ 60%

Tools validity:

Three experts from faculty members in the fields of nursing and medicine tested and evaluated the instruments in this study to see if they met the standards for the reliability of data collection and content validity. To check the applicability, clarity, and comprehensiveness of the tools, a variety of academic fields and specialties were represented in the group, including medical and surgical nursing.

Tools reliability:

Testing the reliability of proposed tools was done by Cronbach alpha test. The result for knowledge was 0.84 and 0.89 for reported practices.

Pilot study:

The pilot study used 10% (5) patients of the total sample to confirm that the tools were clear and applicable, as well as to estimate the time required to complete them.

Ethical Considerations:

Participant permissions were obtained after the study's purpose was stated before data collection; nurses were informed of the study's goal. They were given the option to decline participation and wereinformed that they might withdraw at any moment during the research without giving a reason. They were also told that the information they provided would be kept private and only used for researchpurposes, as this is an ethical requirement.

Fieldwork:
The fieldwork started in July 2021 to December 2021. The researchers made two visits/week, (Saturdays & Mondays, from 10.00 a.m. to 12.00 moon) to complete the pre and the same with post-test. The average time needed to complete the tools ranged from 35-40 minutes.

Educational guidelines construction:

It consisted of three phases, the preparatory phase, the implementation phase, and the evaluation phase.

Preparatory phase:

This study was preceded by a phase of preparation in which the following tasks were carried out: An official letter seeking permission to conduct the study was submitted to the manager of the previously chosen settings from the Dean of the Faculty of Nursing. This letter stated the study's objectives as well as the methods for gathering data to secure approval and cooperation.

After explaining the study's purpose and goals to the patients who had accepted to participate, the researchers gained their oral agreement before using the educational guidelines approach.

To assess the research using the prior tool, past and present literature on the various facets of the research in books, articles, periodicals, magazines,

Implementation phase:

The educational guidelines were made available in text, video, and brochure form. The information provided an overview of bone marrow transplantation, including its definition, types, sources, contributing factors, and complications, as well as its uses in theoretical parts and films demonstrating actual practices or measures. A pamphlet about instructional sessions as well as four educational sessions was provided by the researchers. The length of each session ranges from 45 to 1 hour. A brochure, PowerPoint, and instructional videos served as visual aids for these classes. They received information on terms like "stem cell transplantation," "sources of stem cells," "types of donors," "indications," "complications," "drugs," "precaution," and "nursing care of the patient in the bone marrow transplantation unit" like "catheter care," "skin care," "mouth care," and "care after discharge. Teaching methods were lecture, group discussion, demonstration, and re-demonstration. Media utilized were handouts, videos, and data shows.

Evaluation phase:
Upon the completion of educational guidelines, the post-test was done for patients after one month to estimate the effect of the educational guidelines using the same preintervention tools.

Statistical Design:

Statistical Package for Social Science (SPSS), version 10.0, was used to compile, code, tabulate, and analyze the obtained data (11). Data analysis was carried out using the number, percentage distribution, mean, standard deviation, and correlation coefficients; the significance of some variances was tested using paired t-tests. A significant level value was considered when $p<0.05$, and highly statistically significant at $p<0.001$.

Results:

Table 1: Male patients made up 76% of the patients and reveals that (60%) of them were between the ages of 40 and less than 50. Additionally, 86% of the patients in the study had a secondary education, which was shown to be the majority**.**

Table 2: Shows that 100% of the patients in the study had a chronic illness, and 54% of them had had one for at least two years. Whereas.

90% of the patients had oncology conditions. It was discovered that the sample as a whole had 100% received chemotherapy. Also, they had a prior bone marrow biopsy.

Table 3 shows that, before the adoption of educational guidelines, 84%, 100%, and 100% of the patients in the study, respectively, experienced some early difficulties such as low cell count, respiratory issues, and infection indications. As opposed to this complication, fell to 10%, 26.0%, and 56% with the installation of EBG. This table shows that, in terms of late complications, GVHD, heart issues, and liver issues affect 46%, 66%, and 66% of patients, respectively. Post-implementation, these complications decreased by 24%, 64%, and 56%, respectively, with p=0.000 indicating highly statistically significant differences between pre-and post-implementation.

Table (4): This table demonstrated an improvement in patient knowledge regarding scoring, which went from 18.434.53 to 32.662.81, with a statistically significant difference between patient knowledge levels pre and post-implementation of educational guidelines about complications following bone marrow transplantation, which was discovered at P value 0.01.

Figure 1: This demonstrates that the knowledge of the studied patients has increased as a result of the implementation of educational guidelines. It also demonstrates that 25% of them had a satisfactory level of knowledge regarding complications following bone marrow transplantation before the implementation of educational guidelines, which increased to 75% after.

Figure (2) demonstrates that, before adopting educational guidelines, the practice of 85% of the patients under study was unsatisfactory but that, after doing so, the practice of 72% of the patients under study improved and became satisfactory.

Table (5) shows that there was a strong statistically significant positive association between total knowledge and total practice scores before and after the recommendations' implementation at $P < 0.05$.

Table (1): Percentage, and distribution of the studied patients' demographic characteristics (n=50).

Demographic data	Total (n=50)	
	N	%
Age (Year)		
20 < 25 years	0	0.0
25 < 30 years	5	10.0
30 < 40	15	30.0
40 < 50	30	60.0
Mean ± SD	**42.2 ±5.77**	
Sex		
Male	38	76.0
Female	12	24.0
Level of education		
University education	5	10.0
Secondary education	43	86.0
Illiterate	2	4.0

Table (2): Percentage distribution of the studied patients according to their medical history (n=50).

Variables	Total (n=50)	
	N	%
Suffering from chronic disease		
Yes	30	100.0
No	0	0.0
Years of chronic disease		
From one year	3	10.0
From two year	16	54.0
From three years	3	10.0
For more than three years	8	26.0
Nature of the current disease		
Hematology disease	3	10.0
Oncology disease	27	90.0
Inherited diseases	0	0.0
Others (specify)	0	0.0
Previous treatment		
Chemotherapy	30	100.0
Radiation therapy	0	0.0
Chemotherapy and radiation	0	0.0
Others (specify)	0	0.0
Previous medical intervention		
BM biopsy	30	100.0
Surgical intervention	0	0.0
Previous unsuccessful BMT	0	0.0
Others (specify)	0	0.0

Table (3): Percentage distribution of the studied patients concerning early and late complications

Early Complications		Present		Absent		Pre & Post
		N	%	N	%	
Low cell count	Pre	42	84.0	8	16.0	X^2 = 27.045
	Post	5	10.0	45	90.0	P =0.000
Oral mucositis	Pre	38	56.0	22	44.0	X^2 = 53.56
	Post	19	38.0	31	62.0	P =0.000
Breathing problems	Pre	50	100	0	0.0	X^2=67.78
	Post	13	26.0	37	74.0	P =0.000
Infection signs	Pre	50	100	0	0.0	X^2 =2.96
	Post	17	54.0	23	46.0	P =0.10
Hemorrhage	Pre	10	20.0	40	80.0	X^2=12.44
	Post	5	10.0	45	90.0	P =0.000
Numbness and tingling in hands and feet	Pre	20	40.0	30	60.0	X^2= 14.67
	Post	6	12.0	44	88.0	P =0.000
Immunodeficiency	Pre	29	58.0	21	42.0	X^2= 7.33
	Post	17	34.0	33	66.0	P =0.006
Toxicity	Pre	20	40.0	30	60.0	X^2= 60.22
	Post	10	20.0	40	80.0	P =0.000
Neuropsychiatric problems (sleep disturbance,depression, and fears)	Pre	13	26.0	37	74.0	X^2= 13.77
	Post	13	26.0	37	74.0	P =0.000
Late complications		**Present**		**Absent**		**Pre & Post**
		N	%	N	%	
Graft – versus – host disease (GVHD) = Acute Graft – versus – host disease (GVHD) = Chronic	Pre	23	46.0	27	54.0	X^2 = 3.58
	Post	12	24.0	38	76.0	P =0.057
Heart problems	Pre	33	66.0	17	34.0	X^2 =0.632
	Post	31	62.0	19	38.0	P =0.424
Kidney problems	Pre	27	54.0	23	46.0	X^2=18.261
	Post	17	34.0	33	66.0	P =0.000**
Liver problems	Pre	33	66.0	17	34.0	$X^2$11.376
	Post	28	56.0	22	44.0	P =0.001
Secondary solid tumors	Pre	17	34.0	33	66.0	X^2= 2.233
	Post	12	24.0	38	76.0	P =0.137
Relapse	Pre	20	40.0	30	60.0	X^2 =1.678
	Post	8	16.0	42	84.0	P =0.163
Death	Pre	11	22.0	39	78.0	X^2= 0.000
	Post	12	24.0	38	76.0	P =1.000

Table (4): Mean scores of patients' knowledge about complications post bone marrow transplantation pre and post-educational guidelines implementation

Educational guidelines items	Pre educational guidelines	Post educational guidelines	P.value
Bone marrow 'anatomy and physiology	2.7±1.13	5.83±0.22	<0.001**
Stem cells' importance and sources	3.08±0.82	3.80±0.44	<0.001**
Bone marrow transplantation's definition	1.54±1.03	2.96±0.89	<0.001**
Bone marrow transplantation's indication	1.52±0.63	2±0	<0.001**
bone marrow transplantation' types	1.56±1.13	4.91±0.11	<0.001**
Nursing Management for patients with bone marrow transplantation	7.22±1.83	11.32±1.22	<0.001**
Bone marrow transplantation' Complications	1.12±0.33	1.80±0.33	<0.001**
Care after discharge	7.22±1.73	11.32±1.32	<0.001**
Knowledge Score	18.43±4.53	32.66±2.81	<0.001**

- *independent t-test ** Significant difference at p. value<0.01*

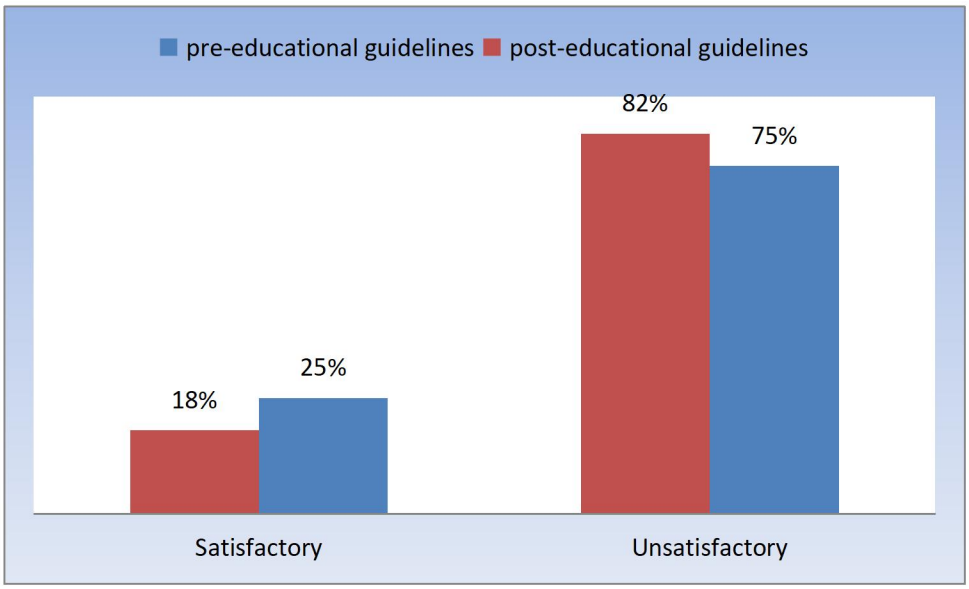

Figure (1) Percentage distribution of the studied total patient's **knowledge level pre and post-educational guidelines implementation about complications post bone marrow transplantation**

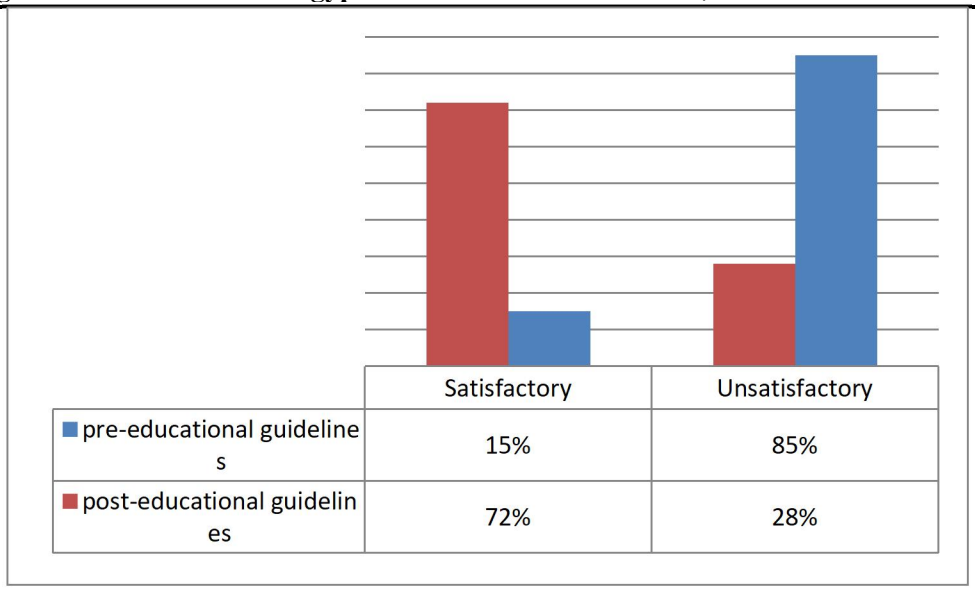

Figure (2): percentage, and distribution of the studied patient's practices pre and post-educational guidelines about complications post bone marrow transplantation

Table (5): Correlation between total knowledge and practices scores among studied patients

Variables		Total knowledge	
		Pre-implementing educational guidelines	Post-implementing educational guidelines
Total Practices	R	0.293	0.342
	p	.036*	.009**

***. Correlation is significant at the 0.01 level (2-tailed).* *r= person correlation coefficient*

Discussion:

In the medical procedure known as a bone marrow transplant, healthy stem cells are used to treat individuals with both malignant and non-malignant illnesses' inadequate bone marrow. (Niess, 2019) The nurses are dedicated to enhancing patients' quality of life and providing them with the greatest amount of physical and psychological comfort **(Diez, et al., 2017)**

In terms of gender-specific patient demographics, the current study found that two-thirds of the patients were between the ages of 40 and less than 50. These findings were in line with a study by **Elgazzar et al. (2019)**, titled "The Efficiency of Guidelines on Performance, Perception, and Satisfaction of Patients Undergoing Bone Marrow Biopsy," which found that less than half of the study subjects were between the ages of 41 and 50.

In terms of gender, the current study showed that men made up more than three-quarters of the patients and were more prevalent. This conclusion is reinforced by **Bajaj et al. (2013)**, who found that men experience higher cancer-related mortality than women in their study on the "quality of life after chemotherapy drugs." However, Mahdy (2009) discovered that males are less affected than females, which was in opposition to this result. Regarding education, it was found that the majority of the patients in the study had only completed secondary school.

The current study found that every patient was suffering from a chronic disease

when looking at the studied patients concerning their medical histories. However, oncology problems affected the majority of the patients. It was discovered that every sample had undergone previous bone marrow biopsies and chemotherapy. These findings indicated the BMT indication, which depends on a variety of elements including the kind of disease, its stage, and its response to prior treatment. Aplastic anemia, leukemia, hereditary blood illnesses, sickle cell disease, and autoimmune diseases are only a few of the conditions for which BMT is a life-saving treatment. These findings concur with those made by **Mohamed (2007),** who wrote in his paper titled "Bone Marrow Transplantation Coordinator" that the autoimmune system is the most common cause of BMT. In addition to **Sherif, (2016**) found that more than one-third of studied patients had cancer diseases and more than one quadrant of them had blood diseases.

Regarding early and late complications among the patients who were studied, the current study's findings revealed that the majority of the patients were affected by early complications such as low cell count, breathing issues, and infection signs before the implementation of evidence-based guidelines. While this complication was reduced by more than half after the adoption of EBG. According to **the National Marrow Donor Program, (2017**), stated in its annual report "A Centralized Cord Blood Registry to Facilitate Allogeneic, Unrelated Donor Umbilical Cord Blood Transplantation," the risk of developing an immune rejection will increase following a bone marrow transplant because the conditioning regimen received before the transplant will weaken the immune system and increase the risk for infection. This is consistent with **Nichols' (2017**) study on the "management of infectious complications in the hematopoietic stem cell transplant recipient," which found that the risk for infectious complications following HSCT depends on several variables, including the patient's age, the type of transplant, the conditioning regimen, and their history of prior infections (including pre-transplant viral serostatus). This finding is further corroborated by **Mersal (2011**), who found that "after training programs for patients undergoing BMT," the chance of rejection may gradually decrease and withdrawal may occur.

Regarding late complications, this finding showed that almost two-thirds of the patients under study experienced them, including GVHD, heart issues, and liver issues. However, with the installation of the EBG, the prevalence of these complications fell to less than half of the patients. This is consistent with the findings of **Abd El-Moniem et al. (2008**), who found in their study on the "treatment of problems following bone marrow transplantation" that the majority of patients had complained of heart disorders before the installation of an educational program.

Furthermore, **Singh (2015**) said in "The Research Process in Nursing (5th ed)" that boosting nurses' knowledge can reduce patient complications and that bettering patients' knowledge of diseases and treatment options may increase adherence. However, **Mahdy (2009**) disagrees with this finding, noting that immunosuppressant medicines caused an increase in renal problems following kidney and BMT transplantation. The current study also showed that the complications of the investigated patients significantly decreased following the use of the program; this improvement may be attributable to the fact that nurses' knowledge and skill levels regarding the care of BMT have grown as a result of the use of the program.

Regarding the relationship between total knowledge and total practice scores among the patients under study, the findings of the present study showed that there was a strong statistically significant positive relationship between total knowledge score and total practice score before and immediately following the implementation of educational guidelines. This may be because patients' knowledge levels have increased as a result of the instructional

guidelines, which has a favorable impact on their practice. This finding was consistent with a study by **Karaly and Abo Elfetoh (2019**), which found a statistically significant association between the study sample's overall knowledge and practice. Additionally, the results of this study, which were corroborated by **Ali et al. (2019**), showed a favorable association between the overall knowledge score and the total practice score before and after the teaching program intervention.

Additionally, **Debock et al. (2014**) clarified in their study about bone marrow transplantation (oncology nursing secrets) that the patient's need for promoting their knowledge and level of BMT was positively related to their need for enhancing their practice. They also reported that higher scores in nurses' knowledge were related to higher practice. Furthermore, **Bayoumi, Kamel, and Fathalla (2017**) reported in their study about a "Guideline Education Program about Nursing Ethics in Pediatric Oncology Unit" that there was a positive correlation between knowledge and practice concerning nursing ethics toward children in the pediatric oncology unit following program intervention. Additionally, according to **Shafik**, **& Abd Allah (2015**), there was a statistically significant association between total nurses' knowledge and total nursing performance score pre & post-program implementation.

The current study's findings demonstrated that the patients were more informed about the risks associated with problems following bone marrow transplantation than they were before the implementation of educational guidelines. According to the researcher's perspective, the low level of patients' knowledge before the implementation of evidence-based guidelines may be related to the lack of ongoing training, whereas there was an improvement in their knowledge following the implementation of educational guidelines, indicating the effectiveness of educational guidelines and the quick responses of the studied patients. This difference may be explained by the fact that instructional guidelines

The current study's findings showed that the majority of the patients were unsatisfactory in their practice before receiving educational guidelines, but that this situation changed and became satisfactory after the majority of the patients received educational guidelines. This absence of practice pre-educational guidelines can be attributed to one or more of the following: a lack of pre-work orientation programs; a lack of procedural books.

This outcome was consistent with **Kirsch et al., (2014) and Moustafa & Youness's (2018**) findings that educational interventions are thought to be most successful for stem cell transplantation nurses when it comes to instructing patients during their inpatient stay and providing patient/family teaching guidelines.

The results of the current study revealed a strong favorable link between patients' knowledge and practices that they reported after receiving educational guidelines. According to the researchers, this demonstrates the significance and value of educational guidelines that are frequently linked to enhancing knowledge and a better understanding among the examined patients and practices to assist them in learning and acquiring good knowledge and applying it. When patients have the necessary knowledge to benefit their practices, this association would make sense.

When knowledge is improved following educational recommendations that caused a rise in the sample practices as a result of adequate knowledge, this outcome may be confirmed. This result is consistent with **Ali (2017**) who found highly significant differences between the knowledge and practice of universal precautions throughout the study phases. **Eskander et al. (2019)** also found a statistically significant positive correlation between knowledge and the practice of universal precautions, which suggests that knowledge can be improved. **Askarian et al., (2017**), research, on the other hand, revealed no connection between knowledge and practice.

Conclusion

In light of the current study, it can be concluded that the current study concluded that educational guidelines regarding complications post-bone marrow transplantation have a positive effect on improving patients' knowledge and reported practice.

Recommendations

Based on the result of the present study, the following recommendations were made:

- Provide continuous educational guidelines regarding complications post-bone marrow transplantation.
- Patients should be aware of the complications of bone marrow transplants and how to prevent them and how to deal with them when developing
- Replication of the current study with a larger sample of the patient in different settings is required for generalizing the results.

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