

Effect of Educational Guidelines on Nurses` Performance Regarding management of Patients undergoing Bone marrow Transplantation

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Abstract: Background: Bone marrow transplantation is an important therapeutic option for malignant and nonmalignant diseases. Specialized nursing care is required to prevent and manage the expected and unexpected complications, provide physical, psychosocial, and spiritual needs to both adult and child patients and their families. **Aim of the study:** to evaluate the effect of educational guidelines on nurses` performance regarding management of patients undergoing bone marrow transplantation. **Design and Setting:** A quasi-experimental research design was used to collect data from bone marrow transplantation unit and its relevant outpatient clinic at Tanta International Educational Hospital. **Sample:** All nurses (40) from above mentioned setting who were providing direct care for patients undergoing bone marrow transplantation. **Tools:** Two tools were used for data collection, Tool(1); Structure questionnaire sheet to assess nurses` knowledge before, immediately and one month after implementation of educational guidelines and Tool (2); Observational check list sheet to assess nurses` practice before, immediately and one month after implementation of educational guidelines regarding bone marrow transplantation procedure. **Results:** As a result of this research, it was determined that nurses had poor score of knowledge and practice before implementation of educational guidelines, most of them had good score of knowledge and practice; immediately and one month after educational guidelines. **Conclusion and Recommendation:** Based on the findings of the study, there were significant improvement in the score of knowledge and practice. So it is necessary to provide continuous training programs regarding management of patients with bone marrow transplantation to update nurses` knowledge and practices.

Key words: Bone marrow transplantation, Educational guidelines and Nurses' performance.

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I. Introduction

Over past century, bone marrow transplantation is recognized as an effective treatment for certain types of malignant (cancerous) and nonmalignant (noncancerous) diseases.⁽¹⁾ Bone marrow transplantation is a medical procedures that are performed to replace bone marrow or stem cells that has been destroyed by disease especially some types of cancers, infection, or chemotherapy. This procedure involves transplanting of blood stem cells, which travel to the bone marrow where they produce new blood cells and promote growth of new marrow⁽²⁾. The National Marrow Donor Program reported that approximately 25,000 allogeneic hematopoietic cell transplants (bone marrow, blood stem cell transplant) are performed annually worldwide⁽³⁾. In Egypt, according to Medical Records of Sheikh Zayed specialized hospital reported that 390 cases of autologous transplant were carried out during the last three years in bone marrow transplantation unit⁽⁴⁾.

Bone marrow is soft and spongy tissues that are found within bones which are rich in stem cells. The most primitive of these stem cells are the pluripotent cells, which are different from other cells because it has capacity to produce of mature cells⁽⁵⁾. The conditions which are necessitate bone marrow transplantation include a variety of both cancerous and noncancerous diseases that are including: acute leukemia, aplastic anemia, bone marrow failure syndromes, chronic leukemia, hodgkin's lymphoma, immune deficiencies, multiple myeloma, neuroblastoma, non-Hodgkin's lymphoma, Plasma cell disorders⁽⁶⁾. There are three types of bone marrow transplantation which are based on the source of donor cells include: allogeneic (from a donor other than the patient): either a related donor (ie, family member) or a matched unrelated donor, Autologous (from patient) and Syngeneic (from an identical twins)⁽⁷⁾.

Nursing care of adult and child patients undergoing bone marrow transplantation is a complex and demands high level of skills and experience. The success of bone marrow transplantation is greatly influenced

by nursing care which are performed throughout the transplantation process ⁽⁷⁾. Due to critical and unstable nature of the bone marrow transplanted patient, nurses who are working in this area should possess specific knowledge and skills for the elaboration of a detailed therapeutic plan, as they act decisively in all treatment phases ⁽⁸⁾. So nurses must be educated about management and specific needs of patients and their families, plan and care from the time where patients admitted to the hospital until discharged. The primary focus of these activities includes; improve patients knowledge regarding transplantation surgery, its progress and expected complications. They also help patients and their family for dealing with physical or emotional problems ⁽⁹⁾.

The process of bone marrow transplantation consists of three phases: pre-transplantation phase, immediate post-transplantation phase, and late post-transplantation phase. The focus of each phase is distinct, yet each clearly overlaps with one another ⁽¹⁰⁾. The nurses provide physical, psychosocial, and spiritual needs to patients, they are dedicated to promote quality of life and provide a compassionate environment for optimal physical and emotional comfort ⁽¹¹⁾. Effective preoperative care had a positive impact on the first 24 hours after surgery, during pre-transplanted phase; patients admitted to the hospital to start transplanted protocol of care, the nurses perform daily care routines and preparation ⁽¹²⁾. Preparation of patient is the key and specialist nurses have a pivotal role in leading and providing education and support for patients throughout the transplant process to receive the bone marrow graft ⁽¹³⁾. Nurses are responsible for teaching patient and their family about transplanted procedures and provide supportive care ⁽¹⁴⁾.

During follow-up post transplantation; ongoing nursing assessment is essential to detect late effects of therapy on patients. Late complications are those that occur until one hundred days or more after BMT. Late effects include infections and restrictive pulmonary abnormalities ⁽⁷⁾. Nurses' basic functions regarding these patients includes; care to maintain life, specialized technical care, provide extensive teaching for patients and their families before discharge regarding; medications, chemotherapy, bone marrow transplant restrictions, lab values, catheter care and the importance of follow-up. They also assist, support, and provide consultations for other nurses in the health care field ⁽¹¹⁾. Therefore this study is to evaluate the effect of educational guidelines on nurses' performance regarding management of patients undergoing bone marrow transplantation.

Significance of the study:-

Bone marrow transplantation unit at Tanta International Educational Hospital was started the process of bone marrow and stem cell transplantation for both adult and child only from one and half year. Because knowledge and practice for health care team in this unit are very important especially for nurses who are providing direct contact care for patients either adult or child. It is necessary to conduct our educational guidelines of this study to improve nurses' knowledge and training activities to be a breast with current scientific practices related to bone marrow and stem cell transplantation and update their knowledge and skills in the light of recent guidelines to decrease post transplantation complications.

Aim of the study

Evaluate the effect of educational guidelines on nurses` performance regarding management of patients undergoing bone marrow transplantation.

Research hypothesis

Knowledge and practice scores of nurses regarding management of patients undergoing bone marrow transplantation will expected to be improved after implementation of educational guidelines.

Operational definitions:-

Nurses' performance; It's defined as the knowledge and practice of the nurses related to management of patients undergoing bone marrow transplantation.

II. Subjects And Method

Research design:

A quasi-experimental research design was used in the present research.

Setting:

The study was carried out at Bone Marrow Transplantation unit and its relevent Outpatient Clinic of Tanta International Educational Hospital affiliated to Tanta University Hospital.

Subjects:

All nurses (40) from above mentioned setting who are providing direct care for adult and child patients undergoing bone marrow transplantation.

Tools of data collections:

Two tools were used to collect the data for this study. These tools aimed to evaluate the effect of educational guidelines on nurses` performance regarding management of patients undergoing bone marrow transplantation.

Tool (I): Structure Questionnaire Sheet:

It was comprised of two parts:-

Part (A): Socio- demographic characteristics of the nurses:

which includes; nurses' code, age, gender, level of education, years of experiences, job description and previous training about care of patients undergoing bone marrow transplantation.

Part (B): Nurses' Knowledge Assessment Sheet:

It was developed by the researchers after reviewing of the related literatures ^(15 -19) to assess nurses' knowledge before, immediately and one month after implementation of educational guidelines regarding bone marrow transplantation. It was included the following:- general knowledge (10) questions, source of bone marrow and stem cells, causes, types, risks, complications (20) questions and management of patients with bone marrow transplantation that are divided into pre-transplantation (16) questions, during transplantation, after transplantation care (34) questions.

Scoring system of nurses' knowledge:

Two level of scoring for questions were as the following:

Correct answer scored (1)

Don't know or incorrect answer scored (0)

The total scoring system of nurses' knowledge was (80), it was categorized as the following:

-Good → > 75% of the total score

-Fair → ≥ 60% - 75% of the total score

- Poor → < 60% of the total score

Tool (II): Observation checklist for nurse's practice:

This tool was developed by the researchers after reviewing relevant literatures ^(10,16,17,18,19,20,21) to assess nursing practice before, immediately and one month after implementation of educational guidelines regarding bone marrow transplantation procedure, it was included the following; care of patients pre bone marrow transplantation and during bone marrow transplantation (30) steps, care after transplantation in the hospital (10) steps and care after discharge from hospital (10) steps.

Scoring system for nurses' practice was as the following:

-Done practices scored (1).

-Not done practices scored (0).

The total nurses' practices score was (50) and it was categorized into two levels

-Satisfactory → ≥ 70% of the total score

-Unsatisfactory → < 70% of the total score

Ethical consideration:

The necessary official permission was obtained from the Head of the Department of the Bone Marrow Transplantation Unit at Tanta International Educational Hospital. Informed consent was taken from every nurse after explanation the aim to participate in the study. Confidentiality and privacy was taken into consideration regarding data collection. A code number was used instead of name.

Methods of data collection:

1- The tools were tested for its content validity by a jury of five expertise in the area of Medical Surgical, Pediatric Nursing and physicians related to BMT, Their opinions were elicited regarding tools format, consistency and scoring system, it was calculated and found to be = (98%). The reliability for the study tools was calculated by Cronbach's alpha, it was 0.897 for tool (1) and 0.980 for tool (II).

2- A pilot study was conducted on (10%) from nurses to test the feasibility and applicability of the tools and to determine any obstacles that may encountered during the period of data collection, accordingly, needed modification was done.

3- Data collection for this study was carried out at the beginning of June 2017 to the end of November 2017.

4- Educational guidelines were conducted through four phases (assessment, planning, implementation and evaluation) as the following:-

Assessment phase;

The nurses were assessed in the 1st week before starting educational guidelines by using tool (I) part A to collect baseline data and Tool I part B and Tool II were used to assess nurses knowledge and practice related to management of bone marrow transplantation patients before implementation of educational guidelines to

determine the needs of the nurses and number of the sessions. The knowledge questionnaire sheet was filled by the nurse within 30 minutes and observational check list was filled by the researchers within 50 minutes for each nurse.

Planning phase;

The content of the educational guidelines was prepared by the researchers based on literature review (10,22,23), an illustrative structured booklet was prepared and written in simple Arabic language supported by illustrative pictures as a guide for the nurses, and different methods were used as video, group discussion and power point for theoretical part and demonstration and re-demonstration for the practical part. A booklet was given to each nurse during sessions to refresh their knowledge. The educational guideline was conducted in (4) sessions (two sessions for theoretical knowledge and two sessions for practical demonstration) to all nurses who are divided to (8) groups; each group was contained 5 nurses, three days/ week, and the time of each session was about two hour. Objectives of the study were prepared based on the aim and needs of the study subjects.

Implementation phase;

It was developed and implemented by the researchers that included the schedule of educational guidelines which was divided into four educational sessions as the following:- The First session: was given to the nurses regarding knowledge about definitions, source, causes, types, risks and complications of bone marrow transplantation. The second session: was given to the nurses regarding knowledge about management of patients with bone marrow transplantation that was divided into pre-transplantation care, care during transplantation, care after transplantation and care after discharge. The third session: was included demonstration and re-demonstration of the nurses regarding care of patients' pre and during marrow transplantation and during bone marrow transplantation. The fourth session: - was included demonstration and re-demonstration of the nurses regarding care of patients' after transplantation and discharge from hospital.

Evaluation Phase:

Immediately post educational guidelines and after one month later, the researchers were reassessed knowledge and practice of the nurses to test if there were any improvement and retained knowledge and practice over time among the participants by using Tool (I) part B and Tool II.

Methods of data analysis:

All data were collected, coded, tabulated and subjected to statistical analysis. Statistical analysis is performed by statistical Package SPSS in general (version 20), also Microsoft office Excel is used for data handling and graphical presentation.

III. Results

Table: (1) showed the distribution of the studied nurses according to their socio-demographic characteristics. As regard to age, the table showed that more than half (52.5%) of the nurses were in the age group (20 - > 25) years old, and about three quarters (72.5%) of them were female. Regarding to level of education, the table revealed that (70.0%) from nurses were diploma and only (30%) were Baccalaureate degree. As regard to years of experience and job description, the table showed that about three quarters (72.5%) of the nurses had < 1- 3 years of experience and more than two thirds (67.5%) of them were nurses and only (30.0%) were nursing specialist. Also the table was showed that the majority (80%) of nurses have no previous training about bone marrow transplantation and only (20%) from them have training course for only one day.

Table (2): showed the levels of nurses' knowledge about source, causes, types, risks and complications of bone marrow transplantation throughout all periods of the study. The table showed that there were improvement among nurses' knowledge regarding; source, causes, types, risks and complications of bone marrow transplantation. Where the majority of the studied nurses (82.5%) had poor level of knowledge pre educational guidelines, whereas they scored high level of knowledge immediately and one month later after educational guidelines for about (90% and 82.5%) respectively. So there was highly statistically significant difference between levels of nurses' knowledge throughout all intervention periods at $P= 0.000$.

Fig (1): showed the levels of nurse's knowledge about management of patients' pre bone marrow transplantation throughout all intervention periods of the study. The figure showed that there were improvement among nurses' knowledge regarding; management of patients' pre bone marrow transplantation. Where the majority of the studied nurses (87.5%) had poor level of knowledge pre educational guidelines, whereas they scored high level of knowledge immediately and one month later after educational guidelines for about (85% and 82.5%) respectively.

Table (3): showed the levels of nurses' knowledge about management during and after transplantation of patients throughout all intervention periods of the study. The table showed that there were improvement among nurses' knowledge regarding; management of patients during and after transplantation. Where the majority of the studied nurses (80%) had poor level of knowledge pre educational guidelines, whereas they scored high level of knowledge immediately and one month later after educational guidelines (90% and 85%) respectively. So there was highly statistically significant difference between levels of nurses knowledge throughout all intervention periods at $P= 0.000$.

Table (4): showed the total levels of nurses' knowledge about bone marrow transplantation throughout all intervention periods of the study. The table revealed that there was improvement regarding total level of nurses' knowledge about bone marrow transplantation. Where the majority of the studied nurses (85%) had poor level of knowledge pre educational guidelines, whereas they scored high level of knowledge immediately and one month later after educational guidelines for about (87.5% and 80% %) respectively. So there was highly statistically significant difference between levels of nurses knowledge throughout all intervention periods at $P= 0.000$.

Table (5): showed the levels of nurses' practice regarding management of patients' pre and during bone marrow transplantation throughout all intervention periods of the study. The table showed that there were statistically significant differences among levels of nurses' practice and intervention period at $P= 0.000$. Where the majority of the studied nurses (82.5%) had unsatisfactory level of practice pre educational guidelines, whereas they had satisfactory level of practice immediately and one month later after educational guidelines (92.5% and 82.5%) respectively. In addition to the highest satisfactory level of practice was immediately after intervention.

Table (6): Showed the distribution of studied nurses' practice regarding management of patients' after bone marrow transplantation throughout all intervention periods of the study. The table revealed that there were significant improvement in nursing practice regarding; wash hand, wear masks, sterile gloves when dealing with patient, early detection of any changes in the patient's health, observe bleeding from nose, mouth, or gums, provide mouth wash for patient with oral hygiene, strictly care for catheter as vessel maintenance and provide wound care, observe patient complication during intravenous infusion, maintain contact precautions, assess complications like mucositis, diarrhea, vomiting, and fever, make discharge plan once their nutrition has returned to normal levels, assess nutritional intake with provide complete nutritional value from pre, immediately and one month later after educational guidelines with statistically significant difference at $P=(0.001, 0.002, 0.001, 0.001, 0.002, 0.014, 0.002, 0.002, 0.001, 0.002)$ respectively.

Table (7): Showed the distribution of nurses' practice regarding care of patients' after discharge throughout all intervention periods of the study. The table was showed that there were significant improvement in nursing practice regarding; teaches patient and families about infection control measures, contact precautions during flu-like symptoms, manifestation of infection, stay away from crowded places for 30 days after the transplantation, stay away from sun after the transplantation, clean the sheet of bed and clothes, manifestation of inflammation in the skin, eat cooked food until change ordered, make follow up investigation at detected time and support psychological condition of patients to prevent depression from pre, immediately and after one month of educational guidelines with statistically significant difference at $P=(0.001, 0.001, 0.001, 0.002, 0.001, 0.002, 0.002, 0.002, 0.002, 0.001)$ respectively.

Figure (2): showed the total levels of nurses' practice regarding management of patients' undergoing bone marrow transplantation throughout all intervention periods of the study. The figure showed that there were statistically significant improvement in the levels of nurses' practice regarding management of patients' with bone marrow transplantation pre educational guidelines (87.5% unsatisfactory, 12.5% satisfactory) to (7.5% unsatisfactory, 92.5% satisfactory) immediately and one month later after there was slightly reduced in the practice level for about (20% unsatisfactory, 80% satisfactory).

Table (8): showed the correlation among nurses' knowledge and practices after educational guidelines and their socio – demographic data. The table showed that there were statistical significant positive correlation among nurses knowledge and age, gender, level of education, years of experience for care of patient with transplantation, job description and previous attendance of training courses about marrow transplantation at $P= 0.001, 0.012, 0.000, 0.022, 0.013$ and 0.001 respectively. Also there were statistical significant positive correlation among nurses practice and age, gender, level of education, years of experience for care of patient with transplantation, job description and previous attendance of training courses about marrow transplantation at $P=0.001, 0.002, 0.014, 0.000, 0.011$ and 0.015 respectively.

Table (1): Distribution of the nurses according to their socio-demographic characteristics.

Socio-demographic data	Nurses sample (no= 40)	
	No	%
Age (year)		
20 > 25	21	52.5
25 > 40	14	35.0
≥ 40	5	12.5
Range	20-45	
Mean±SD	29.0±7.88	
Gender		
Male	11	27.5
Female	29	72.5
Level of education		
Diploma	28	70.0
Baccalaureate degree	12	30.0
Years of experiences for care of patient with transplantation		
≥1	11	27.5
< 1- 3	29	72.5
Job description		
Nurse	27	67.5
Nursing specialist	12	30.0
Supervisor	1	2.5
previous training about bone marrow transplantation		
yes: (1 day)	8	20%
No	32	80%

Table (2): Levels of nurses' knowledge about source, causes, types, risks and complications of bone marrow transplantation throughout all intervention periods of the study

Levels of nurses knowledge	intervention periods (no= 40)					
	Pre		Immediately		After one month	
	No	%	No	%	No	%
Poor (< 60%)	33	82.5	1	2.5	2	5
Fair (≥ 60% - 75%)	6	15	3	7.5	5	12.5
Good (> 75%)	1	2.5	36	90	33	82.5
F	219.25					
P	0.000*					

* Significant or P < 0.05

Fig (1): Levels of nurses' knowledge about management of patients' pre bone marrow transplantation throughout all intervention periods of the study

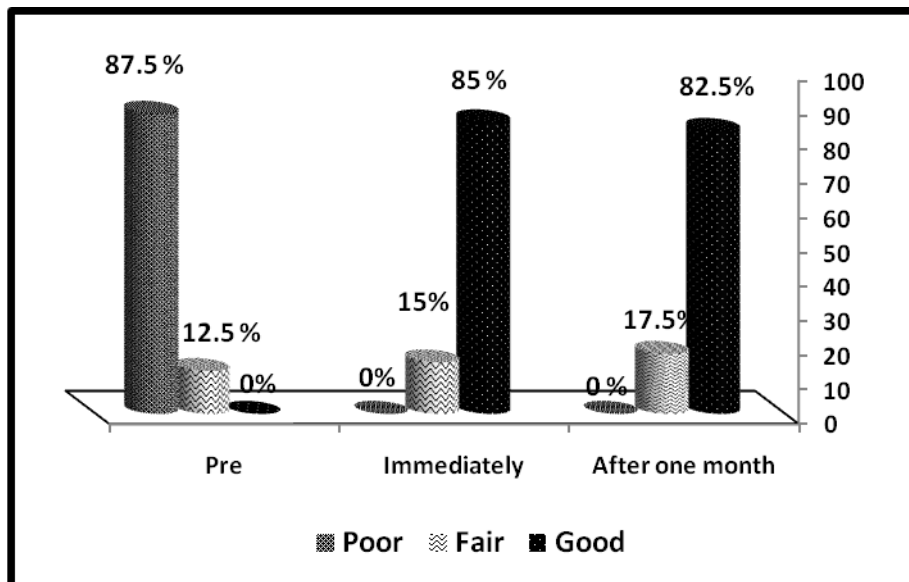


Table (3): Levels of nurses' knowledge about management of patients during and after Transplantation throughout all intervention periods of the study

Levels of nurses knowledge	intervention period (no= 40)					
	Pre		Immediately		After one month	
	No	%	No	%	No	%
Poor (< 60%)	32	80	1	2.5	2	5
Fair (≥ 60% - 75%)	5	12.5	3	7.5	4	10
Good (> 75%)	3	7.5	36	90	34	85
F	181.68					
P	0.000*					

* Significant or P < 0.05

Table (4): Total levels of nurses' knowledge about bone marrow transplantation throughout all intervention periods of the study

total Levels of nurses knowledge	intervention period (no= 40)					
	Pre		Immediately		After one month	
	No	%	No	%	No	%
Poor (< 60%)	34	85	2	5	3	7.5
Fair (≥ 60% - 75%)	4	10	3	7.5	5	12.5
Good (> 75%)	2	5	35	87.5	32	80
F	202.91					
P	0.000*					

* Significant or P < 0.05

Table (5): Levels of nurses' practice regarding management of patients' pre and during bone marrow transplantation throughout all intervention periods of the study

Levels of nurses care	intervention period (no= 40)					
	Pre		Immediately		After one month	
	No	%	No	%	No	%
Unsatisfactory (< 70%)	33	82.5	3	7.5	7	17.5
Satisfactory (≥ 70%)	7	17.5	37	92.5	33	82.5
F	142.83					
P	0.000*					

* Significant or P < 0.05

Table (6): Distribution of nurses' practice regarding management of patients' after bone marrow transplantation throughout all intervention periods of the study

Management after transplantation in the hospital	intervention period (no= 40)						X2 P
	Pre		Immediately		After one month		
	No	%	No	%	No	%	
1-Wash hand, wear masks, sterile gloves when dealing with patient.							
Done	21	52.5	40	100.0	35	87.5	16.43 0.001*
Not done	19	47.5	0	0.0	5	12.5	
2- Early detection of any changes in the patient's health							
Done	8	20.0	34	85.0	33	82.5	18.19 0.002*
Not done	32	80.0	6	15.0	7	17.5	
3-observe bleeding from nose, mouth, or gums or blood in urine							
Done	7	17.5	36	90.0	34	85.0	26.43 0.001*
Not done	33	82.5	4	10.0	6	15.0	
4-Provide mouth wash for patient with oral hygiene continuously							
Done	9	22.5	37	92.5	35	87.5	16.43 0.001*
Not done	31	77.5	3	7.5	5	12.5	
5-Strictly care for catheter as vessel maintenance and provide wound care							
Done	15	62.5	38	95.5	36	90.0	27.43 0.002*
Not done	25	37.5	2	5.0	4	10.0	

6-Observe patient complication during intravenous infusion.							
Done	19	47.5	40	100.0	40	100.0	17.93
Not done	21	52.5	0	0.0	0	0.0	0.014*
7-Maintain contact precautions to prevent infection and inflammation.							
Done	17	42.5	40	100.0	36	90.0	19.73
Not done	23	57.5	0	0.0	4	10.0	0.002*
8-Assess complications like mucositis, diarrhea, vomiting, and fever.							
Done	14	35.0	37	92.5	36	90.0	19.73
Not done	26	65.0	3	7.5	4	10.0	0.002*
9-Make discharge plan once their nutrition and GI system has returned to normal levels.							
Done	11	27.5	35	87.5	33	82.5	25.12
Not done	29	72.5	5	12.5	7	17.5	0.001*
10-Assess nutritional intake with provide complete nutritional value							
Done	17	42.5	39	97.5	36	90.0	17.14
Not done	23	57.5	1	2.5	4	10.0	0.002*

* Significant or $P < 0.05$

Table (7): Distribution of studied nurses' practice regarding care of patients' after discharge throughout all intervention periods of the study

Care of patients after discharge from hospital	intervention period (no= 40)						X2 P
	Pre		Immediately		After one month		
	No	%	No	%	No	%	
1-Nurse teaches patient and families about infection control measures							
Done	13	32.5	40	100.0	34	85.0	29.16
Not done	27	67.5	0	0.0	6	15.0	0.010*
2-Teaches family about maintaining contact precautions during flu-like symptoms							
Done	5	12.5	37	92.5	34	85.0	27.12
Not done	35	87.5	3	7.5	6	15.0	0.001*
3-Teaches patient family about manifestation of infection							
Done	12	30.0	40	100.0	35	87.5	19.42
Not done	28	70.0	0	0.0	5	12.5	0.001*
4-Instruct patient to stay away from crowded places for 30 days after the transplantation							
Done	15	62.5	38	95.5	35	87.5	20.18
Not done	25	37.5	2	5.0	5	12.5	0.002*
5-Instruct patient to stay away from sun							
Done	7	17.5	36	90.0	34	85.0	62.43
Not done	33	82.5	4	10.0	6	15.0	0.001*
6-Instruct patient about clean the sheet of bed and clothes							
Done	10	25.0	36	90.0	36	90.0	27.43
Not done	30	75.0	4	10.0	4	10.0	0.002*
7-Instruct patient about manifestation of inflammation in the skin							
Done	17	42.5	40	100.0	36	90.0	27.33
Not done	23	57.5	0	0.0	4	10.0	0.002*
8-Instruct patient to eat cooked food until change ordered							
Done	14	35.0	37	92.5	36	90.0	22.16
Not done	26	65.0	3	7.5	4	10.0	0.002*
9-Instruct patient to make follow up investigation at detected time							
Done	15	62.5	38	95.5	35	87.5	19.12
Not done	25	37.5	2	5.0	5	12.5	0.002*
10-Support psychological condition of patients to prevent depression							
Done	11	27.5	35	87.5	33	82.5	21.13
Not done	29	72.5	5	12.5	7	17.5	0.001*

* Significant or $P < 0.05$

Fig (2): Total levels of nurses' practice regarding management of patient undergoing bone marrow transplantation throughout all intervention periods of the study

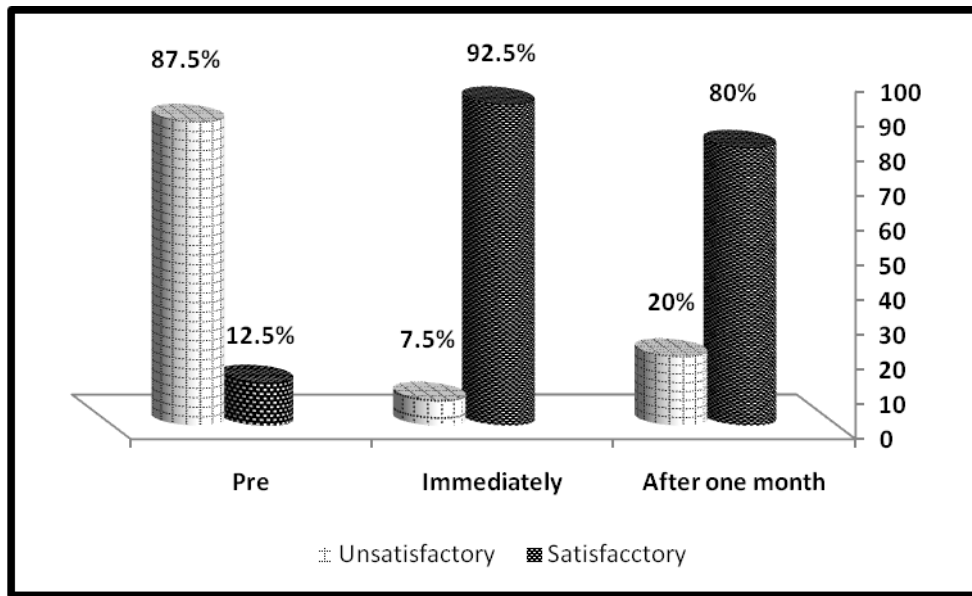


Table (8): Correlation among nurses' knowledge and practices after educational guidelines and their socio – demographic data

Socio – demographic data	Knowledge	Practices
	r P	r P
Age	0.528 0.001*	0.528 0.001*
Gender	0.412 0.012*	0.513 0.002*
Level of education	0.418 0.000*	0.547 0.014*
Years of experience for care of patient with transplantation	0.618 0.022*	0.418 0.000*
Job description	0.578 0.013*	0.618 0.011*
Previous attendance of training courses about marrow transplantation	0.528 0.001*	0.649 0.015*

* Significant or P < 0.05

r = correlation coefficient.

P = Significance

IV. Discussion

Bone marrow transplantation is a medical procedure in which healthy stem cells are used to replenish the defective bone marrow of those with malignant and non-malignant diseases ⁽²⁴⁾. The nurses are dedicated for promoting quality of life and providing an optimal physical and emotional comfort ⁽¹¹⁾. The aim of this study was to evaluate the effect of educational guidelines on nurses' performance regarding management of patients undergoing BMT. Concerning to socio-demographic characteristics of the nurses, the study result revealed that more than half of the nurses were in the age group (20 -> 25) years old. It may be due to the unit was recently established and the administrators selected young age nurses to be able to perform mainly tasks in the unit effectively. This result was in the same line with **Mohamed and Sayed (2015)** ⁽²⁵⁾ who reported in their study about nurses' knowledge regarding stem cells therapy that more than half of nurses were aged from 20-25 years.

Regarding educational level, the result showed that (70%) of nurses were diploma degree and (67.5%) from them were nurses, it may due to that the administrators of the unit was selecting them from the unit of hematology due to their abilities to understand the tasks more efficiently, this result in congruent with **Mohamed and Sayed (2015)** ⁽²⁵⁾ who reported majority of nurses who are working in BMT unit had diploma

degree in nursing. In relation to attending any previous training program, the majority of nurses had no previous training about BMT and only (20%) from them had course for only one day. This result was supported by **Rochester (2017)**⁽²⁶⁾ Who said that nurses who are working in the bone marrow transplantation unit needs additional education to provide optimal care for patients that are including; preparatory regimens, intensive supportive therapies for patients, stem cell and marrow infusions. In addition to **Tork et.al; (2018)** ⁽²⁷⁾, mentioned that in their study participants from nurses had never attended training courses on stem cells therapy.

Regarding to nurses' knowledge about bone marrow transplantation, the study results revealed that there were highly significant improvements among nurses' knowledge regarding; source, causes, types, risks, complications and management of patients' pre, during and after bone marrow transplantation throughout all intervention periods of the study, also there were significant improvement regarding total levels of nurses' knowledge about management of patients undergoing bone marrow transplantation throughout all intervention periods of the study. Low level of nurses' knowledge before implementation of educational guidelines may be attributed to the fact that bone marrow transplantation and stem cells are new advanced trend. Moreover, nursing curricula remained deficient in this issue which affects level of nurses' knowledge.

This results were in the line with **Team of Patient & Family Guide to Blood and Marrow Transplant (2013)** ⁽⁹⁾ that mentioned the nurses must be educated about management and specific needs of patients and their families to improve patients knowledge regarding transplantation surgery, its progress and expected complications. In addition to **Khalil and Sharshor (2016)**⁽²⁸⁾ that assessed the nurses' knowledge about stem cells in Tanta, Egypt, they reported that nurses' knowledge about stem cells is inadequate in 69 % of participants, so they need educational program to improve it. Also **Mohamed and Sayed (2015)**⁽²⁵⁾ reported that nurses in their study had poor knowledge about stem cells pre educational program, and showed statistical significance improvement in knowledge post test and 3 months after the intervention. **Elizebeth (2005)**⁽²⁹⁾ concluded that 84% of health professionals' team had inadequate knowledge about bone marrow and stem cell therapy. So it is necessary to update health professionals on latest trends & developments in their knowledge.

Also **Keng (2016)** ⁽³⁰⁾ mentioned that nurses' knowledge toward bone marrow and stem cells is moderate and they recommended the need for in-service educational programs related to bone marrow and stem cells to develop nurses' knowledge and practice in order to fit this contemporary trend in health care. In addition to **Lai et.al; (2016)**⁽³¹⁾ who indicated that although there was a high level of awareness towards stem cells transplantation among medical students, but there was a poor level of general knowledge about stem cell. According to **Moustafa and Youness (2015)** ⁽³²⁾ who reported that most maternity nurses had a low knowledge levels of stem cells and its uses. Also **Tintu (2007)** ⁽³³⁾ revealed that during pre-test 40 % from nurses had inadequate knowledge regarding bone marrow and stem cell therapy. After intervention showed that 80 % (p<0.05) was gained knowledge.

Regarding to nurses' practice about management of patients' pre, during and after bone marrow transplantation. The results showed that there were highly significant improvements in the nurses' practice regarding management of patients' pre and during bone marrow transplantation. Also there was significant improvement in nurses' practice after transplantation regarding; wash hand, wear masks, sterile gloves when dealing with patient, early detection of any changes, observe bleeding from nose, mouth, or gums, provide oral hygiene, strictly care for catheter as vessel maintenance and provide wound care, observe patient complication during intravenous infusion, assess complications like mucositis, diarrhea, and fever, make discharge plan, assess nutritional intake with provide complete nutritional value throughout all intervention periods of the study. The lack of nurses' practice regarding bone marrow and stem cells transplantation may be due to late exposure to stem cell technology in the clinical environment as it was a later development. Moreover the nurses lack the efficiency of updating their practice after being settled in the clinical environment for a longer time.

This result was in the line with **Wood (2011)**⁽³⁴⁾ who reported that in his study about assessment of nurses' patterns of practice in the field of stem cell transplantation, nurses play a key role in assessing, monitoring and supporting patients in their pharmaceutical treatment, so it is strongly recommended that nurses need basic training and continuous education to improve this issues. On the other hand **Holmes (1990)** ⁽⁴⁰⁾ mentioned that nurses are an integral member of the multidisciplinary team who are caring for the bone marrow transplantation patient. The pre-transplant period is an intensive for the delivery of the preparative therapy, management of early complications, and teaching and support to the patient and family. In addition to **Cancer and Hematology Centre (2017)** ⁽³⁵⁾ mentioned that the nurses must be educated about the necessary pre-transplant tests to be done, answer any questions or concerns that the patients or their family may have and manage the care of the donor during marrow transplantation.

The study results revealed that there was significant improvement in nurses' practice after patients discharge from hospital regarding; teaches patient and families about infection control measures, manifestation

of infection, maintaining contact precautions during flu-like symptoms, stay away from crowded and sun, manifestation of inflammation, eat cooked food, make follow up investigation and support psychological condition of patients to prevent depression. Also there was significant improvement in total levels of nurses' practice regarding management of patients with bone marrow transplantation throughout all intervention periods of the study. This result was in the line with **Kirsch et.al; (2014)**⁽³⁶⁾ who reported that educational interventions are considered most effective for stem cell transplantation nurses regarding for training patients during their inpatient stay and providing patient/family teaching guidelines.

In addition to **Wheatley (2017)**⁽²³⁾ who suggested that in his study nurses provide education for bone marrow transplanted patients and their family that focused on teaching about self-care activities and how to manage care at home that are preventing 30-day readmissions due to infection. Also **Cancer and Hematology Centre (2017)**⁽³⁵⁾ reported that the bone marrow transplantation nurse must be educated about spending more time with patients and their family who are discharged and during follow-up to offer support, advice and guidance to patients and relatives and know what to expect. Also **Rochester (2017)**⁽²⁶⁾ reported that emotional support and patient/family teaching are important care components of these often bone marrow transplant patients.

Also the study result revealed that there was statistical significant positive correlation among nurses' knowledge and practice and their socio-demographic characteristic included; age, gender, level of education, and years of experience for care of patient with transplantation, job description and previous attendance of training courses about BMT. This result was in line with **Elizebeth (2005)**⁽²⁹⁾ who reported that on assessing the knowledge of the studied sample's regarding stem cells, the finding of a statistically significant difference between the 1-5 years of experience group and all the other groups ($p=0.003$) were noted. While in contrast with **Keng (2016)**⁽³⁰⁾ who mentioned that results from this survey indicated that there was no association between stem cell awareness with gender, nationality, race, religion or year of the respondents in medical school.

V. Conclusion

In the light of the current study, it can be concluded that: There were statistical significant improvements of nurses' knowledge and practice regarding management of patients undergoing BMT immediately and one month later post educational guidelines than pre intervention period. Also there were statistical significant positive correlations among knowledge and practice and socio-demographic characteristic of nurses.

VI. Recommendation

Based on results of the present study recommendation are suggested that; Adequately planned continuous training programs related to bone marrow and stem cell transplantation must be established to develop nurses' knowledge and practices in order to inform them about new technology regarding management of patients. Further research with large sample from nurses and student nurse is recommended to update information among them, evaluate needed curriculum content, and determine which practice matters are most effective. Standards for nursing care of patients undergoing bone marrow transplantation should be established that contain update knowledge and practice and published in all hospital.

Limitations of the study:

For the findings presented in this paper some limitations should be taken into account. Small sample size represents a limitation that could affect generalization of results.

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