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Effect on reducing infections complications among chemotherapy patients

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Abstract
Background: A totally implantable venous access device (TIVAD) is safe, long-lasting, effective, and convenient. The patients can use it for the administration of chemotherapy medications.
Objective: Evaluate the effectiveness of nursing guideline (NG) for implanted portal catheters (IPC) in reducing Infections Complications (IC) among chemotherapy patients (CP) at Minia Oncology Center (MOC).
Sample: A purposive sampling of 70 adult patients who connected with portal catheter (PC).
Tools: 2 tools:
First Tool: Patient Health Assessment (PHA) included 2 parts.
First Part: Patient Demographic Data (PDD).
Second Part: Patient's Medical Data.
2nd Tool: Portal Catheter Infections Complications Observation Checklist.
Results More than half of the intervention group (IG). There was a lower percentage of renal diseases and hypertension among the IG. It was noticed that there was a highly significant correlation between local infection (LI) and the number of chemotherapy sessions per week among IG.
Conclusion: The present finding concludes that adhering to NG was the reason for the IG's lower percentage of IC than the CG's.
Recommendations: To generalize the findings, the current study should be repeated using an additional probability sample for various geographical areas.

Keywords: Nursing guidelines implanted portal catheters, infections complications and chemotherapy patient

Introduction
Totally implantable vascular access devices (TIVADs) are commonly utilized to enable the administration of intravenous chemotherapy, hydration enhancement, and long-term supportive care for cancer patients (CPs) [1].
Venous Access Devices Implanted (IVAD) can be used to transfuse fluids, collect samples from patients, and infuse a variety of drugs, e.g., chemotherapy medication (CM) and supplements. It lessens the agony and suffering brought on by recurrent peripheral punctures. Additionally, it offers CPs. a long-lasting path for IV fluid [3].
The responsibility of nurses in reducing infections and problems related to TIVADs: they should implement infection prevention strategies, Follow sterile technique during implantation and every subsequent access to prevent infection; check the port frequently before each injection to ensure patency and integrity; take care when administering chemotherapy drugs to prevent extravasation; if this happens, stop injecting medication right away. She should also stress how crucial the patient's participation is in their everyday at-home care. Extra guidance on avoiding vigorous activity on the side of the infusion port and refraining from cleaning the skin close to the port when showering [4].

Significance
According to (Li *et al*. 2022) [3] retrospective clinical cohort analysis through 2022, 13.0% of patients (224/1716) had higher percentages of infection complications, which consider highest incidence of late complications (LC).

The recent study conducted by (Mersal *et al*., 2019) [6] in Egypt, about a quarter of patients had systemic or site infections following a fully implanted venous access device. Furthermore, more than ten percent of them had venous thrombosis, tube cutting, and unintentional blood vessel puncturing.

Subjects and Methods

Aim of the Study

Evaluate the effectiveness of NG for IPC in reducing IC among CP at MOC.

Research Hypotheses

H1: Portal catheters infection complications would be reduced among IG compared with CG.
H2: There was a correlation between demographic data and reducing portal catheter complications.
H3: There was a correlation between medical data and reducing portal catheter complications.

Research Design

A quasi-experimental research design (intervention-control) was utilized.

Setting

This study was conducted at MOC in the outpatient chemotherapy and the critical care unit (CCU).

Subjects

A purposive sample of 70 adult patients who connected with a portal catheter was divided equally into two groups (intervention and control), with 35 in each one.

Inclusion Criteria

Patients aged between 18 to 65 years who are willing to participate in the study and have recently been admitted to an MOC for the implantation of a portal catheter to receive chemotherapy via it.

Exclusion Criteria: Patients had infections.

Sample Size

The formula of (Slovin's, 1960) used to calculate the sample $n = N / (1+Ne^2)$; whereas:
$n= 84/ [1+ (84) (0.05)^2 = 70$ patients

Study Duration

Data collection started from "October 2019 to October 2020".

Tools for Data Collection

The researcher developed two tools that were used in the current study. They were established after an extensive literature review and revised for validity.

First Tool: Patient Health Assessment

First Part: Demographic Data: It involved the patient's code, age, sex, occupation, and educational level.

Second Part: Medical Data: It included the medical diagnosis, date of admission, presence of chronic diseases (e.g., liver diseases, diabetes, renal diseases, and hypertension), and number of chemotherapy sessions per week.

Second Tool: Portal Catheter Infection Complications Observation Checklist.
This tool was adapted from Matthew Johnson, Consultant Nurse Chemotherapy 15-8605, 2010 and it is utilized to systematically evaluate and track the complications resulted from implanted portal catheters connected to patient who administer chemotherapy. It included:

Systematic Infection: Pyrexia, Hypotension, Tachycardia

Local Infection: Inflammation at port pocket (PP), and tenderness at PP.
Scoring imposes including two responses (Yes, "1" or No, “Zero") scored.

Tools Validity

The developed study tools were submitted to a jury of five experts specializing in the field of Medical Surgical Nursing (MSN) to test their content validity and clarity of items. According to the jury opinion, the necessary modifications were made.

Tools Reliability

The reliability of the tools was estimated using Cornbrash’s Alpha test.

Pilot Study

A pilot study was conducted on 10% (7 Pt.) of the study subjects who were fulfilling the inclusion criteria for testing the clarity, feasibility, and applicability of the developed tools.

Ethical Considerations

Written informed consent from patients was obtained to participate in the study after explaining the aim of the study and ensuring that data collection was used only for the purpose of the study. Official permission to conduct the study was obtained from the Research Ethics Committee (REC), NF, and MU, and second permission was obtained from the director of the MOC for approval to gather data for research.

Study Procedure

Preparatory Phase

The researcher carried out the present study after formal authorization was achieved, tools were prepared through reviewing relevant related literature, and it ended by carrying out the pilot study.

Implementation Phase

Data collection for the current study was conducted individually for each participant with a portal catheter by the researcher throughout their visits at the above-mentioned setting to assess PC within approximately 30-35 minutes after an explanation of the study's purpose. Collected data started from the CG and then from the IG, using two tools. The implementation period of time for the first tool was 30–35 minutes, and for the second tool, it was all the period of care provided for the patient through the PC. Follow up for patients was through their visits to the MOC for any care through the PC. The researcher followed the patient visits through their medical records and by telephone communication with the head nurse. The researcher

attended the MOC about 3 days per week or more according to patient attendance.
The CG received routine nursing care from hospital nurses for managing PC.
The IG received care for PC from the researcher according to PC NG.

Evaluation Phase
The researcher used the second tool during the 1st, 2nd, and 3rd observations. Follow-up for patients is done before, during, and after each session of chemotherapy.

Operational Definition
Nursing guidelines to prevent IC based on the policy of the PC. The policy is based on National Health Service (NHS) NG for the management of TIVADs.

Limitations of the Study
Limited national and international studies have been conducted regarding the correlation between the application of nursing guidelines regarding IPC and the prevention of IC.

Statistical Analysis of Data
Data was coded and transferred into a specially designed format, then fed to the computer and analyzed. A statistical package for social science (SPSS), version (22), was used for statistical analysis of the data.

Results

Table 1: Frequency Distribution of Studied Groups in Relation to their Demographic Data. (n= 70)

Demographic Data	Intervention Group (N= 35)		Control Group (N= 35)		t-Test	P-Value
	No.	%	No.	%		
Age / Years						
18-28	2	5.71%	1	2.85%	1.882	.064
29-39	11	31.42%	4	11.42%		
40-49	9	25.71%	12	34.28%		
50-65	13	37.14%	18	51.42%		
Mean ± SD	49.26± 10.85		46.11± 11.66			
Gender						
Male	14	40.00	6	17.14	4.480	.034*
Female	21	60.00	29	82.85		
Occupation						
Employee	11	31.42	9	25.71	.280	.597
Non-Employee	24	68.57	26	74.28		
Educational Level						
Educated	29	82.85	19	54.28	6.629	.010**
Non – Educated	6	17.14	16	45.71		

X^2 = Chi-square Test / *= Statistically Significant Difference P – Value ≤ 0.05/
**= High Statistically Significant Difference P – Value ≤ 0.01

Table (1): Shows that frequency distribution of the studied groups according to their demographic data. More than a third of the IG and more than half of the CG were aged between 50 to 65 years old (37.14 and 51.42 percent respectively). More than half of the IG was female, while more than three-quarters of the CG were female (60.00 and 82.85 percent, respectively). In regards to occupation, the majority of both studied groups were non-employees (68.57% and 74.28%). Concerning the education level, more than three-quarters of the IG were educated, compared to more than half of the CG (82.85 and 54.28 percent, respectively).
Frequency Distribution of Studied Groups According to their Medical Data (n= 70): Figures (1-2)

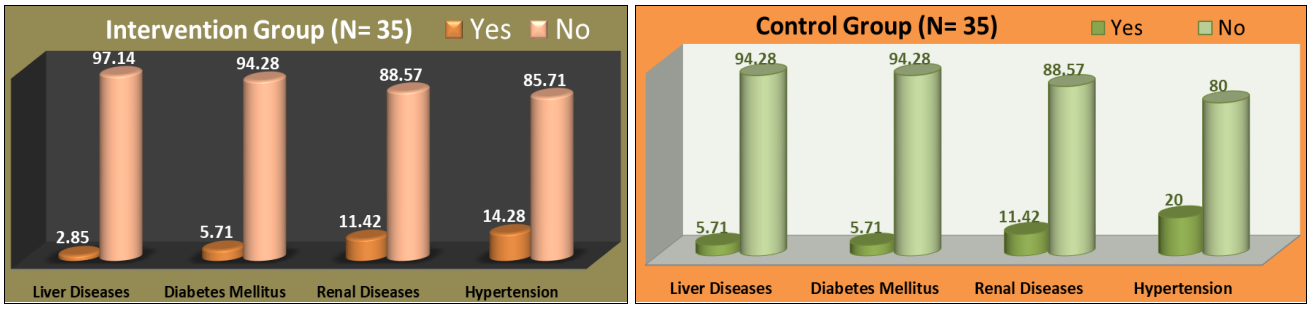

Fig 1-2: Frequency Distribution of Studied Groups According to their Medical Data (n= 70)

Figures (2): Illustrate that very lower percentage (5.71%) of the studied groups (intervention and control) had diabetes mellitus. More than tenth of the IG had hypertension, while nearly quarter of the CG had hypertension (14.28 and 20 percent, respectively).

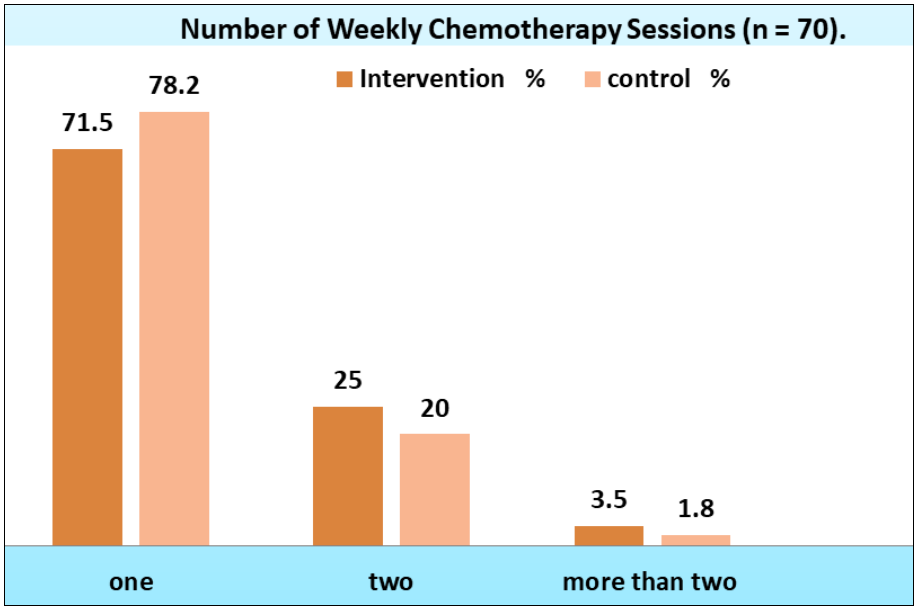

Fig 3: Frequency Distribution of the Studied Groups According to the Number of Weekly Chemotherapy Sessions (n = 70).

Figure (3): Reveals that frequency distribution of the studied groups according to their medical data. Three quarters of the IG had one chemotherapy session per week, while most of the CG had one chemotherapy session per week (71.5 and 78.2 percent, respectively).

Table 2: Frequency Distribution of the Studied Groups According to Presence of Infections at Three Observations. (n= 70).

Presence of Infection	1st Observation				2nd Observation				3rd Observation			
	Intervention		Control		Intervention		Control		Intervention		Control	
	No	%	No	%	No	%	No	%	No	%	No	%
Systemic Infection												
Yes	1	2.85	3	8.27	4	11.42	17	48.57	4	11.42	26	74.28
No	34	97.14	32	91.42	31	88.57	18	51.42	31	88.57	9	25.71
X^2 (P- Value)	12.824(.042)				16.144(.000**)				33.857(.000**)			
Local Infection												
Yes	1	2.85	4	11.42	2	5.71	13	37.14	4	11.42	20	57.14
No	34	97.14	31	88.57	33	94.28	22	62.8	31	88.57	15	42.85
X^2 (P- Value)					18.768(.000**)				24.162(.000**)			

X^2 = Chi-square Test / *= Statistically Significant Difference P – Value ≤ 0.05 / **= High Statistically Significant Difference P – Value ≤ 0.01

Table (2): Reveals that systematic infection was present in 5.71% of the intervention group while it was present in 31.42% of the control group at the first observation, it was noticed that systematic infection percent increased among intervention and control groups at the second and third observation (14.28%, 48.57%) & (14.28%, 74.28%) respectively. While local infection was present in 2.85% of the intervention group while it was present in 14.28% of the control group at the first observation, it was noticed that local infection percent increased among intervention and control groups at the second and third observation (5.71%, 37.14%) & (14.28%, 68.57%) respectively.

Table 3: Correlation between Medical Data and Occurrence of Systemic Infection at Three Observations (n= 70).

Medical Data	Systemic Infection											
	1st Observation				2nd Observation				3rd Observation			
	Intervention		Control		Intervention		Control		Intervention		Control	
	r	P- Value	r	P- Value	R	P- Value	r	P- Value	r	P- Value	r	P- Value
Liver Disease	.061	0.748	-.115	0.543	.047	0.805	.137	0.469	-.185	0.326	-.126	0.506
Diabetes Mellitus	-.216	0.252	.006	0.973	-.182	0.335	.007	0.972	-.038	0.840	-.057	0.765
Renal Disease	.195	0.301	.117	0.537	-.199	0.291	.222	0.238	.252	0.179	.199	0.293
Hypertension	.232	0.128	.203	0.282	.286	0.126	.600**	0.000	-.345	0.062	.202	0.286
Number of Chemotherapy Sessions Per Week	-.013	0.940	.166	0.340	.057	0.746	.084	0.631	-.142	0.416	.261	0.129

Table (3): Reveals that, there was no statistical correlation between systemic infection and hypertension among IG documented by P (0.126) compared to highly significant correlation among CG documented by P (0.000) at second observation.

Table 4: Correlation between Medical Data and Occurrence of Local Infection at Three Observations (n= 70)

Medical Data	Local Infection											
	1st Observation				2nd Observation				3rd Observation			
	Intervention		Control		Intervention		Control		Intervention		Control	
	r	P- Value	r	P- Value	r	P- Value	r	P- Value	r	P- Value	r	P- Value
Liver Disease	-.089	0.639	.021	0.912	-.084	0.660	.146	0.441	-.084	0.660	.235	0.211
Diabetes Mellitus	.000	1.000	.171	0.366	.171	0.366	.280	0.133	-.372	0.061	.028	0.884
Renal Disease	-.106	0.575	.275	0.141	-.372	0.061	.000	1.00	-.320	0.085	-.219	0.245
Hypertension	.347	0.060	.163	0.389	-.050	0.792	.173	0.362	.015	0.938	.051	0.787
Number of Chemotherapy Sessions Per Week	.174	0.318	.176	0.312	-.147	0.400	.105	0.547	.488**	0.003	.020	0.908

Table (4) Illustrates that there was a highly significant correlation among IG, as documented by P (0.003) at the third observation. While there was no statistical correlation between local infection and the number of chemotherapy sessions per week among CG, as documented by P (0.908).

Discussion

The subclavian, internal jugular, and axillary veins are common puncture sites for TIVAD. Implanted Venous Access Devices (IVAD) is another term for TIVAD. They are mainly used for long-term IVs or intermittent total parenteral nutrition (TPN), blood transfusions, and CM for CP [8].

Regarding age, the current study shows that more than a third of the intervention group was between the ages of 50 and 65. According to the researcher's perspective, the majority of people over fifty are more likely to experience a wide range of chronic diseases as a result of aging and physiological changes. This result is opposite that of (Kim *et al*., 2019) [2] who revealed that nearly half of cases were aged ≥60 years.

As regards gender, more than half of the IG in the present study was female. The researcher's perspective helps to explain the findings. Females are more likely than men to develop cancer diseases. This may be because female experience higher hormone levels during pregnancy and family planning procedures, in addition to higher exposure to major stresses and occupational hazards. This result is in conformity with (Kim *et al*. 2019) [2] who found that more than half of the studied samples were female. While the previous finding was contradicted by (Tsuruta *et al*. 2020) [9] who revealed that the lowest percent of the studied samples were female.

Concerning the educational level, it was observed that most of the intervention group was educated. These results might be attributed to the fact that most people are concerned with education in general. Learning becomes one of the first priorities for people because it helps them avoid health problems. This result is compatible with the finding of (Mersal *et al*., 2019) [6] which indicated that more than half of the intervention group was educated.

As regards the medical data of the intervention group the present findings indicated that more than ten percent of the IG had hypertension. The researcher's interpretation of the study's findings might be attributed to a hereditary factor or a life stressor. The current study result is in conformity with (Odabas *et al*., 2014) [7], who showed that more than ten percent of patients had hypertension. In addition, a recent study indicated that nearly ten percent of the IG had renal diseases. The researcher's interpretation of the study's findings was that renal diseases were considered one of the major diseases that affected the patients. Also, the present result illustrated that the majority of the IG take one chemotherapy session weekly. The researcher's interpretation of the study's findings is that attending the oncology center once per week may reduce the incidence of complications related to an implanted portal catheter.

Regarding the presence of systematic infection complications, the present finding reveals that more than ten percent of the IG had a systematic infection at the third observation. This result contradicts with (Mersal *et al*. 2019) [6], who observed that twenty percent of the intervention group had systematic infection post educational guidelines. In addition, the result revealed that there was no statistical correlation between systemic infection and medical data among the IG at three observations. This finding is explained by the researcher's perspective that medical data were not risk factors for the development of systemic infections.

Concerning the presence of local infection complication, the present study illustrated that local infection percentages increased among the intervention group at the third observation**.** This findings agrees with (Qiu *et al*., 2022) [8] who found that Local infections was a complication from the port.

Finally, the current study predicted that applying nursing guidelines regarding implanted portal catheters would reduce the occurrence of infection complications among chemotherapy patients.

Conclusion

According to hypothesis 1: The present finding reveals a Lower percentage of portal catheter infection complications among IG post-application NG compared with CG.

According to hypothesis 2: There was a correlation between demographic data and reducing portal catheter infection complications.

According to hypothesis 3: There was a correlation between medical data and reducing portal catheter complications.

Recommendations

Recommendations Related to Nurses

Developing a nursing guideline booklet explaining the ways of avoiding PC complications

Recommendations Related to Patients

Designed brochure includes patient instruction about how to avoid infection complications of PC.

Recommendations for Furthers Researches

The current study should be repeated using an additional probability sample for various geographical areas to generalize the findings.

Conflict of Interest
Not available

Financial Support
Not available

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