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Effectiveness of Foot Reflexology on Chemotherapy Induced Some Gastrointestinal Disturbances and Fatigue among Patients with Colorectal Cancer

Noura Eslam Mohamed [1], Neima Ali Riad [2], Seham Mohamed Abd Elalem[3] , , Neama Ahmed Mohamed [4]

[1]Clinical Instructor,
[2,3] professor of Medical Surgical Nursing,
[4]Lecturer of Medical Surgical Nursing,
[1,2,3,4]Faculty of Nursing, Menoufia University

Abstract: Background: Chemotherapy induced nausea, vomiting, retching and fatigue are the serious side effects experienced by patients with colorectal cancer. Reflexology is a complementary therapy in which practitioners have been interested in using it to reduce these side effects. **The Purpose of** the present study is to examine the effectiveness of foot reflexology on chemotherapy induced some gastrointestinal disturbance and fatigue among patients with colorectal cancer. **Design**: A quasi-experimental research design was utilized. **Setting**: The study was conducted in department of clinical Oncology and nuclean medicine, at Menoufia University Hospital, Shebin Elkom, Menoufia Governorate, Egypt. **Sample**: A consecutive sample of (60) adult colorectal cancer patients of both sexes who are receiving chemotherapy. They assigned into two equal groups (study and control groups). **Instruments**: Three instruments were used in data collection: 1) Structured Interview Questionnaire, 2) Rhodes Index of Nausea, Vomiting, and Retching 3) Brief Fatigue Inventory (BFI) Scale. **Results**: The results revealed that there were highly statistically significant differences between the studied groups according to their total score of nausea, vomiting and retching (P=0.000). Also, there were highly significant differences between the studied groups according to their total fatigue severity and its effect of daily activities (P=0.000). **Conclusions**: Foot reflexology had a positive effect on reducing some gastrointestinal disturbances (nausea, vomiting, retching) and fatigue that reflected on an improvement in daily activities. **Recommendations**: Patients and relatives should be taught about importance of foot reflexology during chemotherapy cycles.

Key words: *Chemotherapy induced gastrointestinal disturbance, Colorectal cancer, Fatigue, Foot reflexology.*

Introduction

Cancer is a large group of diseases that can start in any organ or tissue of the body when abnormal cells grow uncontrollably, go beyond their usual boundaries to invade adjoining parts of the body or spread to other organ through lymphatic and blood spread (World health organization, 2025). There are More than 200 types of human cancer have been identified based on the cell or tissue from where they originate, the most common of which is colorectal cancer (CRC) (Abedini et al., 2022).

Colorectal cancer (CRC) is one of the leading causes of cancer-related morbidity and mortality worldwide. It is slowly developing cancer that begins as a tumor or tissue growth in the inner lining of the rectum or colon (Peña-Flores et al., 2024). The clinical symptoms of CRC appear in the final stages of the disease and there is a significant golden time between the formation of polyps and the onset of cancer, early diagnosis can play a significant role in reducing mortality (Abedizadeh et al.,2024).

Management of colorectal cancer depend on the progression of the cancer and the person's medical history. Early detection of colorectal cancer can lead to better treatments and outcomes which include chemotherapy, surgery, radiotherapy, targeted therapy, immunotherapy (world health organization, 2023). Chemotherapy is a primary treatment option, it is one of the widely used anticancer treatments that involves the use of powerful cytotoxic drugs to stop tumor growth by targeting rapidly dividing cells. It is frequently associated with adverse side effects, including gastrointestinal disturbances such as nausea, vomiting and debilitating fatigue. These side effects not only impact patients' physical health but also significantly reduce their quality of life (Brianna and Lee, 2023).

Chemotherapy-induced nausea and vomiting (CINV) is a common adverse effect of cancer treatment, affecting 40%–70% of patients with cancer. While antiemetic drugs are commonly administered to manage CINV, they may not always be effective and can introduce additional complications which causes some individuals to seek alternative therapies to manage their CINV symptoms (Nelwati and Noviyani.,2024).

Fatigue is considered one of the most important adverse events caused by chemotherapy and it is a common symptom in cancer patients. Cancer-related fatigue (CRF) is defined as persistent distress that is out of proportion to recent activity and which interferes with daily life, there are two types of CRF, one caused by the cancer itself and the other caused by chemotherapy-induced fatigue (CIF) (Fukuoka et al,.2023).

Nurses play a key role in the management of CINV and fatigue for patients undergoing chemotherapy. There are numerous activities, such as patient's initial assessment, education on CINV and fatigue and use the alternative therapy during chemotherapy treatments (Cope, 2022). Nursing staff are crucial to apply alternative therapy such as foot

reflexology to manage these side effect. They should improve awareness, attention of technique of application and actively carry out in clinical practice (Li et al., 2022).

Complementary and alternative therapies such as foot reflexology, have gained attention for their potential to alleviate these symptoms. Foot reflexology is a non-invasive therapeutic practice based on the principle that specific points on the feet correspond to different organs and systems in the body. By applying pressure to these points, reflexology is believed to stimulate nerve function, improve circulation, and promote relaxation, thereby alleviating symptoms associated with chemotherapy (Klaus et al.,2024).

Significance of the Study

Colorectal cancer (CRC) is the third most common cancer in males and the second most common in females, with approximately 1.9 million new cases which represent 9.6% and is the second most frequent cause of cancer deaths, with approximately 900000 deaths which represent about 9.3%in 2022 worldwide (WHO, 2024).

In Egypt colorectal cancer is the 7Th commonest cancer, representing about 3.47% and 3.9% of male cancers and female cancers respectively (Bakr et al., 2024) .

And it was reported that about 165 colorectal cancer cases admitted to oncology department in 2024 from January to December in Menoufia oncology department (Statistical record of oncology department of Menoufia university hospital, 2024).

Colorectal cancer patients undergoing chemotherapy often experience distressing side effects, including gastrointestinal disturbances such as nausea, vomiting, along with severe fatigue. These symptoms not only affect their physical health but also impair their emotional well-being and overall quality of life. While pharmacological treatments are available to manage these side effects, they may not always be effective (Pekmezci and Hintistan, 2022). Reflexology is non-pharmacological therapies that can significantly decrease the severity of chemotherapy-induced nausea, vomiting and fatigue (Eladham et al., 2021).

However few studies were conducted to examine the effects of foot reflexology on chemotherapy induced some gastrointestinal disturbance and fatigue. This study aims to fill this gap by rigorously evaluating the effectiveness of foot reflexology in mitigating chemotherapy-induced gastrointestinal disturbances and fatigue among colorectal cancer patients.

Purpose of the Study

The purpose of this study to examine effectiveness of foot reflexology on chemotherapy induced some gastrointestinal disturbance and fatigue among patients with colorectal cancer.

Research Hypothesis:

The following research hypotheses are formulated in an attempt to achieve the purpose of the study:

1) Patients with colorectal cancer who apply foot reflexology (study group) will state reduction in chemotherapy

induced some gastrointestinal disturbance than patients who don't (control group).

2) Patients with colorectal cancer who apply foot reflexology (study group) will have lower level of fatigue than patients who don't (control group).

Operational definition:

- **Some gastrointestinal disturbance**: it is operationally defined as serious side effects of chemotherapy that occur in the gastrointestinal tract, including nausea, vomiting, and retching (National Cancer Institute, 2022). These symptoms will be measured using the Rhodes Index of Nausea, Vomiting, and Retching (RINVR)
- **Nausea** is defined as the feeling of an urge to vomit and will be assessed through RINVR items related to frequency, duration, and distress of nausea. Vomiting refers to the throwing up of stomach contents through the mouth and will be measured by RINVR items assessing frequency, amount, and distress. Retching is described as the reverse movement of the stomach and esophagus without expulsion of stomach contents and will be evaluated by RINVR items focusing on occurrence and associated distress. Fatigue is operationally defined as a feeling of tiredness and an inability to perform activities of daily living resulting from chemotherapy treatment (National Cancer Institute, 2021), and will be measured using the Brief Fatigue Inventory (BFI)

Methods

Research design:

A Quasi-experimental research design was utilized in this study (study & control group).

Research Setting:

The study was conducted in the department of clinical Oncology and neuclean medicine at Menoufia University Hospital, Shebin Elkom, Menoufia Governorate, Egypt.

Sample:

A consecutive sample of 60 patients (study and control) of both genders diagnosed with colorectal cancer were included in the study.

The studied patients were divided into two equal groups (study and control), thirty patients in each.

- **Study group**: Patients received foot reflexology in addition to routine hospital care.
- **Control group**: Patients received usual routine hospital care only (antiemetic drugs).

Patients of two groups were selected according to the following inclusion and exclusion criteria:

Inclusion criteria

- Adult patients whose age ranges between 18 - 60 years.
- Conscious and able to participate in the research.
- Patients at the first cycle of chemotherapy to follow up from the beginning before taking chemotherapy.

Exclusion criteria

- Any foot impediments (open wound, fracture or infection on the foot) due to pain.
- Mental disorders due to lack of perception, cooperation and recognition of given instructions.
- Experienced lack of sensation to reflexology such as patients with diabetes mellitus, paralysis of the lower extremities due to improper sensation and inadequate perceive of foot reflexology.
- Patients who have deep venous thrombosis because foot reflexology improve circulation, it could potentially cause a clot to move toward the heart or brain.
- Pregnancy is advisable to avoid treatment during the first three months.

Instruments of data collection:

For achieving the purpose of the current study, the following instruments were used:

Instrument one:- Structure interview questionnaire

It was designed by the researcher based on related recent literature (Eladham et al., 2021), it comprised Arabic structured items related to different aspect of sociodemographic as well as medical data and consists of three parts:

- **Part one: Patient's socio-demographic data**: which included question related to age, gender, marital status, occupation, level of education and residence.
- **Part two: Patient's medical data**: it aimed to assess patients medical history which included past and present medical history such as presence of chronic diseases, smoking, diagnosis, duration of disease, stage of cancer and chemotherapy regimen as (chemotherapy cycle, interval between each cycle).
- **Part three: Anthropometric measurements**: it included question related to weight, height and BMI.

Instrument two: - Rhodes Index of Nausea, Vomiting, and Retching self-report assessment

It was adopted from Rhodes and McDaniel in (1999) and translated into Arabic language by the researcher, it used to measure severity and distress of nausea, vomiting and retching among patients receiving chemotherapy.

The Rhodes index of nausea, vomiting, and retching (RINVR) include an eight self-report questions. The first three questions were used to assess the patients feeling and their experience of nausea as frequency of nausea, duration of nausea and distress from nausea, and the second three questions were used to assess vomiting as frequency of vomiting, amount of vomiting, distress from vomiting, and the last two questions were used to assess retching as frequency of retching, and distress from retching.

Scoring system:

Each item was scored in the (5) point Likert type scale from 0 to 4 "zero" was indicate no symptoms, "one "was indicate mild symptoms, "two "was indicate moderate symptoms, "three" was indicate great symptoms, and "four" for severe symptoms.

- All eight self-reported questions were summed to give the total score that range from 0-32.

Instrument three: The Brief Fatigue Inventory (BFI) self-report assessment scale

This scale was adopted from Anderson (1997) and translated into the Arabic language by the researcher, it used to assess fatigue severity and interference with daily activities. It consists of nine items, The first three questions measure fatigue severity as present, usual and worst level of fatigue, while the following six questions assess fatigue interference with daily activities as general activity, mood, walking ability, normal work (both inside and outside the home), relations with other people and enjoyment of life.

Scoring system:

Each item of the scale is rated in 11-point numeric scale from 0–10, with 0 indicating no fatigue while 10 indicating the worst level of fatigue. Fatigue severity score was assessed and calculated by summing the first three items and dividing the total scores by three while the score of fatigue effects on life activities was assessed and calculated by summing the following six items and dividing the total score by six.

Ethical consideration

- A written approval was obtained from ethical and research committee of the Faculty of Nursing, Menoufia University to carry out the study from responsible authorities after explanation of the purpose of the study (No. of ethical research committee form ERCNMA 1000 /4/17/28/24).
- Patients who agree to participate in the study were informed that participation in the study was voluntary and they can withdraw from the study at any time without penalty.
- Confidentiality and anonymity of patients were assured through coding all data and put all papers in a closed cabinet.
- Patients were taught that instruments wouldn't caused any physical or emotional harm.
- A written consent was obtained from all participants who were meet the inclusion criteria to participate in the study after explanation of the study purpose and benefits.

Preparatory phase:

The phase included reviewing the literatures of various aspects of study to develop the appropriate tools for data collection according to supervisor guidance of expert's opinions. The researcher developed colorectal cancer booklet in Arabic language, the researcher also visited the study setting to acquainted with personal setting. The tools were tested by the following tests:

Face validity

All instruments were tested for content validity by a jury of six experts in the field of Medical Surgical Nursing (five professors, one assistant professor from Faculty of Nursing Menoufia University and one nursing staff from oncology department. Their opinions elicited regarding the content format, consistency, accuracy and relevancy;

necessary modifications were done accordingly.

Reliability of the instruments:

Test re-test method was used to ascertain reliability of instruments. For instrument one reliability was 0.97. The reliability of the second instrument (Rhodes Index of Nausea, Vomiting, and Retching self-report assessment instrument) was tested by Eladham, et al., (2021) and it was found that the test-retest reliability was 0.94 and reported that it has excellent test-retest reliability. While reliability of instrument three (Brief Fatigue Inventory) was tested by Mendoza et al., (1999) by test-retest method it was shown that r 0.96 and it is considered excellent.

Pilot study

Prior to actual study, a pilot study was conducted on 10% of subjects (10 patients) to assess the constructed instruments for feasibility and applicability. Then the necessary modifications were carried out. The results of pilot study were included in the actual study.

Procedure:

- An official letter was submitted from the Dean of the Faculty of Nursing, Menoufia University to the director of Oncology Department including the purpose of the study and methods of data collection.
- Data collection period spanned five months from April to august 2024.
- The researcher attended the study setting four days per weeks during morning shift in the department of clinical Oncology and nuclean medicine.
- Patients who fulfill the inclusion criteria were assigned and divide alternatively into two equal groups: study group and control group.
- The researcher was meet participant in outpatient's clinic for new cases from 10 am to 2 pm explain study then obtain oral and written consent from participants then conduct interview.
- The researcher was found that the patients with colorectal cancer follow specific protocol of chemotherapy (folfox, calcium leucovorin, oxaliplatin) and they came to sessions every two weeks.
- The study was conducted on four phases: assessment, planning, implementation and evaluation phase.

1-Assessment phase

Once the researcher got consent from the patients an interview started individually for each patient in the outpatient clinic during medical examinations and preparation of the patient before deciding chemotherapy cycles, the researcher was collecting sociodemographic and medical data using instrument I and assess nausea, vomiting and retching using tool II. Also, the researcher assesses the fatigue severity and it is interference with daily activity using tool III. The tools were collected by the researcher for each subject, in addition to the researcher knowing the time that the patient was attend to oncology department to take the first chemotherapy cycle.

2-Planning phase:

Once the initial assessment was finished, the intervention protocol was developed through recent literature, revised and modified based on expert's comments in order to be implemented using handout illustrative booklet in a very simple Arabic language as well as supplemented by photo. The booklet contained the following information: definition, sign and symptoms, risk factor, complication, prevention, management of colorectal cancer. Also, definition, benefit, contraindication, map, reflex zone therapy and application technique of the foot reflexology.

The intervention protocol was designed based on patient needs and the learning plan covers general and specific objectives by the researcher. Two sessions were planned for the study group each session was 30-45 minute.

3-Implementation phase:

During this phase the studied patients who met inclusion criteria were recruited to the study and the researcher was interviewed the patients in the study group individually in two sessions, the first session before starting chemotherapy cycle and the second session during chemotherapy cycles (1st, 2nd and 3rd), between each cycle 15 days. The previously prepared booklet was distributed by the researcher at the beginning of the first sessions. Lectures, printed material and videos were used for more illustration. The prepared intervention was conducted through the following sessions

- **First session**: Starting before chemotherapy cycles. At the beginning of this session, the researcher provided each patient of the study group and relatives information related to colorectal cancer and foot reflexology. At the end of this session, the researcher allowed each subject to ask questions and provided them with answer.
- **Second session**: Foot reflexology was applied to the study group during initial three cycles of chemotherapy administration in front of their relatives to teach them how to apply foot reflexology at home.

4-Evaluation phase:

- All subjects of both groups were assessed for nausea, vomiting, retching and fatigue after 24 hours after each first, second and third chemotherapy cycle by the telephone using instruments II and III (Appendix III & Appendix IV).
- Comparison was made between the two groups to examine effectiveness of foot reflexology on chemotherapy induced some gastrointestinal disturbance and fatigue among patients with colorectal cancer.

Statistical analysis:

The data collected were tabulated & analyzed by SPSS (statistical package for the social science software) statistical package version 25 on IBM compatible computer.

Two types of statistics were done:

1) **Descriptive statistics**: were expressed as mean and standard deviation (X+SD) for quantitative data or number and percentage (No & %) for qualitative data.
2) **Analytic statistics:**

1. Pearson Chi-square test ($\chi 2$) was used to study association between two qualitative variables.
2. Independent samples t test was used for comparison between two independent groups of normally distributed quantitative variables.
3. One Way ANOVA test was used for comparison between more than two independent groups of normally distributed quantitative variables.
4. Pearson correlation coefficient test was used for quantitative variables.

P-value at 0.05 was used to determine significance regarding:

- P-value ≥ 0.05 to be statistically insignificant.
- P-value < 0.05 to be statistically significant.
- P-value < 0.01 to be highly statistically significant.

Results

Table (1) illustrates frequency distribution and significant difference of the studied groups according to their present medical data. It was observed that about more than half of both study and control groups (56.7 % and 66.6 % respectively) had colon cancer. Regarding duration of disease (months) (50.0%) of study group had cancer from 1-4 months (5.56±4.0) and (36.7 %) of the control groups had cancer ≥10 months (7.46±4.29). As regard stage of the disease (33.3%, 40.0 %) of the study and control groups had Stage IV of disease. In relation to number of scheduled chemotherapy sessions (63.3 % and 56.7 % respectively) of both study and control groups had >10 chemotherapy sessions.

Table (2) Explains frequency distribution and significant difference of the studied groups according to their total score of nausea, vomiting and retching throughout the first three cycles of chemotherapy administration. This table reveals that (53.4%) of the study group had moderate nausea, vomiting and retching after the 1st cycle. Moreover, the percent have been decreased after the 3rd cycle to be (33.3%) had mild nausea, vomiting and retching with mean (5.53±4.4), while in the control group (43.4%) had moderate nausea, vomiting and retching after the 1st cycle. But the percent had been increased to be (63.4%) had moderate of nausea, vomiting and retching with mean (14.7±5.2). Therefore, there were highly statistically significant differences between the study and control groups according to their total score of nausea, vomiting and retching throughout the first three cycles of chemotherapy administration at 0.001 level of statistical significance.

Table (3) Explains frequency distribution and significant difference of the studied groups according to fatigue severity throughout the first three cycles of chemotherapy administration. This table shows that two third of the study group (66.7%) had moderate fatigue after the 1st cycle. Moreover, the percent had been

decreased after the 3rd cycle to be (56.7%) had moderate fatigue, while in the control group (56.7%) had moderate fatigue after the 1st cycle. But the percent had been increased to be (70.0%) had moderate fatigue after the 3rd cycle. Therefore, there were highly statistically significant differences between the study and control groups according to their total fatigue severity throughout the first three cycle of chemotherapy tests at 0.001 level of statistical significance.

Table (4) Explains frequency distribution and significant differences of the studied groups according to their total effect of fatigue on daily activities throughout the first three cycles of chemotherapy administration. It shows that in the study group (56.7%) had moderate interfere after the 1st cycle. Moreover, the percent have been decreased after the 3rd cycle to be (46.7%) had moderate interfere, while in the control group (53.3%) had moderate interfere after the 1st cycle. But the percent have been increased to be (63.3%) had moderate interfere after the 3rd cycle. Therefore, there were highly statistically significant differences between the study and control groups according to their total fatigue severity and effect of fatigue on daily activities throughout the first three cycles of chemotherapy administration at 0.001 level of statistical significance.

Table (1): frequency distribution and significant difference of the studied groups according to their present medical data (n= 60).

Present medical data	Study group (n=30)		Control group (n=30)		X^2	P-value
	No.	%	No.	%		
Site of cancer :					0.667 ns	0.716
Colon	17	56.7	20	66.6		
Rectal	7	23.3	5	16.7		
Colorectal	6	20.0	5	16.7		
Duration of disease(months)					3.750 ns	0.153
1-4	15	50.0	9	30.0		
5-9	10	33.3	10	33.3		
≥10	5	16.7	11	36.7		
Mean SD	5.56±4.0		7.46±4.29		t=1.766 ns	0.083
Stage of the disease					3.978 ns	0.264
Stage I	1	3.4	5	16.7		
Stage II	9	30.0	6	20.0		
Stage III	10	33.3	7	23.3		
Stage IV	10	33.3	12	40.0		
Number of scheduled chemotherapy sessions					0.778 ns	0.678
<5	2	6.7	4	13.3		
5-10	19	63.3	17	56.7		
>10	9	30.0	9	30.0		

X^2: Chi-square test. SD: Standard Deviation. No Statistically significant at p >0.05.

Table (2): frequency distribution and significant difference of the studied groups according to their total score of nausea, vomiting and retching throughout the first three cycle of chemotherapy administration (n=60). (n=60).

Total score	Study group (n=30)						Control group (n=30)						Test of significant		
	1st session		2nd session		3rd session		1st session		2nd session		3rd session		(p^1)	(p^2)	(p^3)
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
None	0	0.0	5	16.6	4	13.3	0	0.0	0	0.0	1	3.3	X^2=11.34 p=0.010*	X^2=25.62 p=0.000**	X^2=23.48 p=0.000**
Mild	7	23.3	11	36.7	16	53.4	1	3.3	1	3.3	2	6.7			
Moderate	16	53.4	14	46.7	10	33.3	13	43.4	17	56.7	19	63.4			
Great	7	23.3	0	0.0	0	0.0	10	33.3	8	26.7	7	23.3			
Severe	0	0.0	0	0.0	0	0.0	6	20.0	4	13.3	1	3.3			
Mean SD	11.8±5.06		6.96±4.7		5.53±4.4		19.1±6.4		16.8±5.17		14.7±5.2		t=4.897 p=0.000**	t=7.753 p=0.000**	t=7.349 p=0.000**

X^2: Chi-square test. **t:** Independent samples t test**.** **P:** p-value. * Significant at p ‹ 0.05. **Highly significant at p ‹ 0.01.

P_1: p value for comparing between two group at **1st session**. **P_2:** p value for comparing between two group at **2nd session**.

P_3: p value for comparing between two group **3rd session**.

Table (3): frequency distribution and significant difference of the studied groups according to fatigue severity throughout the first three cycle of chemotherapy administration (n=60).

Fatigue severity	Study group (n=30)						Control group (n=30)						Test of significant		
	1st session		2nd session		3rd session		1st session		2nd session		3rd session		(p^1)	(p^2)	(p^3)
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
None	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	X2=12.83 p=0.002**	X2=15.95 p=0.000**	X2=15.17 p=0.001**
Mild	8	26.7	9	30.0	12	40.0	1	3.3	1	3.3	1	3.3			
Moderate	20	66.7	20	66.7	17	56.7	17	56.7	17	56.7	21	70.0			
Worst	2	6.6	1	3.3	1	3.3	12	40.0	12	40.0	8	26.7			

X^2: Chi square test. P: p-value. NS : No significant at p >0.05. **Highly significant at p ‹ 0.001.

P_1: p value for comparing between two group at 1st session. P_2: p value for comparing between two group at 2nd session.

P_3: p value for comparing between two group 3rd session.

Table (4): frequency distribution and significant difference of the studied groups according to effect of fatigue on daily activities throughout the first three cycle of chemotherapy administration (n=60).

Effect of fatigue on daily activities	Study group (n=30)						Control group (n=30)						Test of significant		
	1st session		2nd session		3rd session		1st session		2nd session		3rd session		(p_1)	(p_2)	(p_3)
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
No interfere	0	0.0	0	0.0	1	3.3	0	0.0	0	0.0	0	0.0	X^2=23.29 p=0.000**	X^2=24.80 p=0.000**	X^2=24.09 p=0.000**
Mild interfere	12	40.0	15	50.0	14	46.7	0	0.0	0	0.0	0	0.0			
Moderate interfere	17	56.7	14	46.7	14	46.7	16	53.3	18	60.0	19	63.3			
Severe interfere	1	3.3	1	3.3	1	3.3	14	46.7	12	40.0	11	36.7			

X^2: Chi square test. P: p-value. NS: No significant at p >0.05. **Highly significant at p ‹ 0.001.

P_1: p value for comparing between two group at 1st session. P_2: p value for comparing between two group at 2nd session.

P_3: p value for comparing between two group 3rd session.

Discussion:

Chemotherapy-Induced Nausea and Vomiting (CINV) are the two most dreadful and unpleasant side-effects of chemotherapy for cancer patients (Mosa et al., 2020). It can significantly affect patient care and quality of life (QOL). Despite advances in antiemetic therapies used in the prevention and control of nausea and vomiting it was found that almost 50% of patients tend to experience acute, delayed or expected nausea and vomiting. Furthermore, even in very effective antiemetics such as serotonin antagonists, 38-80% of patients experience nausea and vomiting in a severe way and this causes 20% of patients to postpone or refuse treatment (Pekmezci and Hintistan, 2022).

Chemotherapy induced fatigue (CIF) is a frequent and potentially debilitating side effect of chemotherapy that affects approximately 40% of patients with cancer, it interferes with cancer patients' body functions and their daily activities (Chen et al., 2023). Reflexology is non pharmacological methods that could be directly involved in the practice by qualified nurses. It is applied to prevent nausea, vomiting, Retching and fatigue (Yeun et al.,2021).

As regard to present medical data of the studied groups through the first three cycles of chemotherapy.

Pertaining to site of cancer, the results of the current study mentioned that more than half of the study group had colon cancer. This result is consistent with Takasiet al., (2024) reported that about near half of patients in the experimental group and half of patients in the control group were diagnosed with colon cancer.

But this result not agree with Uysal et al., (2017) who study entilted "Effects of foot massage applied in two different methods on symptom control in colorectal cancer patients" in Beyazıt University, Ankara, Turkey, who found that 80% of the study group have rectal cancer.

From researcher point of view, this may be due to difference in setting of study or may be related to dietary habits and life style difference.

Moreover, tumor stage, the result of the current study reveals that about two third of the study group were at the third and fourth stage of the disease. This finding is similar to study conducted in Shahid Beheshti University of Medical Sciences, Tehran-Iran by Gholamzadeh et al., (2023) entitled "The Effect of Reflexology on Quality of Life in Colorectal Cancer Patients Suffering Chemotherapy-induced Neuropathy: A Randomized and Controlled Trial" and mentioned that about half of patients in the experimental group and near half of patients in the control group were diagnosed with Stage III colorectal cancer and less than one third of patients in the experimental group and more than one third of patients in the control group were diagnosed with Stage IIII colorectal cancer.

Also, these finding are similar to study conducted by Abedini et al., (2022) who studied "Effect of Reflexology on the Quality of Sleep in Colorectal Cancer Patients" and showed that half of participants in the study and control groups were diagnosed with Stage III colorectal cancer. While these result contradicted with Takasiet al., (2024) Whose result demonstrated that the

majority of studied group at second stage of disease.

From the researcher point of view: most of the colorectal cancer patients diagnosed with stage III and IV because symptoms of colorectal cancer typically don't start manifesting until the cancer become more advanced that means their cancer is being found later when it's harder to treat. So, patients with colorectal cancer discover the disease at late stage. Also due to the most people in our society not commited to perform periodic checkup for early screening for colorectal cancer.

Furthermore, number of cycles received, the result of this study revealed that about two third of participants in the foot reflexology group and more than half of participants in the control group received 5-10 cycles of chemotherapy. This is inconsistent with Murat-Ringot et al., (2021) and showed that about two third of participants in the foot reflexology group and the majority of participants in the control group received less than five cycles of chemotherapy.

From the researcher point of view, the number of chemotherapy cycle depends on the stage and severity of the disease.

As regard to duration of disease, the result of the current study reveals that half of study group diagnosed with colorectal cancer for less than five months and one third of both groups between 5-10 months This result agrees with Asha et al., (2020) who studied "Effect of Foot Massage on Patients with Chemotherapy Induced Nausea and Vomiting and showed that the majority of study group and about two thirds of control group have disease for less than 4 months.

In the same line this finding similar to study conducted by Gholamzadeh et al., (2023) and result showed that the majority of study group and more than two thirds of control have cancer under one year. Also, Abedini et al., (2022) Who study "Effect of Reflexology on the Quality of Sleep in Colorectal Cancer Patients "and result showed that two thirds of the study and control groups diagnosed with cancer for less than one year.

Regarding nausea, vomiting and retching assessment of studied groups

The results of the current study revealed that there were highly statistically significant differences between the studied groups according to their total score of nausea, vomiting and retching throughout study periods (P value= 0.001), the finding of the present study support the hypothesis number (1), which showed that Patients with colorectal cancer who apply foot reflexology (study group) will state reduction in chemotherapy induced some gastrointestinal disturbance than patients who don't (control group). From the researcher point of view, this may be attributed to application of foot reflexology as non-pharmacological managment to reduce chemotherapy induced nausea, vomiting and retching by inhibit the activity of the CTZ that reducing the detection of chemical substances that trigger nausea and vomiting, modulation of neurotransmitter Activity such as serotonin and dopamine which can help regulate nausea and vomiting. Also, may stimulate anti-nausea pathways, such as the release of endorphins, which can help reduce nausea, vomiting and retching.

These results were in agreement with Sontakke et al., (2020) who study entilted Effectiveness of foot reflexology on nausea and vomiting among patient

undergoing chemotherapy. They found that foot reflexology leads to significant improvement in nausea and vomiting among patients undergoing chemotherapy. Moreover, this result is in the same line with the finding of Sevilay and Hilal (2019) who found that foot reflexology has good effects on nausea and vomiting among lung cancer patients receiving chemotherapy. They concludied that foot reflexology can be utilized in the reduction or prevention of nausea and vomiting.

Likewise, the result displayed by Eladham et al. (2021) confirmed the benefits of foot reflexology sessions on the reduction of chemotherapy induced nausea, vomiting, and fatigue among patients with breast cancer. Also, Pekmezci and Hintistan, (2022). Who study entilted" impact of foot reflexology on nausea-vomiting and sleep quality in patients with lung cancer receiving chemotherapy" in Turkey. And the result show there were statistically significant differences between the experimental and control groups in the RINVR, total (p=0.0001).

These findings inconsistent with Yükseltürk Şimşeket al., (2022) who studied" Effect of Reflexology on Nausea, Vomiting and Anxiety in Patients with Breast Cancer Receiving Chemotherapy". Which showed that the mean scores of nausea, vomiting and retching experience, occurrence and distress in both groups were lower than the initial measurement, there was no difference between the groups.

As regard to fatigue severity and it is interfered with daily activities

The results of the current study revealed that there were highly statistically significant differences between the studied groups according to their total score of fatigue and it is interferences with daily activities throughout study periods (P value= 0.001), the results of the present study supported the hypotheses number (2), which showed that Patients with colorectal cancer who apply foot reflexology (study group) will have lower level of fatigue than patients who don't (control group).

From the researcher point of view this may be attributed to application of foot reflexology as non-pharmacological management to relieve chemotherapy induced fatigue by stimulates nerve endings in the feet, which send signals to the spinal cord and brain this activates brain regions involved in fatigue regulation, including the hypothalamus, pituitary gland and adrenal glands, stimulate the release of neurotransmitters such as serotonin, dopamine, and endorphins, which can help relieve fatigue. These results are similar to study conducted in Iran by Farouk Abolwafa et al., (2024) who conduct the study entitled" Effect of Foot Reflexology on Fatigue, Pain and Insomnia among Children undergoing Chemotherapy" reported that there were very significant statistical differences between the study group and control group in terms fatigue (P= <0.0001).

Also, Shoghi, et al., (2024) who studied" The Effects of Foot Reflexology and Simple Foot Massage on Fatigue and Pain in Children with Leukemia". A Randomized Control Trial in Minia Universities, Egypt and the results showed less fatigue in reflexology group than in the control group, fatigue was significant (P<0.001). Also, this result in agrement with Mazloum et al., (2023) who studied" Effects of Warm Footbath and Foot

Reflexology on the Fatigue of Patients Undergoing Radiotherapy". A Randomized Clinical Trial in Mashhad University of Medical Sciences, Iran and show the reflexology group indicated a significant reduction from 90.9 ± 3.2 in the pre-test to 56.0 ± 3.7 on the 28th day. Also, Parizad et al., (2024) whose study is entitled "Comparing the impact of acupressure and reflexology on fatigue in chronic lymphocytic leukemia patients: A randomized controlled trial in Urmia University of Medical Sciences, Urmia, Iran. And Results showed both acupressure and reflexology significantly reduced fatigue compared to the control group ($P < 0.001$).

Conclusions:

Foot reflexology intervention had a positive effect on reducing some gastrointestinal disturbances (nausea, vomiting, retching) and fatigue that reflected on an improvement of daily activities among colorectal cancer patients at highly statistically significant difference (p=0.000), which supported the research hypotheses.

Recommendations:

Based on the findings of the present study, the following recommendations are derived and suggested:

- Patients and relatives should be taught about the importance of the foot reflexology technique during chemotherapy cycles.
- Simplified booklet about colorectal cancer, risk factor, sign and symptoms, prevention, management, chemotherapy and application of foot reflexology to relieve gastrointestinal disturbances and fatigue should be available for colorectal cancer patients.
- Integration of foot reflexology into oncology care. It should be considered as a complementary therapy a long side standard medical treatment for managing chemotherapy induced nausea, vomiting and fatigue.

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