The Effect of Implementing Nursing Safety Measures and Healthy Nutritional Regimen for Patients Undergoing Cholecystectomy

Fatma A. El-Shahat[1], Manal H. Mahmoud[2], Hala A. Sheta[2], Ola A. Mohamed[2]
[1]Nursing specialist at El mahalla hepatology Educational Hospital
[2]Medical Surgical Nursing Department, Faculty of Nursing, Benha University
E-Mail: totamoda51@gmail.com

Abstract

Background: The surgical removal of the gallbladder is cholecystectomy, which is currently one of the most prevalent abdominal surgical procedures. The knowledge, perspectives, and attitudes of nurses affected the extent to which they adhered to safety guidelines and implemented a healthy nutritional regimen for patients after cholecystectomy. Aim of the study: This research aimed to ascertain the impact of implementing nursing safety measures and healthy nutritional regimen for patients undergoing cholecystectomy. Design: In order to accomplish the purpose of this work, a pre\post research design approach comparing interventions before and after their implementation was utilized. Setting: The research was carried out at an outpatient clinic and surgical department associated with Benha University Hospital, located in the Qualyubia Governorate of Egypt. Sample: All eligible nurses (67) employed in the aforementioned contexts were selected as a convenience sample. And the sample included also 75 patients of both sexes were selected as a purposeful sample. Tools: Three tools were utilized, tool I: Structured questionnaire for nurses to determine nurses' knowledge concerning basic concepts of safety measures and healthy nutritional regimen for patient post cholecystectomy, tool II: Observational checklist to determine nurses' practices pre, during and post cholecystectomy, tool III: Cholecystectomy patients' assessment questionnaire to assess expected complications post cholecystectomy. Results: 28% of nurses under study had good total knowledge level about cholecystectomy pre-educational program which improved to 76% and 73.3% of them post and during follow up respectively, 69.3% of nurses under study achieved a satisfactory total practices level about perioperative patients' safety pre-educational program which enhanced to 94.7% and 93.3% of them post and during follow up respectively.

Conclusion: On the basis of the present study's findings, it is possible to conclude that the knowledge and practise scores of the examined nurses improved statistically significantly following the adoption of the dietary regimen programme and safety measures for nurses. Positive patients' outcomes regarding preventing post cholecystectomy complications which supported the study hypothesis.

Recommendations: Implementing regular in-service training programs for surgical nurses with the aim of enhancing, updating, and revitalizing their understanding and application of patient care in the context of cholecystectomy.

Key words: Safety measures, Healthy nutritional regimen, Cholecystectomy.

1.Introduction

Cholecystectomy is the surgical removal of the gallbladder and is one of the most common abdominal surgical procedures today; the two basic types of this procedure are open cholecystectomy and the laparoscopic

approach. It is estimated that the laparoscopic procedure is currently used for approximately 80% of cases. Performed to treat cholelithiasis and cholecystitis that is recommended when symptoms become frequent, recurrent, or more severe[16].

Cholecystectomy is established as the therapy of choice for symptomatic cholelithiasis. The rise in laparoscopic procedures can be attributed to the reduction in postoperative discomfort and the lengthening of the healing period in comparison to open cholecystectomy. These advantages enable patients to recover more quickly and be discharged from the hospitals sooner[11].

Ensuring patient safety entails preventing harm or injury to patients throughout the provision of medical services; negligence in this regard may re-

sult in irreversible harm. An adverse event is characterized as an inadvertent harm that leads to an extended period of hospitalization, discharge-related disability, or fatality. Its etiology can be attributed to healthcare management deficiencies rather than the patient's underlying illness process[29].

Patient post cholecystectomy have to follow healthy nutritional regimen because after gallbladder removal patient will suffer from fat indigestion due to bile duct dilatation to store more bile. Patient should eat low fat meal with high fiber to help alleviate postoperative symptoms. Low calories of fat and carbohydrate and increase fibers can improve diarrhea postoperative. Eating small portions of meal from time to time especially in the first 2 months after surgery to ensure good full absorption and avoid incidence of diarrhea [20].

The knowledge, attitudes, and perceptions of nurses affected their adherence to cholecystectomy patient safety guidelines. Nurses assume numerous responsibilities and are primarily tasked with ensuring patient safety within the intricate healthcare setting. Research has demonstrated that the impact of

nurses' personal and professional values and attitudes on their adherence to patient safety consistently is more significant than that of their workloads. There is a belief that various individual factors, including the attitudes, perceptions, knowledge, and information seeking of nurses, can either support or impede their utilization of clinical practice guidelines. As a result, inconsistent adherence to patient safety principles may pose a threat to patient safety [31].

2.Significance of the study:

In Egypt, there is increasing incidence and prevalence rate of patients treated by cholecystectomy, it was observed that there is insufficient information to promote patient safety standards of nursing care before, during and after surgery[13].

In Benha, the number of patients who performed cholecystectomy during the year of 2021 and admitted to general surgery department of Benha University Hospital was approximately 142 case, 89 case performed open Cholecystectomy and 53 case performed laparoscopic Cholecystectomy **(Benha University Hospital statistical office, 2021).**

Aim of the study

The objective of the present research was to assess the impact of implementing nursing safety measures and healthy nutritional regimen for patients undergoing cholecystectomy.

Study hypotheses:

H1: The mean scores of nurses' level of knowledge regarding care of patients undergoing cholecystectomy post implementing nursing safety measures and healthy nutritional regimen could be significantly greater than their scores before.

H2: The mean scores of nurses' level of practices regarding care of patients undergoing cholecystectomy post implementing nursing safety measures and healthy nutritional regimen could be significantly higher than their scores before.

H3: Patients' post cholecystectomy complications could be significantly decreased after implementing nursing safety measures and healthy nutritional regimen than before.

3.Subjects and Method:
Study design:

In order to accomplish the objective of the current study, a quasi-experimental comparative study design was employed before and after the study implementation. A quasi-experimental design is defined as an empirical interventional study used to investigate whether there is a causal correlation between independent and dependent variable [21].

Study setting:

The research was carried out at an outpatient clinic and surgical department divided into two floors contains 18 beds in 3 rooms affiliated with Benha University Hospital, situated in the Qualyubia Governorate of Egypt.

Subjects:

Nurses: Convenience sampling of the 67 available nurses working in the aforementioned settings, of both sexes, with at least two years of experience, qualifications, and willingness to engage in the study.

Patients:

A purposive sample of 75 cholecystectomy patients, aged between 21 and 60 years, was selected to represent both sexes. These individuals voluntarily consented to participate in the study.

Tools of data collection:

In order to fulfil the objectives of the research, the investigator utilized three tools to gather data for this study.

Tool 1: Structured interview questionnaire for nurses:

-This tool was designed by the investigator following reviewing of current pertinent literatures and scientific references and presented in simple Arabic structured items. It involved **72** multiple choice questions adapted from[7], [8],[3], It consisted of two parts as following:

Part (1): Nurses 'personal data: It was constructed and included **9** multiple choice questions to assess personal data related to their age, sex, educational qualification, years of experience in nursing, years of work in surgical department and attendances of training courses about safety measures, how many courses attended in safety measure, training courses about nutrition post operations and how many courses attended.

Part (2): Nurses' knowledge assessment: This part designed to determine the knowledge of nurses regarding basic concepts of patient safety, principles of patient safety, importance, goals and factors that help to improve patient safety, nurses' role, types of infection control measures, environmental hygiene, hand hygiene, patients' nutritional regimen and patients' complications.

This part included **63** multiple choice questions split into **5** sections as the following:

Section I: Nurses' knowledge assessment about biliary system and cholecystitis. It comprised **4** multiple-choice questions designed to assess the knowledge of nurses about biliary system definition, gallbladder definition, cholecystitis causes, signs and symptoms.

Section II: Nurses' knowledge assessment about cholecystectomy. It included **3** multiple choice questions to determine nurses' knowledge about cholecystectomy**,** it is treatment ways and duration of hospital stay for surgery.

Section III: Nurses' knowledge about safety measures for patients pre, during and post cholecystectomy:

It was included **56** multiple choice questions covers nurses' knowledge about safety measures precholecystectomy (**5**questions), sterilization and disinfection of tools and instruments intra operation(**7** questions), knowledge about safety measures post cholecystectomy(**5** questions), knowledge about medication administration (**6** questions), knowledge about observation post cholecystectomy (**5** questions), knowledge about dealing with patients' connections (**3** questions), knowledge about falling prevention (**2** questions), knowledge about healthy nutritional regimen for patients post cholecystectomy (**14** questions), knowledge about post choltcystectomy complications (**9** questions).

Section IV: Nurses' knowledge assessment abouthealthy nutritional regimen, it included 14 multi choice questions about healthy dietery regimen, allowances and forbidden of food and digestion differences post cholecystectomy.

Section V: Nurses' knowledge assessment about post cholecystectomy complications, it included 10 multi choice questions about post complications which divided into early and late complications.

Scoring system for patient knowledge assessment questionnaire:

A correct response receives one point on the knowledge scale for nurses, while an incorrect response receives zero to seventy-two points. Percentages were assigned to the following classifications of knowledge scores:

* Poor score <50% (<36 score).

*Average score 50% - < 75% (36 - < 54 score).

* Good score ≥ 75% (≥ 54 score).

Tool II: Nurses' practice observational

checklist:

This tool was designed by the investigator from recent pertinent literature review,

It aimed to assess nurses' level of practice in surgical department pre and post implementation of safety measures and healthy nutritional regimen regarding care for patients undergoing cholecystectomy. Adapted from **[6],[5],[15].**

It was comprised of the following three sections:

Part (1): Pre-operative preparations phase: about preoperative nursing care which met individually for each patient as care for patient pre-cholecystecomy including 95 steps.

Part (2): Intra-operative phase: Practice about Preparing patient and equipment of surgery and this phase begin in the surgical department and ended in surgical room including 34 steps.

Part (3): Postoperative phase: In this phase there is practice patients' postoperative care to avoid any complication after surgery in the recovery room including 76 steps.

Scoring system for nurses' practice observational checklist:

The scoring distributed as:2 scores for each activity regularly done, **1** score for each activity irregularly done or not done 0 for each activity, the scores were ranged from **0** to **205** and expressed as a percentage and classified as follows:

* Satisfactory level ≥ 80% (≥164).

* Unsatisfactory < 80% (164).

Tool III: Cholecystectomy patients' assessment questionnaire:

This questionnaire designed by the investigator in simple Arabic structured items following reviewing current relevant literatures **[27], [34], [38]** and scientific references. It aimed to assess expected complications that might develop among patients undergoing cholecystectomy admitted to the surgical department pre and post implementation of nursing safety measures and healthy nutritional regimen, it comprised two parts as follows:

Part (I): Patients' private information: It comprised six elements containing information regarding occupation, residence, age, gender, marital status, and degree of education.

Part (2): It included **14** questions about Patients' medical and surgical data including diagnosis, patient complaint, signs appeared on patient, length of the disease, pain site, intensity, analgesics prescribed medication, other illness patient suffer from, other medications prescribed.

Part (3): It included 2 checklists about Patients' post-operative complications involved **4** early complications and **9** late complications, some of these complications may be symptomatic or assessed with physiological parameters.

Nursing safety measures and healthy nutritional regimen booklet:

It was developed by the investigator and presented in straightforward Arabic, drawing inspiration from pertinent modern scientific literature and references**[40], [35], [33], [25],[17], [28],[14],[30], [36],[22]** that included all theoretical and practical content, each nurse received it subsequent to the pretest; it comprised two components:

The theoretical part: It was about basic knowledge related to patient safety measures for cholecystectomy patients in surgical department including definition, importance, principles, components, types, goals, complications of cholecystectomy, exit plan and factors that contribute to improve patient safety measurments.

The practical part: It was included nurses' practices before, during and after cholecystectomy

and health education about new life style and healthy nutritional regimen after surgery.

Tools validity:

The face and content validity of the tools reviewed by a panel of five experts from the field of medical surgical nursing at Faculty of Nursing, Benha University. Jury involved 2 professors and 3 assistant professors of medical surgical nursing to check the relevancy, clarity of tools' content, comprehensiveness, understanding, applicability of the tools' content and necessary modification which done accordingly.

Tools reliability:

The investigator assessed the internal consistency of tools employing test-retest methods. On two separate dates, the same tools were administered to the same person under similar conditions. Evaluating the dependability of tools by **Cronbach alpha**. Tool reliability for the nurses' knowledge questionnaire (tool I) was 0.874, while tool reliability for practical and observational checklist utilized to evaluate nurses' practice (tool II) was 0.996.

Pilot study

The pilot study carried on 10% of the total Studied nurses 67 nurses that were excluded from the main study (7nurses) based on the overall count of nurses and 10% of the total sample of patients (8 patients) from the total studied patients75 patients.

The pilot study was undertaken one month prior to the commencement of data collecting. Due to adjustments made to the research tools, the pilot study sample was omitted from the study sample.

Field work:

The data gathering period for the present study spanned from early March to late September 2023.

Assessment phase:

There are three days per week in which data is gathered, in the morning and afternoon.

Assessment of the nurses' knowledge **(Tool I)** Each nurse was provided with a questionnaire to complete, with the estimated time required to do so varying between 30 and 45 minutes.

Nurses' practice observation checklist (**tool II**) was filled by the investigator to assess their practice level for caring of cholecystectomy patients.

This evaluation provided further insight and illumination on the present level of knowledge, which aided in the identification of deficiencies in knowledge and practice. The findings were derived from the nurses' assessment questionnaire and the observational checklist (tool I&II).

Cholecystectomy patient assessment questionnaire **(tool III, part I)** was filled by the investigator to obtain personnel, medical and surgical data of them as well as assessment of patients postoperative complications post cholecystectomy**.**

Planning phase:

In the planning phase, recent relevant literature on various elements of the study was reviewed via the internet, periodicals, books, and periodicals to design the data study program including the nursing safety measures and healthy nutritional regimen based on nurses' knowledge, practice deficiencies and patients' needs.

Implementation phase:

The designed nursing safety measures and healthy nutritional regimen implemented for nurses of the research to meet goal of the study. Teaching sessions for theory and practice conducted for nurses, who split into 11 subgroups, each subgroup included (6-7 nurses). Teaching aid used as needed. The investigator was attended 3days per week Afternoon and morning shifts. The investigator met with each cohort of nurses for a total of four sessions, consisting of two theoretical sessions and four practical sessions. The theoretical session lasted 30–45 minutes, while the practical session, discussion included, lasted 45–60 minutes. There were 66 in total, with 22 devoted to theory and 40 to practical application. A program overview and explanation of its operation were provided. Every session commenced with a concise recapitulation of the material covered in the previous session, followed by an outline of the aims for the upcoming subjects, with care taken to ensure that the language used was accessible to patients of varying educational backgrounds. In order to further facilitate learning, the intervention sessions incorporated discussion, motivation, and reinforcement. Patients were permitted to ask the investigator follow-up questions at the conclusion of each session in an effort to clarify any confusion.

Theoretical part:

Session one: Orientation and explanation of the significance and rationale for the designed safety measures, as well as clarification of the gallbladder's description, anatomy, and physiology.

Session two: comprised an explanation about types gallbladder diseases and ways of cholecystectomy and complications post cholecystectomy and necessary of following healthy nutritional regimen.

Practical part:

Session three: included pre, intra and postoperative nursing care of patient undergoing cholecystectomy.

Session four: Included post cholecystectomy nursing care and explaining for patients how to avoid any complications.

Session five: Included healthy nutritional regimen and importance of it is following doing that to avoid post cholecystectomy complications.

Session six: Immediately following the completion of data collection, the investigator distributed the instructional colored guidelines booklet to both patients and nurses. This was done to facilitate review and support training.

The Booklet was composed in straightforward Arabic and complemented with visual aids such as images, videos, and illustrations to facilitate the patient's comprehension of the material, which encompassed both theoretical and practical concepts.

Furthermore, to clarify any misunderstandings, the nurses' inquiries were addressed and deliberated upon at the conclusion of each session. The investigator collected comments from the nurses and expressed gratitude for their assistance at the conclusion of the program.

Evaluation phase:

The posttest was administered to nurses and patients using the same research instruments as the pretest. Its purpose was to assess the impact of the healthy nutritional regimen program and nursing safety measures on nurses' knowledge, practices, and patients' complications following cholecystectomy. The posttest consisted of the following phases:

Phase 1: A post-test was administered immediately following the implementation of the nursing safety measures and healthy nutritional regimen program for nurses in order to assess the program's impact on nurses' knowledge and behaviors (utilizing **tool I "part II" & tool II**) to contrast how the knowledge and practices of the nurses under study have changed.

Phase 2: Evaluation executed at $1^{st}, 2^{nd}, 3^{rd}$ post-operative week to evaluate presence of any early or late post cholecystectomy complications **(tool III, part II& III).** In order to ascertain the efficacy of the designed protocol on nurses, practice knowledge, and patients' post-cholecystectomy outcomes, a comparison between the pre-test and post-test was conducted at the conclusion of the study.

Statistical analysis of the data:

The gathered information was arranged, classified, tabulated, and subjected to percentage and number distribution analysis. Version 25 of the Statistical Package for Social Science (SPSS) and Microsoft Excel were the computer programs utilized for the statistical analysis of the data. Data were presented utilizing descriptive statistics in the form of frequencies and percentage for categorical data, the arithmetic mean (X) and standard deviation (SD) for quantitative data. Chi square test was employed to contrast qualitative characteristics (x2).

A paired test was employed to determine the group's differences during the two visits. Furthermore, the R-test was employed to determine the association among the variables under investigation.

Degree of significance of results were considered as follows:

-P-value >0.05 Not significance (NS)
-P-value <0.05 Significant (S)
-P-value <0.01 Highly Significant (HS).

4.Results:

Table (1): exhibits that, 41.4% of nurses under study were aged 40 to < 50 years old, with Mean ± SD = 38.5±6.22 and 78.7% of them were females. As well, 66.7% of nurses under study were graduated from Technical Institute of Nursing. While, 46.6% of nurses under study had more than 10 years of experience in the Hospital. Moreover, 42.7% of them had 2 to < 5 years of experience in surgical department. In addition, 73.3% & 57.3% of nurses under study had training courses of nursing safety measures and healthy nutritional regimen after operation respectively.

Fig (1): demonstrates that 28.0% of the nurses under study had a good degree of total knowledge about cholecystectomy patients pre-educational program, while improved to 76.0% and 73.3 of them post educational program and during follow up respectively.

Fig (2): exhibits that, 69.3% of nurses under study had satisfactory total practices level about perioperative cholecystectomy patients' safety pre-educational program, while improved to 94.7% of studied nurses satisfactory post educational program and 93.3% of them during follow up.

Fig (3): exhibits that, 80.0% of nurses under study had satisfactory total practices level regarding infection control for patients' safety pre-educational program, while enhanced to 94.7% & 93.3% post and follow up educational program respectively.

Table (2): Shows that, The highest rank for early complications was diarrhea among 84.0% of studied patients, followed by continuous pain at the upper part of abdomen, while the lowest rank tor late complications was bile leakage followed by infection, bleeding. In addition to, the lowest risks from general anestheia was 54.7% post cholecystectomy syndrome followed by nausea, vomiting and multi-organ dysfunction.

Table(3): Shows positive correlation between pre and post and follow up educational program group, it was a highly significant and positive connection between total knowledge level and total practice level items about patient safety at p value (<0.001**) and r=.821 pre-educational program and .848 post program implementation.

Table (1) Distribution of nurses under study regarding their personal data **(n= 75).**

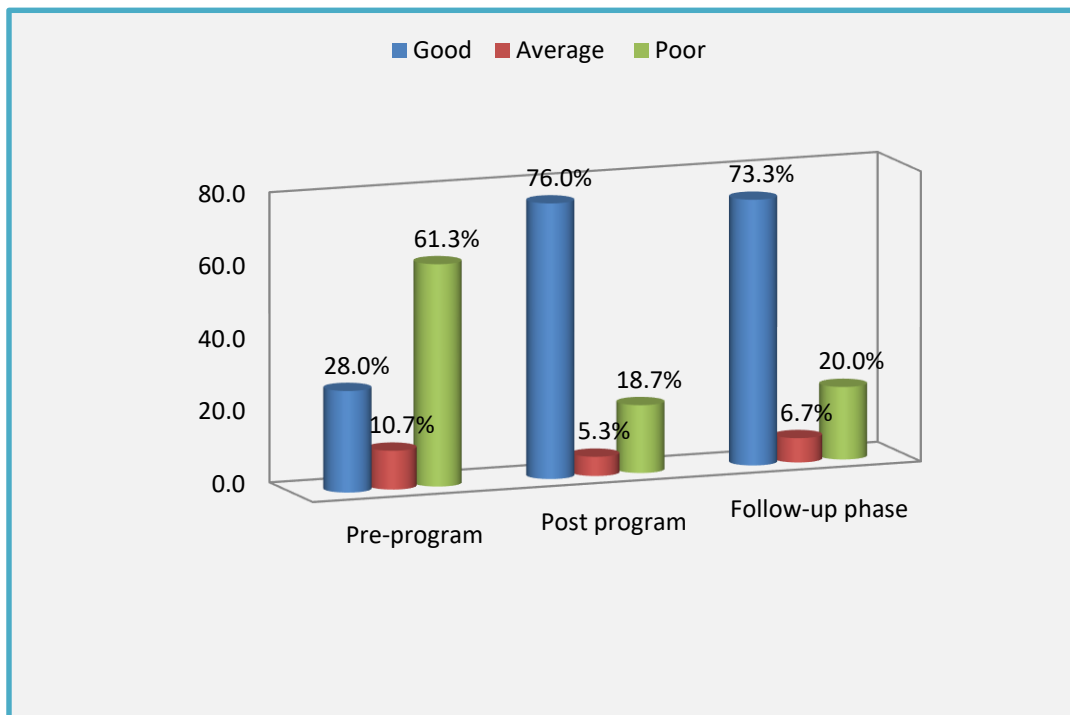| Nurses' personal data	Variables	No.	%
Age (in year)	20 - < 30	16	21.3
	30 - < 40	24	32.0
	40 - <50	31	41.4
	50 – 60	4	5.3
	Mean ±SD 38.5±6.22		
Gender	Male	16	21.3
	Female	59	78.7
Education qualifications	Technical Institute of Nursing	50	66.7
	Bachelor of Nursing	20	26.6
	Postgraduate Studies	5	6.7
Experience Years in the Hospital	2 -< 5	8	10.7
	5-10	32	42.7
	> 10	35	46.6
Experience Years in the surgical department	2-<5	32	42.7
	5 – 10	25	33.3
	> 10	18	24.0
Training courses on nursing safety measures	Yes	55	73.3
	No	20	26.7
Numbers of training courses on nursing safety measures (n=55)	One	29	38.7
	Two	12	16.0
	Three	14	18.7
Training courses on healthy nutritional regimen after operation	Yes	43	57.3
	No	32	42.7
Numbers of training courses on healthy nutritional regimen (n=43)	One	17	39.5
	Two	13	30.2
	Three	13	30.2

Fig. (1) Percentage distribution of nurses under study regarding their total knowledge level pre, post and follow up program **(n=75).**
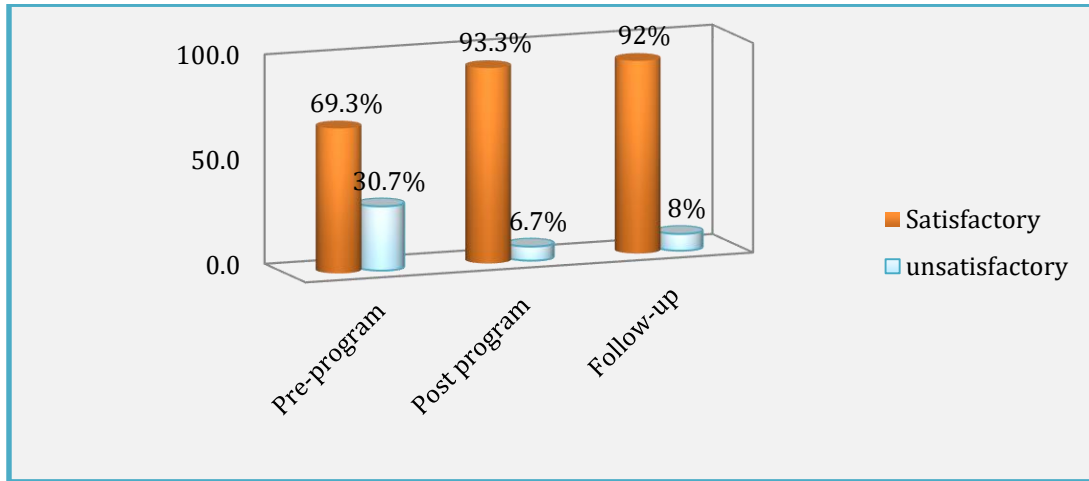
Fig. (2) Percentage distribution of nurses under study concerning their total practices level about perioperative cholecystectomy patient's safety pre and post program (n=75).
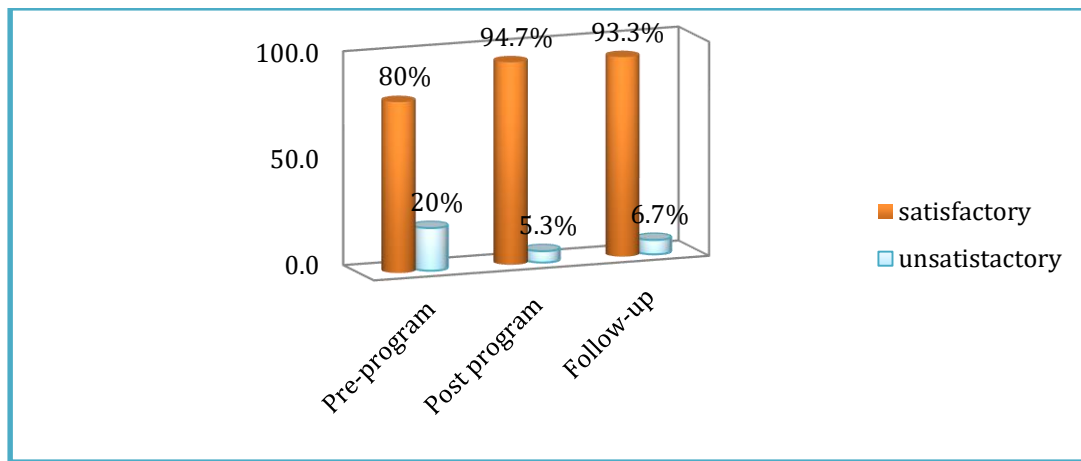

Fig. (3) Percentage distribution of nurses under study concerning their total practices level concerning infection control for patients' safety pre, post and follow up implementation the program (n=75).

Table (2) Distribution of patient under study concerning their post-operative complications record for cholecystectomy (**n=75**).

Post- operative complication	Variables	No.	%	Ranking
Early complications (during. 1st 24 hours post cholecystectomy)	Diarrhea	63	84.0	1
	Continuous pain at the upper part of abdomen.	51	68.0	2
	Dyspepsia.	46	61.3	3
	Vomiting.	34	45.3	4
Late complications (during 1st month post cholecystectomy)	Infection.	75	100.0	1
	Bleeding.	75	100.0	1
	Severe diarrhea.	75	100.0	1
	Injury to the bile duct.	75	100.0	1
	Injury to intestine, bowel and blood vessels.	75	100.0	1
	Deep vein thrombosis (DVT)	75	100.0	1
	Bile leakage.	58	77.3	2
	Nausea.	75	100.0	1
Risks from general anestheia	Multi-organ dysfunction	58	77.3	1
	Confusion	75	100.0	1
	Vomiting.	46	61.3	2
	Chills.	46	61.3	2
	Post cholecystectomy syndrome.	41	54.7	3
	Single organ dysfunction.	58	77.3	2

Table (3) Correlation between total knowledge level and total practices level regarding patient safety among studied nurses through educational program phases **(n=75).**

Variables	Total Knowledge level items					
	Pre-educational program		Post educational program		Follow up post educational program	
	R	p-value	r	p-value	r	p-value
Total practices level items about patient safety	.663	.000**	.821	.000**	.848	.000**

** Highly significant (p ≤ 0.001)

Discussion

Nurses are the primary health care providers supporting patient pre and post-surgery. They have a very important role for patients who has a cholecystectomy involves encouraging the best possible breathing function, avoiding problems, controlling pain, and giving information about the condition, procedures, and necessary treatments, high qualified trained nurse can support patient with health education about healthy lifestyle suitable for life post cholecystectomy and healthy nutrition have a critical part in enhancing patient health and avoid a lot of problems **[20].**

This study sought to determine the impact of implementing nursing safety measures and healthy nutritional regimen for patients undergoing cholecystectomy.

The current study's age distribution reveals that, with a mean ± SD of 38.5±6.22 years, more than two fifths of the nurses under study were between the ages of 40 and less than 50. This could be because most of the nurses in the study were middle age due to nature of their nursing occupation and experienced in the surgical department and outpatient clinic. They were not new to the nursing field and were able to properly care for patients having cholecystectomy; also, over 75% of the nurses were female. The reason for this may be due to that males recently joined nursing education in Egypt. As well, two thirds of nurses under study were graduated from Technical Institute of Nursing. While < half of the studied nurses had > ten years of experience in the Hospital. Moreover, two to five years of experience in the surgical area was possessed by almost two-fifths of the individuals surveyed. In addition, near to three quarters and > half of studied nurses had training courses of nursing safety measures and healthy nutritional regimen after operation respectively.

The present investigation aligns with the research conducted by **[37]** who studied "Knowledge, attitude, perceived responsibilities, and associated factors regarding colostomy care among nurses working in surgical units at amhara region general and referral hospitals, Ethiopia" and discovered that this survey included 413 participants, representing the highest response rate ever recorded. A little over 50% of the participants identified as female. The participants' age was recorded as 28.25 (±3.38)

years on average (±SD). In terms of educational attainment, about two-thirds attended a government-run institution.

The present investigation aligns with the research conducted by**[10]** who studied "Nurses 'level of practice and attitude toward care of patients pre/post laparoscopic cholecystectomy" in Egypt except age and found that over 50% of the study participants fell within the age range of 20 to below 30 years old, with an average age of 29.5±3.2. With respect to gender, women comprised over three-fifths of the sample. In relation to their educational background, it was discovered that approximately two-thirds of the individuals surveyed had completed relevant training courses, less than half possessed five to less than ten years of experience, and a Technical Institute degree was held by nearly two-fifths of the respondents.

In addition, current research is opposite of study done by **[19]** who studied "Assessment of Nurses' Knowledge Regarding Management of patients' with Cholelithiasis Disease, Iraq" and founded that the largest proportion of the research sample is male, they were near to two thirds; those with ages ranging between 35-39 years were one third. This might be due to this work need physical power to can care of patient.

program. While, improved to near to the most of them post educational program and follow up respectively.

According to studied nurses' total knowledge level pre, post and follow up program. This study illustrates that near one third of nurses under study had good total knowledge level about patients' cholecystectomy pre-educational program. Although the intervention increased participation to the extent that almost three-quarters of the nurses examined possessed an excellent overall knowledge level following the educational program, nearly three-quarters of them maintained that level during the follow-up phase.

The current study is consistent with the research conducted by **Abd-[20]**" who studied "Nurses performance regarding care of patients undergoing laparoscopic cholecystectomy" in Egypt and found that, two fifths of participants had adequate total knowledge level about patients' chole-

cystectomy pre-educational program which developed to most of them post educational program. The rationale for the finding could be supported by the fact that as nurses provide care for a greater number of patients with colostomies, they gain familiarity with the issue and, consequently, the information necessary to address it in a professional manner.

As regard of nurses under study' total practices level about patients' assessment concerning cholecystectomy pre and post program. This research demonstrates that around 75% of the nurses surveyed had a satisfactory level of overall practice for patients' evaluations of the cholecystectomy pre-educational program. However, improved to about most of them had satisfactory post educational program and slightly decreased during follow up respectively.

The current study is in agreement with study done by[32],entitled "Operating room nurses want differentiated education for perioperative competencies based on the clinical ladder" in South Korea and determined that all competences achieved an average score of 3.5 out of 5. Significant variations were seen across the majority of domains in relation to clinical career (p< 0.001). Notably, perioperative abilities were significantly influenced by foundational knowledge and skills (p< 0.001).

current study is in disharmony with research done by [1], entitled "The impact The of development and implementation of surgical safety checklist educational program on the surgical team compliance during major operations" in Egypt and discovered that in the study group, about two-thirds of those who had performed unsatisfactorily prior to the program improved to a satisfactory level of performance subsequent to the program.

The study examined the overall level of infection control practices among nurses in order to ensure the safety of patients before to, during, and after the implementation of the program. This research demonstrates that prior to the educational program, over 75% of the nurses surveyed had satisfactory overall practices regarding infection control for the safety of patients. However, by the time the program concluded and follow-up occurred, this percentage had only slightly increased to about 75%.

The present investigation aligns with the study conducted by [23], entitled "Preventing surgical site infection using operating room bundle of care in patients undergoing elective exploratory laparotomy cholecystectomy surgery" and discovered that the majority of nurses had adequate levels of infection control procedures for the protection of patients prior to receiving training. Nevertheless, the majority of individuals experienced improvement subsequent to the instructional session and subsequent follow-up.

This study is supported with a study done by [17], who studied "Impact of a quality improvement intervention on the incidence of surgical site infection in patients undergoing colorectal surgery: Pretest–post-test design" and found that there was improvement in nursing practices regarding infection control for patients' safety. This might be due to attendance of infection control courses, and compliances of infection control team.

As regards of the studied patients' post-operative complications record for cholecystectomy, the present study shows that, the highest rank for early complications was diarrhea among majorityof studied patients followed by continuous pain at the upper part of abdomen, while the lowest rank for late complications was bile leakage. In addition, the lowest risks from general anestheia was post cholecystectomy syndrome followed by chills, vomiting and single-organ dysfunction.

The present study is consistent with the research conducted by [4], who studied "A study to deduce the potency of a structured teaching strategy in preventing pre-administered postoperative complications in patients undergoing abdominal surgery at pre-administered hospitals in the various Hospitals "SawaiMadhopur Rajasthan" and found that, most of patients suffered from diarrhea.

Also, the current research is consistent with the research conducted by [24], who studied "Safe cholecystectomy multi-society practice guideline and state-of-the-art consensus conference on prevention of bile duct injury during cholecystectomy" in United states of America and discovered that all patients were susceptible to general anesthetic hazards, including nausea and confusion.

With respect to the correlation between the overall level of knowledge and the overall level of practice concerning patient safety among the nurses under investigation during the educational program phases, the findings of the present study indicate a strong and positive correlation (p <0.001) between the total knowledge level and the overall level of practice regarding patient safety items before, after, and during the follow-up educational program.

The current study is in agreement the research conducted by[12], who studied "Nurses knowledge and practice regarding care for patients undergoing cholecystectomy" and discovered a highly substantial and favorable connection (p value 0.001**) between total knowledge level and total practice level items regarding patient safety.

This research is corroborated by a study conducted by [18], who studied "Nurses' performance and postoperative outcome among patients undergoing gastrointestinal surgery" and discovered that the association between the entire knowledge of nurses and their practise of peri-operative care for patients undergoing gastrointestinal surgery was statistically significant and beneficial (P-value 0.000).

Conclusion:

On the basis of the present study's findings, it is possible to conclude that the knowledge and practice scores of the examined nurses improved statistically significantly following the adoption of the dietary regimen program and safety measures for nurses. Positive outcomes for patients in this aspect. In addition, there were preventing post cholecystectomy complications which supported the study hypothesis.

Recommendations:

On the basis of the present study's findings, the following recommendations are made: Implementing regular in-service training programs for surgical nurses with the aim of enhancing, updating, and revitalizing their understanding and application of patient care in the context of cholecystectomy.

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