

# A Study to Assess the Effectiveness of Medication Safety Education on Knowledge among Undergraduate Nursing Students in a Selected College of Nursing, Chennai

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## Abstract

### Aim

Medication administration is routine task yet a complex nursing activity

### Objective

The objective of the study was to (1.) Assess the effectiveness of medication safety education on knowledge among undergraduate nursing students and (2.) Find the association between knowledge with the selected demographic variables among undergraduate nursing students.

The Research Design adopted was a quantitative approach with one group pretest posttest design. 99 III-year B. Sc Nursing students were selected by purposive sampling technique based on the inclusion criteria. The knowledge on medication safety measures were assessed by using a self-administered knowledge questionnaire on medication safety. The data collected based on ethical principles were analyzed by inferential and descriptive statistics.

### Results

The total study population was (n=99) of B. Sc Nursing (Basic) students. In the pretest 40.1% of the B Sc Nursing 3<sup>rd</sup> year students the knowledge of medication safety among B. Sc Nursing (Basic) 99 students were, (n=18) of the students had inadequate knowledge, (n=76) had moderate knowledge and (n=5) had adequate knowledge in pretest, and in the posttest (n=3) had inadequate knowledge, (n=28) had moderate knowledge and (n=68) had adequate knowledge. Knowledge on high-alert medication in pretest shows (n=31) had inadequate knowledge, (n=61) had moderate knowledge (n=7) had adequate knowledge about high-alert medication in posttest inadequate knowledge (n=2), moderate knowledge (n=24) and adequate knowledge (n=73) on high-alert medication. Knowledge on look-a-like sound-a-like medication, (n=48) had inadequate knowledge, (n=47) had moderate knowledge and (n=4) had adequate knowledge, in posttest (n=3) had inadequate knowledge, (n=14) had moderate knowledge and (n=82) had adequate knowledge. Regarding knowledge on narcotic medication pretest shows (n=62) had inadequate knowledge, (n=34) had moderate knowledge and (n=3) had adequate knowledge on narcotic medication, whereas in posttest (n=9) had inadequate knowledge, (n=33) had moderate knowledge and (n=57) had adequate knowledge on narcotic medications after the post-test. Knowledge of B Sc nursing 3<sup>rd</sup> year students' scores on medication safety, in pre-test had the mean value of 15.62 and standard deviation was 6.37 and after the post test, mean was 27.93 and standard deviation was 2.26.

The t value was 7.54 and the p value was .000\*\*\*

### Conclusions

The students were given a planned educational programme. The students had shown improvement in their knowledge on medication safety. This will ultimately help to reduce the number of medication errors in their day to day professional practices. The findings of the study indicate that the educational programme was effective in improving the knowledge of the students.

### Chapter I Introduction

Medications are the most common treatment intervention used in healthcare around the world. Medication is defined as a substance used to promote health, to prevent illness, to diagnose, to alleviate or cure diseases when medication is used safely and appropriately, they contribute to significant improvements in the health and well- being of patients.

The patient, Physician, Pharmacist and Nurse should coordinate to cure the diseases. Hospitals and health services aim to prevent harm by understanding what contributes to the errors.

Giving drug is one of the most important, complexes, yet most vital processes of nursing care and it needs the right knowledge and function of nurses. Nurses spend 40 percent of their time on average in hospital for giving medicine to their patients (Demehin & Babalola, 2008). Nurses and nursing students in hospitals are people who are directly associated with giving drug to patients and they are known as people who may make the most medication errors (Clifton-koepfel, 2008). Today there are more than 20 thousand types of drugs in the world, that all of them despite their therapeutic effects have complications and their own instructions. Hence the nurses and nursing students should have the necessary information about drugs to avoid potential dangers (Koohestani & Baghcheghi, 2008).

The safe and accurate administration of medication is one of the major responsibilities of a nurse. The nurse must have thorough knowledge of drugs that is administered by him/her. "A fundamental rule of safe drug administration is: never administer an unfamiliar medication". Medication errors can have undesirable consequences for patients such as: Increased length of hospitalization, increased costs of hospitalization, disability and distrust in the healthcare system, severe injury or even patient death (Webster & Anderson, 2002). Implementation of medication orders is an important part of the process of treatment and care of patients is considered as a major component of nurse's function, and in the meantime patient safety has a particular importance (Soozani & Bagheri, 2007)

Medication safety is a significant patient safety issue. Medication safety is defined as freedom from preventable harm with medication use (ISMP Canada, 2007). It is estimated more than 1.5 million Australians suffer an adverse event from medicines each year.

An adverse drug event is defined as an incident which caused harm or injury to a patient (Australian commission on safety and quality in health care, 2011). Using 2011-12 Australian hospital admission data, it was estimated that there were 230,000 medication related hospital admissions every year, costing the community approximately \$1.2 billion annually (Roughead et al., 2013).

Medication errors can occur during the phases of prescribing, dispensing and administration, with system and human factors increasing the like-hood of an error or omissions (Evans, 2009; Latimer et al., 2011). Common medication errors in drug prescription include: making mistake in drugs concentration, not paying attention to the right time of using drug, over dosage of drug and not paying attention to the right way of using the drug (Woods & Doan-Johnson, 2002). Research has shown that the rate of medication errors by nurses and nursing students is high, (Blegen & Vaughn, 2004).

Whilst medication administration is a routine task for nursing, it is becoming an ever increasingly complex activity. For example, there are over 8000 medications commonly available for administration including 17,000 different medication brand names. Additionally, advances in technology and increasing diversity in administration routes (Tang et al.,2007), reflect the changing nature of medication administration. More recently there has been recognition in the literature that medication adverse events are related to systems failures (Deans, 2005; Evans, 2009; Popescu et al.,2011; Roughead and Semple,2009) associated with the complex process of medication administration, rather than individual or professional group factors (Roughead and Semple,2009). Reported factors that increase the like-hood of medication error occurring include knowledge-based mistakes, poor communication (Nichols et al.,2008), polypharmacy, and poor compliance with medication assessment practices such as medication reconciliation (Latimer et al.,2011). Drug complications were the most common type of outcome attributed to negligence, accounting for 19% of these preventable adverse events.

Medication Errors compromise patients' confidence in the healthcare system and increase healthcare costs. Research conducted by the American Society of Health- System Pharmacists (ASHP) showed that 61% of patients surveys reported that they were “very concerned” about being given the wrong medicine during a hospital stay. The causes of medication errors are multifactorial and span healthcare disciplines. Medication errors can result from actions taken by both experienced and inexperienced staff and all types of people involved in the medication-use process, including pharmacists, physicians, nurses, supportive personnel (e.g., pharmacy technicians), students, clerical staff (e.g., unit clerks), administrators, pharmaceutical manufacturers, and patients and their caregivers.

Ronda G et al., (2008) discussed about the patient safety and quality in his book on Medication administration safety. The Institute of Medicine's (IOM) first Quality Chasm report, *To Err Is Human: Building a Safer Health System*, stated that medication-related errors (a subset of medical error) were a significant cause of morbidity and mortality; they accounted “for one out of every 131 outpatient deaths, and one out of 854 inpatient deaths”. Medication errors were estimated to account for more than 7,000 deaths annually. Building on this work and previous IOM reports, the IOM put forth a report in 2007 on medication safety, *Preventing Medication Errors*. This report emphasized the importance of severely reducing medication errors, improving communication with patients, continually monitoring for errors, providing clinicians with decision-support and information tools, and improving and standardizing medication labeling and drug-related information. Joint commission of International accredited the International Patient Safety Goal in the year 2006, in that IPSG-3 is been considered as high-alert medication safety for patients.

With inadequate nursing education about patient safety and quality, excessive workloads, staffing inadequacies, fatigue, illegible provider handwriting, flawed dispensing systems, and problems with the labeling of drugs, nurses are continually challenged to ensure that their patients receive the right medication at the right time. The purpose of this study is to impart knowledge regarding medication safety in relation to nursing care. The nurse's role is the very important role in medication safety, every nurse administers an average of 10 medication doses for every hospital patient every day. The volume and complexity of medication administration contribute to the risk of medication errors, which take a heavy financial and human toll on the U.S. healthcare system. According to estimates, 1% to 2% of hospitalized patients are harmed from medication errors, resulting in an increased length of stay of 4 to 10 days. The Committee on Identifying and Preventing Medication Errors reports that at least 1.5 million preventable medication errors and adverse drug events occur each year in the United States, excluding

errors of omission. On an average, hospitalized patients will be exposed to a minimum of one medication error each day they're hospitalized.

Nurses need to recognize the challenges they face when administering medications to their patients. Because nurses consistently administer medications, they're well positioned to prevent medication errors. Nurses must be prepared to not only catch their own errors, but also the errors of healthcare providers, pharmacists, and others in the chain of medication administration. Nurses perform a critical role in preventing medication errors. This commentary explores system, human, and environmental factors that contribute to medication administration mistakes and near misses. The author recommends changes in nursing practice to reduce these elements that increase risks in care delivery.

Zimmer J Hartl S Standu et al., (2017) conducted a prospective controlled study with two study periods: (i) a status-quo period (routine education on handling hazardous drugs) followed by (ii) an intervention period (additional innovative teaching session on handling hazardous drugs) on Handling of hazardous drugs - Effect of an innovative teaching session for nursing students at vocational school with samples (n=53). In both study periods (i) and (ii), the following factors were analyzed: (a) knowledge of hazardous drug handling by questionnaire, (b) practical skills in hazardous drug handling (e.g. cleaning) by a simulated handling scenario, (c) contamination with drug residuals on the work surface by fluorescent imaging, median knowledge improved from status-quo (39% right answers) after intervention (65%,  $p<0.001$ ), (b) practical skills improved from status-quo (53% of all participants cleaned the work surface) after intervention (92%,  $p<0.001$ ). (c) median number of particles/m<sup>2</sup> decreased from status-quo after intervention (93%,  $p<0.001$ ).

## Background

Medication management is a complex multi-stage and multi-disciplinary process, involving doctors, pharmacists, nurses and patients. Errors can occur at any stage from prescribing, dispensing and administering, recording and reporting. There are several safety mechanisms built into the medication management system and it is recognized that nurses are the final stage of defense. However, medication error still remains a major challenge to patient safety globally. Nurses experience insufficient medication knowledge; particularly in drug dose calculations, but also in drug management and pharmacology. The weak knowledge could be a result of deficiencies in the basic nursing education, or lack of continuing maintenance training during working years. The aim of this study was to compare the medication knowledge, certainty and risk of error among graduating bachelor students in nursing.

The factors that related to adverse medication events are complex. Research indicates medication events or errors are often a result of system failures, that is, errors related to team, task, environment, individual and system factors (Deans, 2005; Evans, 2009); Popescu et al.,2011; Roughead and Semple, 2009). The multifaceted nature of medication administration involves the contribution of medical staffs, pharmacists and nurses. Therefore, team factors such as communication, the repetitive nature of a task, environmental factors such as noise and lightening, individual factors such as knowledge and skills and systems factors such as access to protocols, all contribute to medication error (Brady et al.,2009; Nichols et al.,2008).

In acute care settings, medication administration involves multiple decisions by the multidisciplinary team. Three health care professionals are involved in the medication cycle: medical officer who prescribes medications, pharmacists who dispense medications, nurses who administer medications; with the monitoring of a therapeutic outcome a shared responsibility (Bullock et al., 2010; Popescu et al., 2011). The process of medication administration accounts for a large proportion of nurses' time, indeed,

it is estimated that 40% of nurses' clinical time is spent managing the administrations of medications (Meechan et al., 2011).

Students enrolled in Bachelor of Nursing curricula receive educational tuition on a variety of strategies to reduce the like-hood of medication errors. Developing students' abilities to undertake medication dose calculations (McMullan et al., 2010; Wright, 2005) is one such strategy. However, Harding and Petrick (2008) argue that this fails to take into consideration the complexity of the administration process. Other strategies include double checking of medications by two nurses prior to administration, however this assumes that this fails to take into consideration the complexity of the administration process.

### **Need for the study**

One of the major issues related to current medication safety education in many hospitals is that the implementation of medication safety education is not followed effectively. Due to the lack of medication practices and lack of knowledge on medication safety, it results in mixing of medications and not as per the rights of medication administration. Improper medication safety education results in medication error and types of medication errors as adverse drug reaction and reports like incident and near miss reports.

Bjoerg O Simonsen et al .,(2015) conducted a cross sectional study on 'Differences in medication knowledge and risk of errors between graduation nursing students and registered nurses with the method of two cross sectional studies, with graduation nurse (n=243) and (n=203) the working registered nurse. The knowledge among nurses and that of students were 68.9% (8.0) and 61.5% (7.8), ( $p < 0.001$ ). The improvement occurred during the first working year. The nurses expressed higher degree of risk of errors. And ow risk of error was associated with high knowledge and high sense of coping ( $p < 0.001$ )

Hurley TV et al (2017) conducted a pre-test and post-test design with random assignment into equal-sized groups on Experiential Teaching Increases Medication Calculation Accuracy among Baccalaureate Nursing Students with (n=78) baccalaureate nursing students at a Northeastern college. The experiential strategy was more effective than the traditional method ( $t = -0.312$ ,  $df = 37$ ,  $p = .004$ , 95% CI) with a reduction in calculation errors. Evaluations of error type and teaching strategies are indicated to facilitate course and program changes.

Hence the training of the nursing students on medication safety was considered to be essential in health care practices. The investigator felt the need of it and was intended to provide the knowledge on medication safety.

### **Statement of the problem**

A study to assess the effectiveness of medication safety education on knowledge among undergraduate nursing students in a selected college, Chennai.

**Objectives:** The objectives of the study were to

- Assess the effectiveness of medication safety education on knowledge among under graduate nursing students.
- Find the association between knowledge and the selected demographic variables among undergraduate nursing students.

### **Operational Definitions Assess**

Estimation of knowledge on medication safety, before and after the medication safety education

programmme.

### **Effectiveness**

It is the significant change in knowledge of medication safety among nursing students after implementation of an education programme.

### **Medication Safety Education**

Video assisted teaching for a group of 35 students each with the duration of 45 minutes on medication safety measures that are used in tertiary care settings.

### **Knowledge**

The awareness of medication safety as determined by a multiple-choice questionnaire that has 30 questions with one correct answer for each question, and is administered once before the education programme and once after one week.

### **Undergraduate nursing students**

Students in the third year of the B.Sc. Nursing (Basic) programme

### **Hypothesis**

H<sub>1</sub>: The medication safety education will improve knowledge among undergraduate nursing students

### **Assumptions**

1. Knowledge influences the practice of medication safety measures.
2. Education programme may enhance and standardize the knowledge on medication safety.
3. Enhanced knowledge promotes confidence to practice

### **Delimitations**

1. The study was conducted for a period of one month.
2. The samples were the students of B. Sc. Nursing (Basic).

## **CHAPTER II**

### **Review of literature**

This chapter exhibits a review of selected literature relevant to the present study. It is an important step in the research process

Section A: Review of related literature Section B: conceptual framework

Section A: Related literature

The review of literature is arranged in the following headings.

1. Studies related to knowledge on medication safety.
2. Studies related to medication education

### **Studies related to knowledge on medication safety**

Tanz et al., (2018) conducted a simulation project on Improving Safety Knowledge, Skills, and Attitudes with a Good Catch Program and Student-Designed Simulation. The project was aimed to

increase 49 undergraduate nursing students' knowledge, skills, and attitudes (KSAs) relevant to the Quality and Safety Education for Nurses which was identified as a critical performance area. The study results showed that the intervention group ( $n = 33$ ) were found to be statistically significant  $t(32) = 6.14$ ,  $p <$

$.05$  student designed simulation were beneficial in improving students' KSAs regarding safety in health care. In addition, mean scores increased by 37%, whereas the nonintervention group increased by only 12%.

Sulosaari et al., (2015) conducted a correlational study on Factors associated with nursing students' medication competence at the beginning and end of their education, with the samples at beginning ( $n=328$ ) and at the end of the study ( $n=338$ ). In the evaluation of theoretical medication competence, the students' mean score over the semesters was 72 % correct answers in a knowledge test. In the evaluation of practical medication competence, the mean score was 74 % correct answers in a medication calculation test. In the evaluation of decision-making competence, the mean score was 57 % correct answers on deciding the best action in the situation given in patient vignettes. At the end of their education, students were able to solve patient vignettes significantly better. Individual factors were most evidently associated with medication competence. At the beginning of their education, students' previous academic success had a stronger association with medication competence. However, at the end of the education students' abilities in self-regulated learning and study motivation were more significant factors.

Jayne Hewitt Marion Tower Sharon Latimer (2014) conducted a study on education intervention to improve nursing students understanding of medication safety. The samples were ( $n=460$ ), in that more than two-third of the students ( $n=19$ ; 67.9%) reported the recordings clearly and demonstrated a systems approach to safe medication in terms of task, environment, individual and system factors. Also, the same number ( $n=19$ ; 67.9%) reported the strategies outlined to prevent medication error, with a small number ( $n=2$ ; 7.2%) reported they were partially appropriate. Most students ( $n=23$ ; 82.18%) believed the content being related to medication practice, was very appropriate for undergraduate nursing students, with only one respondent (3.6%) indicated that it was partially appropriate. The majority of students ( $n=25$ ; 89.3%) indicated it was either very useful or mostly useful

### **Effectiveness of medication safety education among students and staff**

Christina Agar., (2017) conducted a quasi-experimental study on practicing skills to competency level in a simulated clinical environment is thought to prepare nursing students for the real-world setting. The study included 180 second year nursing students with the objective of examining the effectiveness of a time management intervention using simulation to improve nursing students' preparedness for medication administration in a clinical setting. A self-administered validated questionnaire measured the student nurse perception of preparedness for medication administration in a clinical setting. There was no significant difference for overall perceived preparedness for medication administration, the intervention group showed significantly improved perceived ability to clarify unclear instructions ( $p = 0.019$ ), monitor patients' conditions post medication administration ( $p = 0.032$ ) and assess medication effectiveness ( $p = 0.034$ ). Adequate theoretical pharmacology knowledge is crucial in preparing nursing students for medication administration in the clinical setting.

Dolan sky MA et al., (2019) conducted a study on Perspectives from Academic and Practice Leaders on Nursing Student's Education and Role in Medication Reconciliation by

electronic survey method, with (n=90) academic and (n=160) for nurse practice leaders. Majority 75% of the faculty of the schools of nursing reported that the medication reconciliation curriculum was mostly taught in the classroom. Only 24.4% of the school's taught medication reconciliation in an interdisciplinary context with pharmacy students. During clinical time, 33% of faculty reported that students had direct involvement and 33% had the opportunity to observe the process of medication reconciliation. The majority (80%) of practice nurse leaders reported that their facility does not permit nursing students to perform medication reconciliation. Although medication reconciliation processes are specific to each organization, only 52.8% of the practice leaders reported that they provide faculty or nursing students' formal training on their hospital's medication reconciliation policy or site-specific process.

### **Studies related to medication error**

Vaismoradi., (2014) conducted a qualitative study with, themes and subthemes on Nursing students' perspectives of the cause of medication errors with the samples (n=24). The study was conducted to describe nursing students' perspectives of the causes of medication errors. Two main themes emerged from the data: "under- developed caring skills in medication management" and "unfinished learning of safe medication management", which was subdivided into "drifting between being worried and being careful", and "contextualizing pharmacology education". All respondents felt that their education programmes were leaving them vulnerable to "drug errors" and cited incidents where patient safety had been jeopardized.

Marvanova M Henk et al., (2015) conducted a study on the perception and experiences of nursing students in Collaborating on medication errors in nursing. The samples (n=72) were assessed with Likert-type that included (1) an evaluation of the simulation experience; and (2) self-reported perceived benefits for clinical ability and confidence in recognizing, managing and reporting medication errors. In this majority of students (60.8-84.1%) evaluated the experience positively with regard to time pressure, type/severity of events, challenges, and benefits for critical thinking and decision-making regarding patient safety and medication errors.

Reid-Seari K et al., (2015) conducted a study on the supervision of medication administration by the nursing students. The samples (n=45) completed the questionnaire on their supervision experiences while administering medications. The study findings show that, 7% of the students reported not receiving supervision throughout medication administration, 66% of students indicated that they received lower levels of supervision when wards were busy, 40% expressed that they were under pressure to comply with the wishes of RNs, 51% of the students had experienced that extended periods of time in clinical settings and 37% of the stated that medical administrations was trusted the student nurses by RNs . Approximately one third of student nurses disagreed that RNs followed the six rights when administering medications. These findings suggest that student nurses are not always adequately supervised at the times of administering medications which were outside the parameters of the law.

Whitehair Provost Hurley (2014) conducted a study with cross sectional observation design on Identification of prescribing errors by pre-registration student nurses. The samples were (n=193) student nurses who had difficulties in identifying the prescribing errors built into the prescription of medication. Of the five prescriptions containing an error, 7.3% of students identified all 5 errors, 13% identified 4, 21.9%



identified 3, 26.6% identified 2, and 20.3% identified only one error.

Fatma Cebeci et al., (2015) conducted a cross-sectional survey on Nursing students' medication errors and their opinions on the reasons of errors. The samples were (n=513) of nursing students from different semesters, the final samples were (n=324) of the nursing students who had completed the questionnaire. A total of 124 (38.3%) subjects declared that they have made an error in clinical/field applications. There was no statistically significant difference in error rates ( $p=0.797$ ) among students from different semesters. 402 were total errors reported in the questionnaire and 155 (38.6%) of them were detected and corrected by academic nurses. 96(23.8%) most common medication errors were deviation from aseptic technique, 90 (22.8%) followed by improper dose and quantity and 73(18.1%) not recording the medication administered. 60(62.5 %) errors about deviation from aseptic technique and 65(7 2.2%) improper dose and quantity errors were corrected. Among these errors, (n=22; 5.5%) all errors related to administering wrong drug, (n=6; 1.5%) wrong drug in fluid or (n=2;0.5%) wrong electrolyte in fluid were corrected.

## SECTION B: Conceptual framework

Conceptual framework is an abstract generalization that explains systematically the relationship among phenomena and helps to explain the nature of relationship between research variables. The study based on the general system model approach of Ludwig Von Bertalanffy system theory is concerned with changes due to interaction between the various factors in a situation. In a human person, interaction between the person and environment occurs continuously.

The main concepts of general system theory are input, throughput, and output. In systems theory, Input refers to any form of information, energy or material that enters into system through its boundary. Through put refers to the process whereby the system transfers, creates and organizes in out. Output refers to energy, information, matter that is transferred to the environment.

In this study before the educational programme, there was a lack of knowledge towards medication safety among undergraduate nursing students. The input was the conduct on of a planned educational programme on medication safety for the study group. Throughput was the process of transformation of knowledge on Medication Safety among undergraduate nursing students at Sri Ramachandra Institute of Higher Education & Research Institute (DU), Chennai.

**Input:** The first component of the theory is input. This involves assessment of the level of knowledge on medication safety. In the present study, the researcher selected the students who met the inclusion criteria and conducted a pretest. The questionnaire includes Section (A): demographic variables such as age, sex, year of batch, qualification, source of information about medication safety, Section (B) assessment of knowledge on medication safety by using self-administered questionnaire.

**Through put:** During this phase the investigator conducted, a planned educational programme on Medication Safety- a video assisted teaching on medication safety for a duration of 45 minutes followed by a discussion.

**Output:** After the educational programme, the investigator carried out a posttest after one week that included the assessment of knowledge on Medication Safety. The outcome could be change in the knowledge and practice on medication safety.

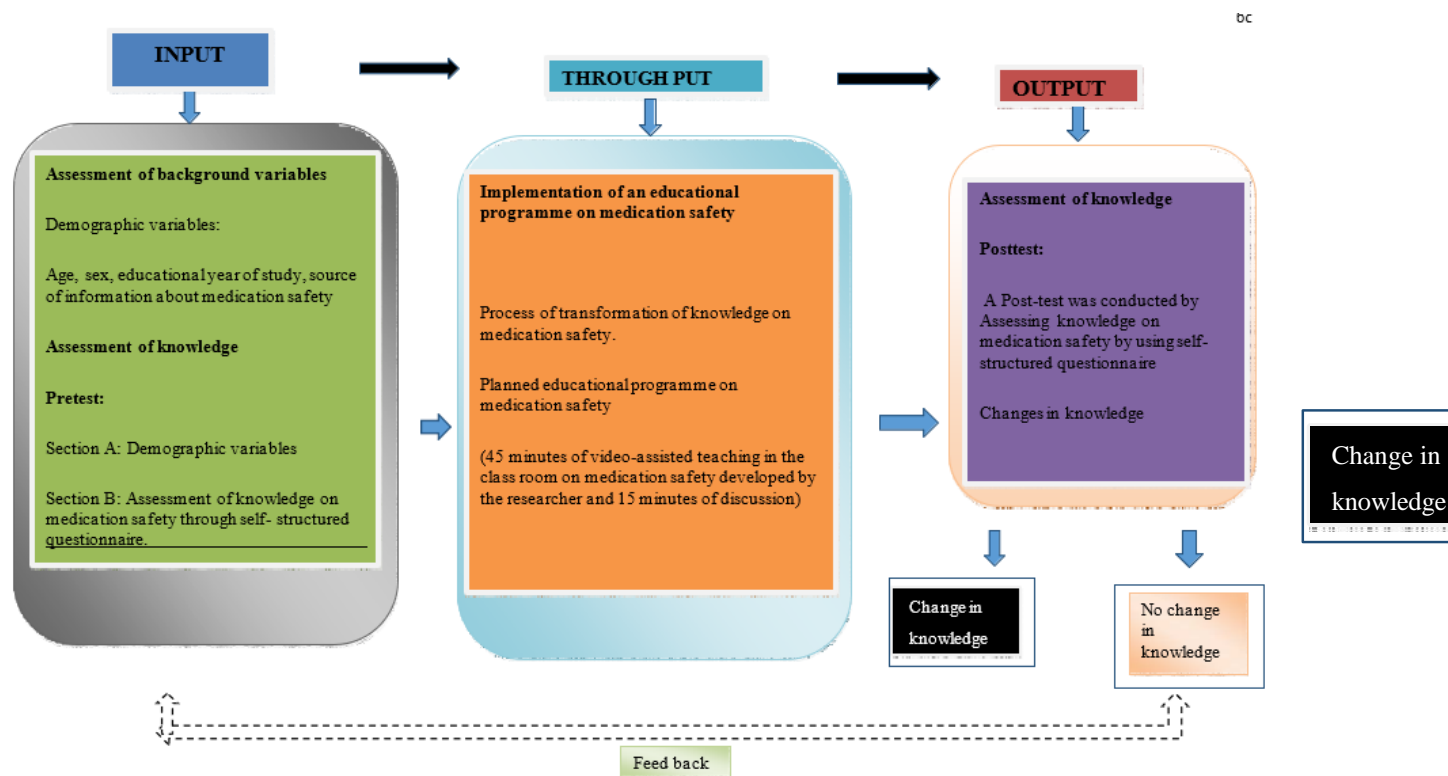


Figure 2. Conceptual framework based on Ludwig von Bertalanffy's General System Theory (1968)

### Chapter III Methodology

This chapter describes the methodology that was followed to assess the knowledge on Medication Safety among undergraduate nursing students at Sri Ramachandra Institute of Higher Education and Research Institute (DU), Chennai.

#### Research Approach

The quantitative research approach was used to assess the effectiveness of educational programme on medication safety among undergraduate nursing students.

#### Research design

The research design of this study was one group pretest - posttest design.

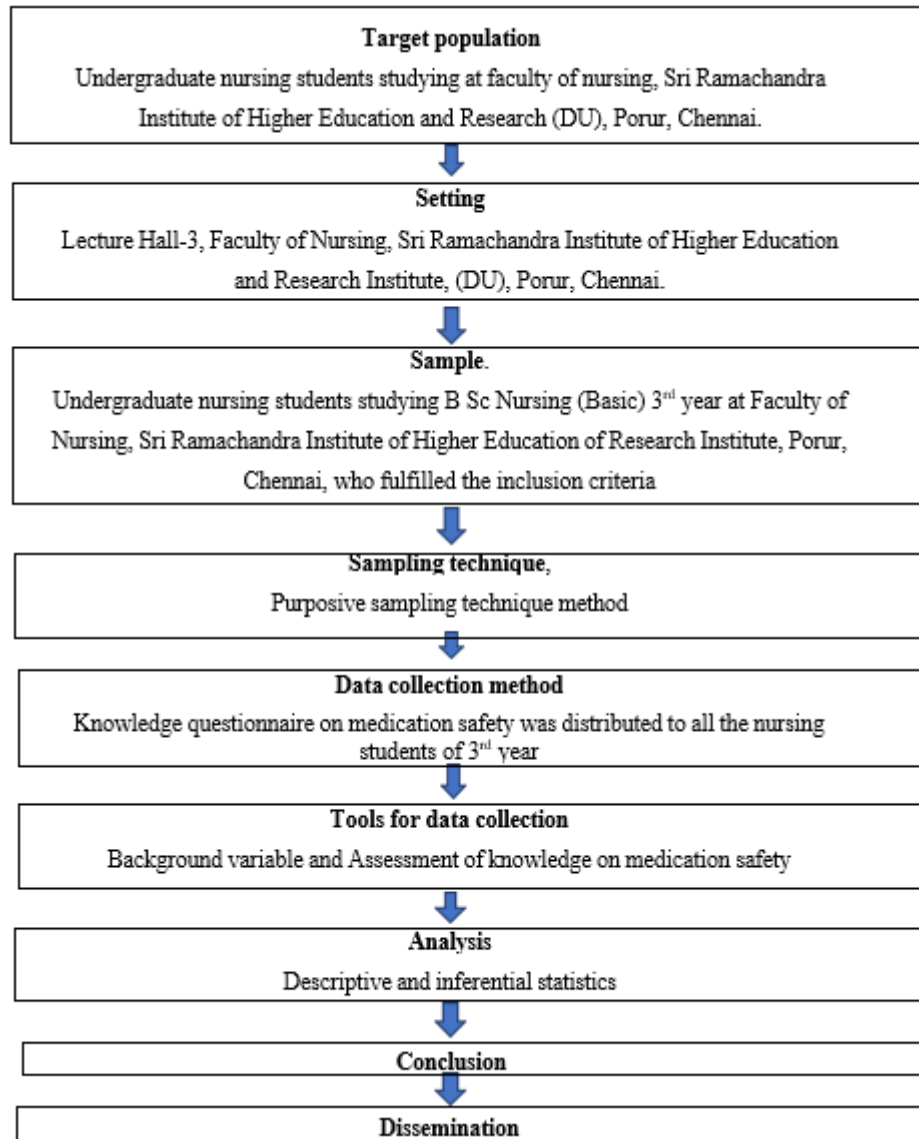
GROUP	PRETEST	INTERVENTION	POSTTEST
Study		X	
Key:	O <sub>1</sub>		O <sub>2</sub>

- O<sub>1</sub> – Pretest assessment of knowledge on medication safety.
- X- Planned educational programme on medication safety to undergraduate nursing students for 45 minutes of video assisted teaching and 15 minutes of discussion.
- O<sub>2</sub>- Posttest assessment of knowledge on medication safety after one week

#### Setting

The study was conducted in Lecture Hall-3, Faculty of Nursing, Sri Ramachandra Institute of Higher

Education and Research (DU), Porur, Chennai. The lecture hall is located in the ground floor of the Faculty of Nursing. It is a spacious, gallery type hall which accommodates 100 students comfortably.



**Figure. 2 Schematic representation of research design**

### Population

The target population of this study was B. Sc. Nursing (Basic) students and the accessible population was students studying B. Sc. Nursing (Basic) 3<sup>rd</sup> year at Faculty of nursing, Sri Ramachandra Institute of Higher Education and Research Institute (DU), Chennai.

### Sampling processes Sample

Undergraduate nursing students who fulfill the inclusion criteria and studying B. Sc. Nursing (Basic) 3<sup>rd</sup> year (2016-17 batch) at Faculty of nursing, Sri Ramachandra Institute of Higher Education and Research Institute (DU), Chennai.

### Sample size

The sample size was calculated by using the formula  $N = z^2pq/ez$  Where,

n: sample size

p: expected proportions q: 100-p

e: half width of the desired interval

with the confidence level of 95% and Z at 1.96, p (proportions/ confidence level) =13%

Error = 5%

The required sample size was 99

All the available 3<sup>rd</sup> year students of college of nursing: 99

### Sampling technique

Purposive sampling technique was used. All the undergraduate nursing students who fulfilled the sampling criteria during the period of study were selected as sample.

Total number of B. Sc. Nursing (Basic) 3<sup>rd</sup> year is 99

### Criteria for sample collection Inclusion criteria

Undergraduate nursing students studying B. Sc. Nursing (Basic) 3<sup>rd</sup> year who are

1. willing to participate in the study.
2. present during the data collection period.

### Description of the tool

#### Description of the tool, scoring and interpretation

The tool consists of two sections

#### Section A: Background variables

Background variables such as age, gender, awareness of medication safety, involvement in medication administration and source of information about medication safety.

#### Section B: Knowledge questionnaire on medication safety.

It is a questionnaire developed by the investigator, which consists of knowledge on high-alert medication, sound-a-like and look-a-like medications, narcotics and safe handling of medication.

#### Scoring:

The questionnaire consists of 30 questions with multiple choices. A score of '1' is given for the right answer and '0' for the wrong answer. The total score is 30.

#### Interpretation:

The level of knowledge is determined as follows:

SCORE	%	LEVEL OF KNOWLEDGE
1-10	<50	Inadequate
11-20	51-75	Moderately adequate
21-30	>76	Adequate

#### Validity and reliability

The content validity was obtained from the experts in the field of nursing. The reliability of the tool was assessed using test-re-test method. The reliability score of the tool - self structured questionnaire for assessing the knowledge on medication safety was r=0.98.

**Pilot study**

The pilot study was conducted in the Faculty of Nursing among 20 students of B. Sc Nursing (Basic) 3<sup>rd</sup> year (2016-17 batch). The pilot study was conducted for a period of 5 days. 25.06.2018 to 29.06.2018. The investigator decided to modify the lecture type of teaching into video assisted teaching after the pilot study.

**Data collection procedures**

A written permission to conduct the study was obtained from Principal, Faculty of Nursing, Dean of students and Institutional Ethics Committee, Faculty of Nursing. The duration of the data collection period was one month from 1.10.2018 to 3.11.2018. Participants were selected based on the inclusion criteria. The purpose and procedure of the study were explained to the participants and a written informed consent was obtained.

The data of the background variable and self-structured questionnaire for assessing the knowledge on medication safety were distributed to 99 study participants and instructed to mark the correct option and the total time taken for pre-tests was 35 minutes, after the pre-test, video-assisted teaching was given to the participants for 45 minutes followed by 15 minutes of discussion. After seven days, post-test was conducted with the self-structured questionnaire for assessing the knowledge on medication safety.

**Plan for data analysis Descriptive statistics:**

Frequency, percentage, mean and standard deviation was used to assess the demographic variables and knowledge on medication safety.

**Inferential statistics**

Chi-square and ANNOVA was used to find out the association between knowledge of medication safety and selected background variables among undergraduate nursing students.

**Ethical consideration**

The study was conducted after the approval from Principal, Faculty of Nursing, Dean of students and Institutional ethics committee. Participants were explained clearly about the study purpose and a written informed consent was obtained from all the participants before conducting the study confidentiality was maintained throughout the study.

**Chapter IV Analysis and Interpretation**

Statistical analysis helps to interpret and communicate the findings of the study. The present study was conducted by the investigator to assess the knowledge on medication safety among undergraduate nursing students at Sri Ramachandra Institute of Higher Education & Research (DU). The data collected were analyzed using descriptive and inferential statistics. The findings are discussed as follows:

**Section A**

Distribution of nursing student's data according to their background variables (N=99) (Table 1).

**Section B**

Distribution of nursing student's data according to their level of knowledge on medication safety (N=99)

(Table 2)

Distribution of nursing student's data according to their level of knowledge on medication safety (N=99)

(Table 3)

Distribution of nursing student's data according to mean and standard deviation of knowledge on medication safety (N=99) (Table 4).

Distribution of nursing student's data according to their level of knowledge on high alert medication (N=99) (Table 5).

Distribution of nursing students according to their level of knowledge on sound-a- like and look-a-like medications. (n=99) (Table 6)

**Section C**

Association of knowledge on medication safety with selected demographic variables (N=99) (Table 7)

Section A

**Table 1 Distribution of nursing students' data according to their Demographic Variables (N= 99)**

<b>Background variables</b>	<b>n</b>	<b>%</b>
<b>Age (in years)</b>		
21	0	0
22	99	100
23	0	0
<b>Gender</b>		
Male	24	24
Female	75	76
<b>Are you aware of Medication safety</b>		
Yes	99	100
No	0	0
<b>Involved in medication administration</b>		
Yes	99	100
No	0	0
<b>Source information about Medication Safety</b>		
Curriculum	22	23
Clinical exposure	78	79

Table 1 Distribution of nursing students' data according to their Demographic Variables (N= 99)  
 Table 1 depicts that 100% of students were in 22yrs of age group, with respect to the gender 25% of students were males and 76% of students were females

Awareness about medication safety, involvement in medication administration is 100% among the study participants. Majority, 78% of the students had gained information on medication safety from their clinical exposure and 22% of them had gained information from the curriculum.

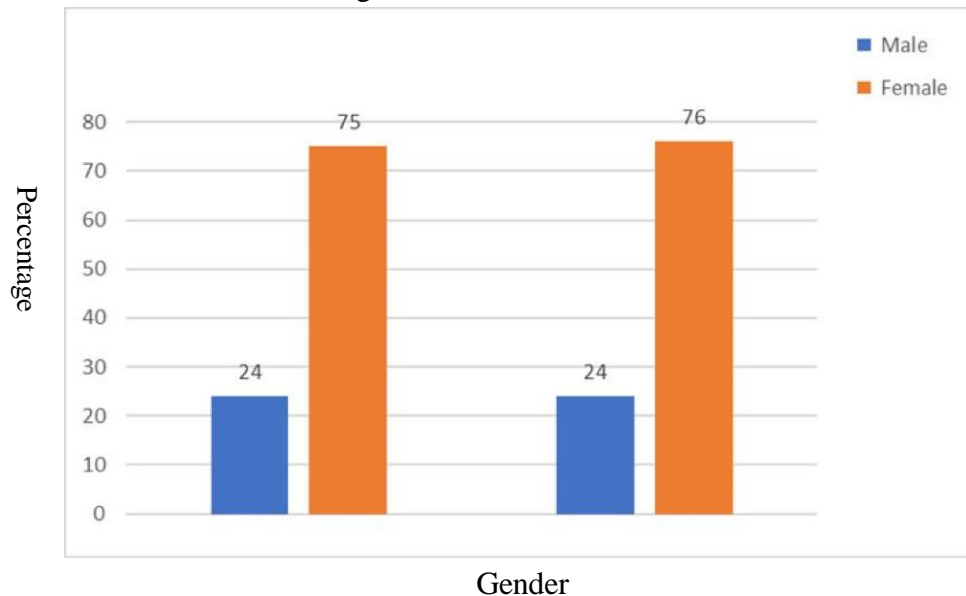


Figure 3 Distribution of nursing students' data according to their gender. (N=99)

Section B

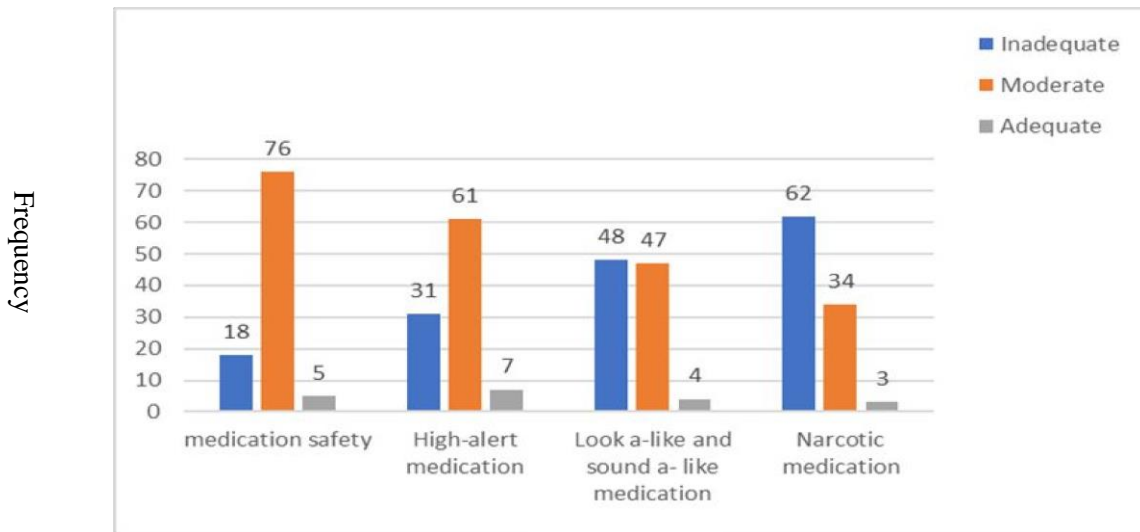
Table 2 Distribution of nursing students' data according to their level of knowledge on medication safety (N=99)

Knowledge On	Pretest						Posttest					
	Inadequate (<50%)		Moderate (51-70%)		Adequate (>76%)		Inadequate (<50%)		Moderate (51-70%)		Adequate (>76%)	
	n	%	n	%	N	%	n	%	n	%	n	%
Medication safety	18	18.1	76	76.7	5	5.05	3	3.03	28	28.2	68	68.6
High-alert medication	31	31.1	61	61.6	7	7.07	2	2.02	24	24.2	73	73.7
Look a-like and sound a-like medication	48	48.4	47	47.4	4	4.04	3	3.03	14	14.4	82	82.8
Narcotic medication	62	62.6	34	34.3	3	3.03	9	9.09	33	33.3	57	57.5

Table 2 shows that showed that the knowledge of medication safety among B. Sc Nursing (Basic) 99 students were, (n=18) of the students had inadequate knowledge, (n=76) had moderate knowledge and (n=5) had adequate knowledge in pretest, and in the posttest (n=3) had inadequate knowledge, (n=28) had moderate knowledge and (n=68) had adequate knowledge. Knowledge on high-alert medication in pretest shows (n=31) had inadequate knowledge, (n=61) had moderate knowledge (n=7) had adequate knowledge about high-alert medication in posttest inadequate knowledge (n=2), moderate knowledge (n=24) and adequate knowledge (n=73) on high-alert medication.

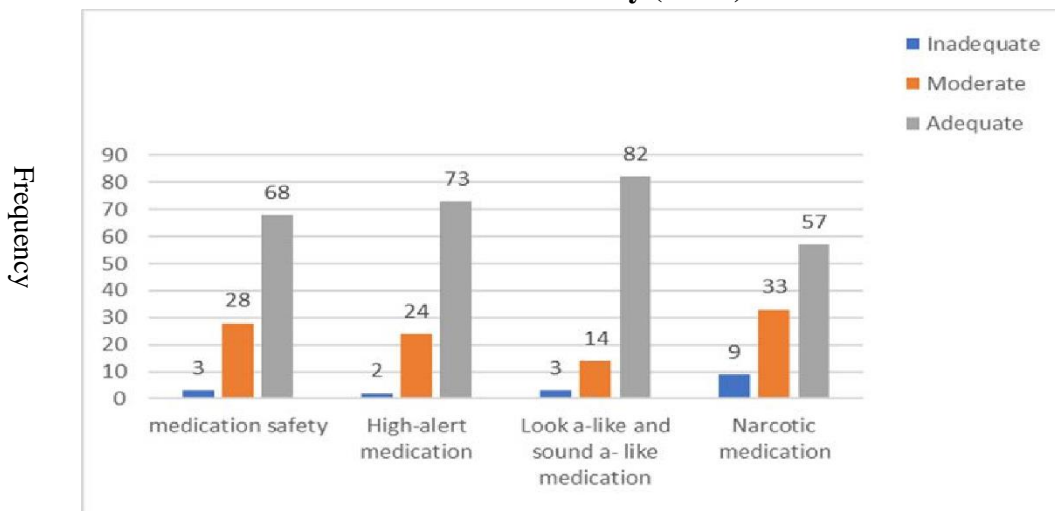
Knowledge on look-a-like sound-a-like medication, (n=48) had inadequate knowledge, (n=47) had moderate knowledge and (n=4) had adequate knowledge, in posttest (n=3) had inadequate knowledge,

(n=14) had moderate knowledge and (n=82) had adequate knowledge. Regarding knowledge on narcotic medication pretest shows (n=62) had inadequate knowledge, (n=34) had moderate knowledge and (n=3) had adequate knowledge on narcotic medication, whereas in posttest (n=9) had inadequate knowledge, (n=33) had moderate knowledge and (n=57) had adequate knowledge on narcotic medications after the post-test.



Knowledge

**Figure 4 Distribution of nursing students according to their level of knowledge of pretest on medication safety (N=99)**



Knowledge

**Figure 5 Distribution of nursing students according to their level of knowledge of posttest on medication safety (N=99)**



Table 3 Distribution of mean and standard deviation of B. Sc, Nursing (Basic) 3<sup>rd</sup> year on medication safety (N=99)

Variables	Mean	Standard deviation	t value p value
<b>Knowledge</b> Pretest	15.62	6.377	7.54
Posttest	27.93	2.26	.001***

\*\*\* P< 0.001

Table 3 shows that among the knowledge of B Sc nursing 3<sup>rd</sup> year students' scores on medication safety, in pre-test, the mean value was 15.62 and standard deviation was 6.37 and after the post test, mean was 27.93 and standard deviation was 2.26. The t value was 7.543 and the p value was .001

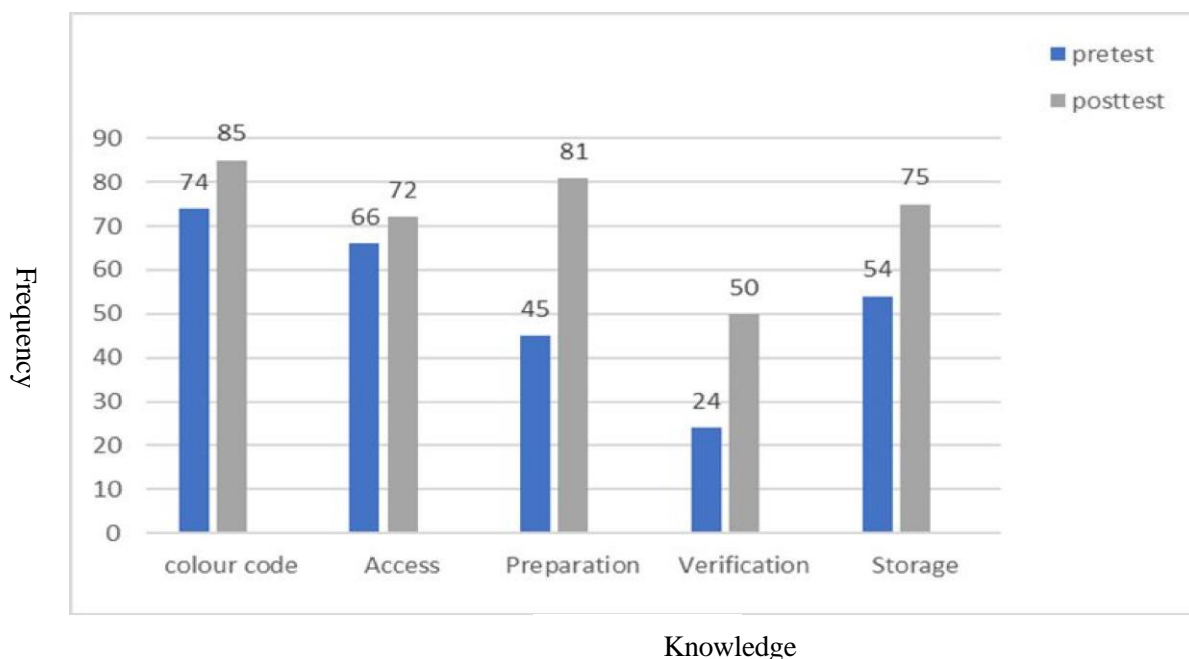
Table 4 Distribution of nursing students' data according to their level of knowledge on high alert medication (N=99)

High-alert medication	Pretest		Posttest	
	N	%	N	%
<b>Label with colour code</b>				
Yellow	16	16.16	7	7.07
Red	74	74.74	85	85.85
Green	5	5.05	1	1.01
Blue	4	4.04	6	6.06
<b>Access to high alert medication</b>				
Ward nurse and ward in-charge	66	66.66	72	72.72
Nurse and doctor	21	21.21	12	12.12
Doctor and in-charge	12	12.12	12	12.12
Doctor and pharmacist	0	0	3	3.03
<b>Preparation of high alert medication</b>				
store room	38	38.38	11	11.11
nurses' room	8	8.08	1	1.01
bed side	8	8.08	6	6.06
laminar hood	45	45.45	81	81.81
<b>Verification done before administration of high alert drug name and record</b>				
	23	23.23	22	22.22

dose and strength	24	24.24	50	50.50
frequency and route	24	24.24	10	10.10
name and route	28	28.28	17	17.17
<b>Storage of high alert medication</b>				
store room	25	25.25	8	8.08
Refrigerator	19	19.19	12	12.12
double lock cupboard	54	54.54	75	75.75
patient bed side	1	1.01	4	4.04

Table 4 showed that the students' knowledge on the labelled color code as red for the high alert medications was 74% in the pre-test whereas 85% in the post-test. Majority 66% of the students were aware of the access to high alert medication through knowledge from the nurse and the ward in-charge in the pre-test whereas 72% of the students answered in the post-test. About 45% of the students were aware of the preparation of the high alert medication should be done in the laminar hood during pre-test whereas 81% of them gained knowledge in the post-test.

Only 24% of the students were aware that the dose and strength verification of the high alert medication should be done twice before administration during the pre-test where as 50% of the students gained knowledge about it in the post-test. 54% of the students were aware of the storage of high alert medication in double locked cupboard during the pre-test whereas 75% of the students demonstrated that in the post test.



**Figures 7 Distribution of nursing students data according to the knowledge on high alert medication (N=99)**

**Table 5 Distribution of nursing students according to their level of knowledge on sound-a-like and look-a-like medications. (n=99).**

Variables	Pretest		Posttest	
	n	%	n	%
<b>Documentation of look-alike drug in drug chart</b>				
red pen	47	47.47	58	58.58
red colour sticker	13	13.13	24	24.24
black pen	23	23.23	7	7.07
green pen	16	16.16	10	10.1
<b>Dispensing of LASA medication</b>				
in-charge nurse	57	57.57	75	75.75
Physician	9	9.09	15	15.15
Patient	12	12.12	3	3.03
medical suppliers	21	21.21	6	6.06
<b>Responsible person for LASA medication</b>				
Nurses	26	26.26	51	51.51
Physiotherapist	6	6.06	4	4.04
medical representative	35	35.35	31	31.31
Manufacturer	32	32.32	13	13.13

Table 5 showed that only 47% of the samples were aware of the documentation of look-a-like medication in the drug chart and should be underlined with red pen during the pre-test whereas 58% of the students had exhibited knowledge in the post-test.

Only 57% of the students were aware of the dispensing of LASA medication should be given to the ward in-charge nurse during pre-test where as 75% of the students had gained knowledge during the post-test. Only 26% of the students were aware that the nurse is the responsible person for LASA medication during pre-test where as 51% of the students showed it during the post-test.

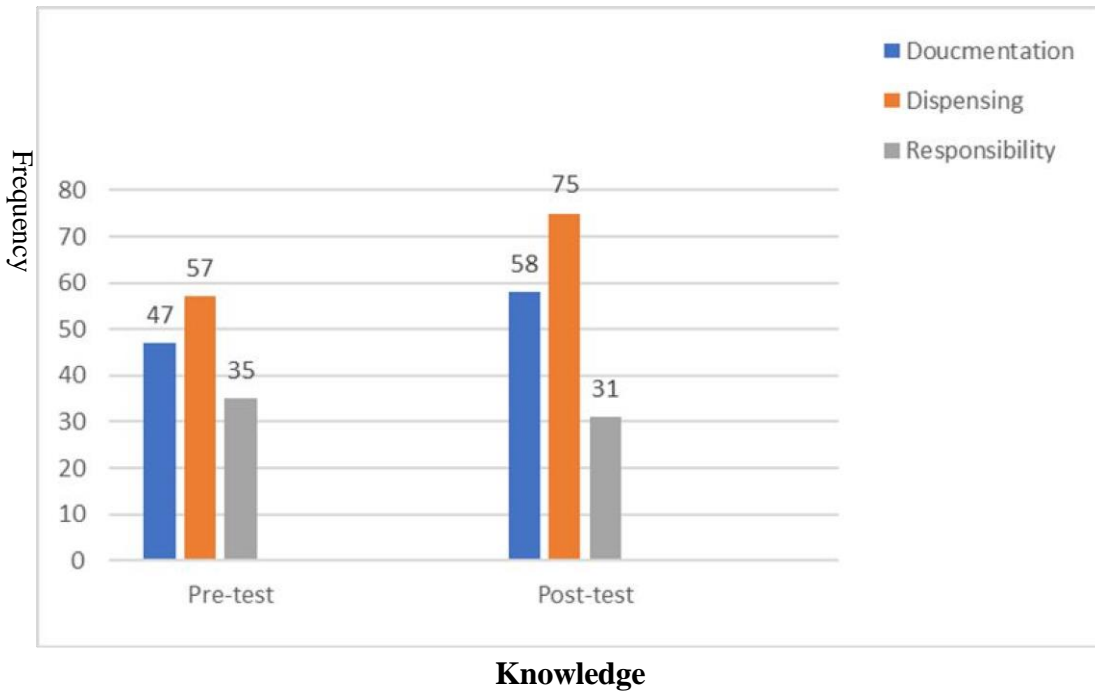


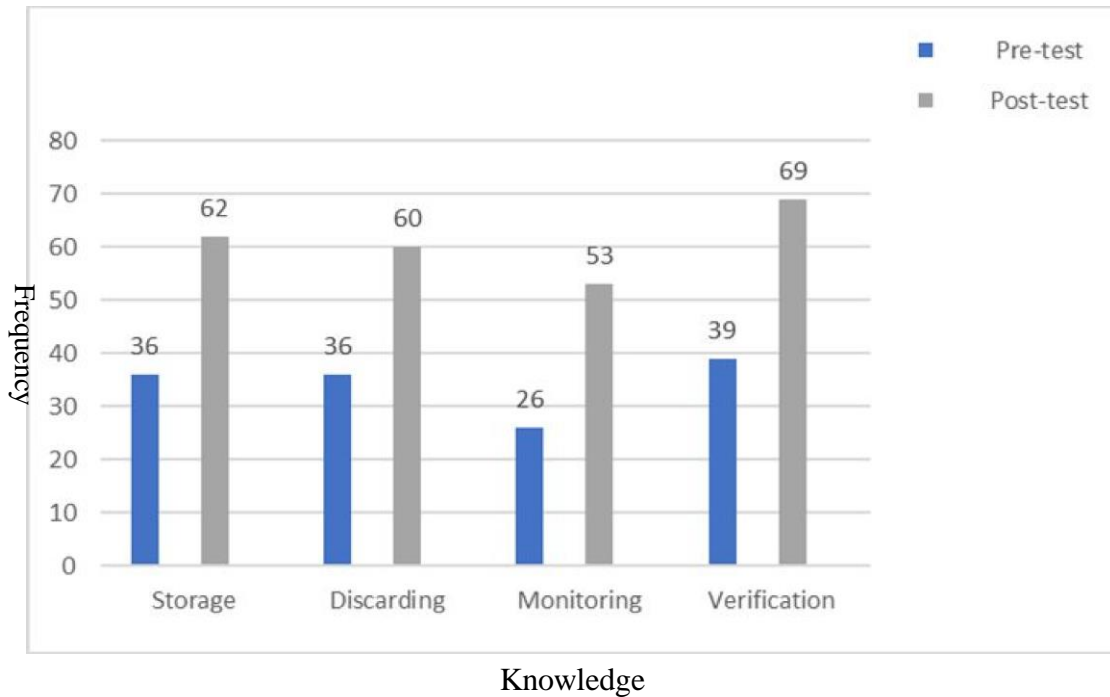
Figure 6 Distribution of nursing students according to their score of knowledge on sound-a-like and look-a-like medications. (N=99).

Table 6 Distribution of nursing students according to their level of knowledge on narcotic medication (N=99)

Variables	Pretest		Posttest	
	n	%	n	%
<b>Storage of narcotic drugs</b>				
nurses' station	2	2.02	14	14.14
double-lock cupboard	36	36.36	62	62.62
crash cart	59	59.59	22	22.22
patient's bed side	2	2.02	1	1.01
<b>Discarding of leftover narcotic drug</b>				
rinse it in water	36	36.36	60	60.60
burnt it	20	20.20	7	7.07
dissolve it in solution	39	39.39	25	25.25
wipe it with cotton	4	4.04	7	7.07

<b>Monitoring of vital signs following narcotic drugs</b>					
2 <sup>nd</sup> hourly	48		48.48	39	39.39
4 <sup>th</sup> hourly	26		26.26	53	53.53
6 <sup>th</sup> hourly	10		10.10	4	4.04
8 <sup>th</sup> hourly	15		15.15	5	5.05
<b>Verification of narcotic drug before Administration</b>					
one nurse	16		16.16	11	11.11
two nurses	39		39.39	69	69.69
three nurses	32		32.32	12	12.12
four nurses	12		12.12	7	7.07

Table 5 showed that 36% of the students were aware of the storage of narcotic drug in the double locked cupboard during pre-test whereas 62% of the students gained knowledge about it during the post-test. Only 36% of the students were aware of discarding the leftover narcotic medicines by rinsing the needle in water during the pre-test where as 60% of the students learnt were aware about it during the post-test. Around 26% of the students only were aware of the monitoring the vital signs 4<sup>th</sup> hourly during pre-test whereas 53% of the students exhibited knowledge about it during the post-test. Only 39% of the students were aware of the information that the narcotic drugs need to be checked by two nurses before administration during pre-test where as 69% of the students were made aware of it during the post-test.



**Figure 9 Distribution of nursing students according to their level of knowledge on narcotic medication (N=99)**

**Section C**

Table 7 Association between demographic variables and pretest knowledge among B. Sc Nursing (Basic) students (N=99)

Background variables	Pretest		
(n=99)	mean	Standard deviation	F value P value
Male	17.78	7.45	-7.54
Female	14.96	5.90	-20.4
			.001***

\*\*\*P<.001

Table 7 showed that there was a statistically significant association between the level of knowledge of B Sc nursing 3<sup>rd</sup> year students (n=99) and the gender. In the present study the males have more exhibited knowledge on medication safety than the females (mean 17.78 and 14.96 and SD 7.45 and 5.90), respectively.

**Chapter V Discussion**

This chapter discusses the results based on the stated objectives. This study was undertaken to assess the effectiveness of medication safety education among undergraduate students.

Description of study participants

The sample comprised of 99 B. Sc. Nursing (Basic) 3<sup>rd</sup> year students. Out of 99 students, 100% of students belonged to 22yrs of age and 24% of students were males and 75% of students were females from B. Sc. Nursing (Basic) 3<sup>rd</sup> year. All, 99 (100%) of students had some awareness about medication safety measures. Majority, 78% of the students had gained information on medication safety from their clinical exposure and 22% of them had gained information from the curriculum.

**The first objective of the study was to assess the effectiveness of medication safety education among undergraduate nursing students**

The study showed that the knowledge of medication safety among B. Sc Nursing (Basic) 99 students were, (n=18) of the students had inadequate knowledge, (n=76) had moderate knowledge and (n=5) had adequate knowledge in pretest, and in the posttest (n=3) had inadequate knowledge, (n=28) had moderate knowledge and (n=68) had adequate knowledge. Knowledge on high-alert medication in pretest shows (n=31) had inadequate knowledge, (n=61) had moderate knowledge (n=7) had adequate knowledge about high-alert medication in posttest inadequate knowledge (n=2), moderate knowledge (n=24) and adequate knowledge (n=73) on high-alert medication. Knowledge on look-a-like sound-a-like medication, (n=48) had inadequate knowledge, (n=47) had moderate knowledge and (n=4) had adequate knowledge, in posttest (n=3) had inadequate knowledge, (n=14) had moderate knowledge an(n=82) had had adequate knowledge. Regarding knowledge on narcotic medication pretest shows (n=62) had inadequate knowledge, (n=34) had moderate knowledge and (n=3) had adequate knowledge on narcotic medication, whereas in posttest (n=9) had inadequate knowledge, (n=33) had moderate knowledge and (n=57) had adequate knowledge on narcotic medications after the post-test.

The mean value of knowledge of B Sc nursing 3<sup>rd</sup> year students' scores on medication safety, in pretest, was 15.62 and standard deviation was 6.37 and after the posttest, mean was 27.93 and standard deviation was 2.26. The t value was 7.54. Hence, the study findings show that hypothesis H<sub>1</sub>: the medication

safety education will improve knowledge among undergraduate nursing students is been accepted.

**The second objective of the study is to associate the knowledge with selected demographic variables among undergraduate nursing students.**

The medication safety was found to have statistically significant association in knowledge with selected demographic variables at  $p < .05$  (Table 7).

**Limitations**

- The study was restricted to nursing students only
- Practice on medication safety was not assessed.

**Chapter VI**

Summary, Nursing Implications and Recommendation

This chapter consist of four sections: Summary of the study, conclusion of the study, implication for nursing, recommendation for further research.

**Summary of the study**

The study was conducted to assess the effectiveness of an educational programme on knowledge on medication safety education of undergraduate nursing students at Sri Ramachandra Medical College & Research Institute, Porur, Chennai.

The research approach was quantitative in nature. An experimental one group pretest- posttest design was adopted for the study.

The conceptual framework adopted for the study was based on the general system model approach of Ludwing Von Bertalafy system theory.

The samples included for the study was 99 third year B Sc nursing students, based on the inclusion criteria. The samples were selected using purposive sampling technique.

The questionnaire consists of two sections, Section A: Back ground variables, Section B: Assessment of knowledge on medication safety education. The self- administered questionnaire was given to the samples to elicit the data.

The posttest was conducted after one week for the same participants using same knowledge questionnaire.

Data were grouped and analyzed using descriptive and inferential statics. The descriptive methods used were frequency, percentage, mean and standard deviation to assess the distribution of students according to the demographic variables and knowledge on medication safety among B Sc nursing students. ANNOVA, paired t- test was used to assess the effectiveness of educational programme on knowledge on medication safety education and chi-square was used to identify the correlation between knowledge.

**The study findings are summarized below**

- The sample comprised of 99 students. Out of 99 students, 100% of students belonged to 22yrs of age and 24% of students were males and 75% of the students were females from B Sc nursing 3<sup>rd</sup> year. All 99 (100%) of students had some awareness about medication safety measures. Majority 78% of the students had gained information on medication safety from their clinical exposure and 22% of them had gained information from the curriculum.



- The knowledge of medication safety among B. Sc Nursing (Basic) 99 students were, (n=18) of the students had inadequate knowledge, (n=76) had moderate knowledge and (n=5) had adequate knowledge in pretest, and in the posttest (n=3) had inadequate knowledge, (n=28) had moderate knowledge and (n=68) had adequate knowledge. Knowledge on high-alert medication in pretest shows (n=31) had inadequate knowledge, (n=61) had moderate knowledge (n=7) had adequate knowledge about high-alert medication in posttest inadequate knowledge (n=2), moderate knowledge (n=24) and adequate knowledge (n=73) on high-alert medication.
- Knowledge on look-a-like sound-a-like medication, (n=48) had inadequate knowledge, (n=47) had moderate knowledge and (n=4) had adequate knowledge, in posttest (n=3) had inadequate knowledge, (n=14) had moderate knowledge an(n=82) had had adequate knowledge. Regarding knowledge on narcotic medication pretest shows (n=62) had inadequate knowledge, (n=34) had moderate knowledge and (n=3) had adequate knowledge on narcotic medication, whereas in posttest (n=9) had inadequate knowledge, (n=33) had moderate knowledge and (n=57) had adequate knowledge on narcotic medications after the post-test.
- The knowledge of B Sc nursing 3<sup>rd</sup> year students' scores on medication safety, in pretest, the mean value is 15.62 and standard deviation is 6.37 and after the posttest, mean is 27.93 and standard deviation is 2.26. The t value is 7.543 and the p value is .000
- The student's knowledge on the labelled color code as red for the high alert medications was 74% in the pretest whereas 85% in the posttest. In the pretest, around 66% of the students were aware of the access to high alert medication is by the nurse and the ward in-charge whereas 72% of the students answered in the posttest. About 45% of the students were aware about the preparation of the high alert medication should be done in the laminar hood during pretest whereas 81% of them gained knowledge in the posttest.
- Only 24% of the students were aware that the dose and strength verification of the high alert medication should be done twice before administration during the pretest where as 50% of the students gained knowledge about it in the post-test. 54% of the students were aware of the storage of high alert medication in double lock cupboard during the pre-test where as 75% of the students learnt that in the posttest.
- Only 47% of the samples were aware of the documentation of look-a-like medication in the drug chart and should be underlined with red pen during the pretest whereas 58% of the students gained knowledge in the posttest. Only 57% of the students were aware of the dispensing of LASA medication should be given to the ward in-charge nurse during pretest where as 75% of the students had gained knowledge during the posttest. Only 26% of the students were aware that the nurse is the responsible person for LASA medication during pre-test where as 51% of the students learnt it during the post-test.
- 36% of the students were aware of the storage of narcotic drug in the double lock-cup board during pre-test whereas 62% of the students gained knowledge about it during the post-test. Only 36% of the students were aware of discarding the leftover narcotic medicines by rinsing the needle in water during the pre-test whereas 60% of the students showed improvement. Around 26% of the students were only aware of the monitoring the vital signs 4<sup>th</sup> hourly during pre-test where as 53% of the students gained knowledge about it during the post-test. Only 39% of the students were aware of the information about the narcotic drugs need to be checked by two nurses before administration during pre-test where as 69% of the students were made aware of it during the post-test.

## **Conclusion**

The students were given the planned educational programme. The students had improved their knowledge on medication safety. This will ultimately help to reduce the number of medication errors in their day to day professional practices. The findings of the study indicate that the educational programme was effective in improving the knowledge of the students.

## **Nursing implications**

### **Nursing practice**

Working in tertiary health care settings and in health care agencies makes knowledge of medication safety education a necessity. Nurses can educate their own co-workers and students during their practice to prevent errors. Nurses have to ensure that the medication safety education should be given to all health care professional which can be promoted by lectures and workshops

### **Nursing education**

Medication safety education is existing the curriculum of both undergraduate and postgraduate nursing. The learning process of students can be strengthened by periodical reinforcement and creating simulated settings, where the practice of medication safety can be observed.

### **Nursing administration**

Nursing administrators need to strengthen their own knowledge and practice and those of the other health care personnel and students of health care to practice appropriate medication safety measures. Encouragement, motivation and reinforcement should be provided by the administrative authorities to do research on various aspects about medication safety

### **Nursing Research**

Research adds value to comprehensive and holistic care. Students and nurses should be motivated and encouraged by the nurse educators and administrators to conduct initiated research to identify measures to reduce and or manage the medication errors

### **Recommendations for further research**

1. A similar study can be conducted with large samples.
2. The study can be compared among other healthcare team members to promote necessary information regarding medication safety

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