RESEARCH PAPER

Effectiveness Of Planned Teaching Program On Knowledge Regarding Exchange Transfusion Among Nursing Students In Selected Nursing Institutions: A Quasi Experimental Study

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ABSTRACT

Exchange transfusion is an important therapeutic procedure used in severe neonatal hyperbilirubinemia to rapidly reduce serum bilirubin and prevent bilirubin-induced neurological damage. Nursing students require adequate knowledge regarding its indications, procedure, monitoring, complications, and nursing responsibilities. The present study was conducted to assess the effectiveness of a planned teaching programme on knowledge regarding exchange transfusion among nursing students.

Methods: A quantitative research approach with a quasi-experimental one-group pre-test–post-test design was used. The study included 100 nursing students from selected nursing institutions, chosen through a non-probability convenience sampling technique. Data were collected using a demographic proforma and a 30-item structured knowledge questionnaire. The tool demonstrated good reliability with a coefficient of r = 0.905. A pre-test was conducted, followed by administration of the planned teaching programme, and the post-test was carried out after seven days. Data were analyzed using descriptive and inferential statistics.

Results: In the pre-test, 58% of students had average knowledge, 36% had good knowledge, 5% had very good knowledge, and 1% had poor knowledge. The mean pre-test knowledge score was 13.14 ± 2.99. In the post-test, 58% had very good knowledge, 23% had excellent knowledge, 17% had good knowledge, and 2% had average knowledge. The mean post-test score increased to 21.26 ± 4.06. The mean difference was 8.12, and the calculated t-value was 16.035, showing a highly significant improvement at $p \leq 0.001$. Previous knowledge regarding exchange transfusion was significantly associated with both pre-test and post-test knowledge scores, while other demographic variables were not significant.

Conclusion: The planned teaching programme was highly effective in improving nursing students' knowledge regarding exchange transfusion and can be incorporated into neonatal nursing education.

Key words: Exchange transfusion; Planned teaching programme; Knowledge; Nursing students; Neonatal care

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INTRODUCTION

Neonatal hyperbilirubinemia is one of the most frequently encountered conditions during the early neonatal period and is characterized by excessive accumulation of bilirubin in the blood. More than 80% of newborn infants develop some degree of jaundice; although most cases are physiological and self-limiting, markedly elevated unconjugated bilirubin can cross the blood–brain barrier and cause acute bilirubin encephalopathy or permanent kernicterus [1]. Timely assessment of total serum bilirubin, recognition of neurotoxicity risk factors, intensive phototherapy, and escalation of care are therefore essential components of neonatal management.

Exchange transfusion is a rapid and potentially life-saving intervention for severe hyperbilirubinemia when bilirubin reaches the recommended exchange threshold or when signs of intermediate or advanced acute bilirubin encephalopathy are present. Current American Academy of Pediatrics guidance recommends urgent exchange transfusion when total serum bilirubin is at or above the age-, gestation-, and

risk-specific exchange threshold [1]. The procedure removes bilirubin and circulating antibodies while replacing sensitized erythrocytes, thereby reducing the risk of bilirubin-induced neurological injury. However, it is technically demanding and requires meticulous preparation, continuous monitoring, infection-control practices, accurate blood-volume calculation, and early recognition of complications.

The burden is particularly important in low- and middle-income settings. A systematic review estimated severe neonatal jaundice at 251.3 per 10,000 live births in the South-East Asian region and exchange transfusion at 107.1 per 10,000 live births, substantially higher than rates reported in many high-income regions [2]. An Indian study of 38 neonates undergoing exchange transfusion reported acute bilirubin encephalopathy in 45%, with Rh isoimmunization, ABO isoimmunization, and sepsis contributing to severe hyperbilirubinemia [3]. Nursing students preparing for pediatric and neonatal practice must therefore possess accurate knowledge regarding indications, preparation, procedural assistance, monitoring, complications, and post-transfusion care. A structured planned teaching programme can provide systematic, evidence-based learning and strengthen readiness for safe neonatal nursing practice.

NEED FOR THE STUDY

Exchange transfusion is performed less frequently because of improved antenatal prevention, bilirubin surveillance, and effective phototherapy, yet it remains an emergency procedure when severe neonatal hyperbilirubinemia threatens neurological function. Its relative rarity can reduce opportunities for nursing students to observe or assist with the procedure during clinical postings. Consequently, students may enter practice with theoretical exposure but insufficiently organized knowledge concerning treatment thresholds, blood selection, equipment preparation, infection prevention, infant monitoring, adverse reactions, and post-procedure care. This creates a clear need for focused teaching before students encounter high-risk neonates.

The procedure carries significant risks. In a multicentre cohort of 1,252 neonates who received exchange transfusion, 4% died within seven days and 6% died before hospital discharge; thrombocytopenia occurred in 64% of evaluated infants, hyperkalemia in 5%, and hypocalcemia in 2% [4]. These findings emphasize that rapid recognition of physiological and laboratory changes is essential during and after exchange transfusion. Indian evidence also shows preventable gaps preceding severe jaundice: among 38 referred neonates requiring exchange transfusion, 57% had been discharged within 24 hours, 43% lacked ABO/Rh grouping, and 45% presented with acute bilirubin encephalopathy [3].

Knowledge among nursing personnel is not uniformly optimal. A study involving 202 nurses and midwives found good knowledge of neonatal jaundice in 69.3%, while good practice was reported in only 62.9%; better knowledge was strongly associated with better clinical practice [5]. Educational intervention research in Indian nursing students also demonstrates that structured teaching improves maternal-neonatal competence. In Bihar, mean competency scores increased from 21.3 before training to 62.0 after standardized instruction, with an adjusted improvement of 52.3 percentage points [6]. Therefore, assessing baseline knowledge and evaluating a planned teaching programme on exchange transfusion is justified. The findings can identify learning gaps, measure educational effectiveness, and guide curriculum reinforcement for safe, evidence-informed neonatal nursing care.

AIM

The aim of this quasi-experimental study is to assess the effectiveness of planned teaching program on exchange transfusion among nursing students from selected nursing institutions and find the association between both the pre-test and post-test knowledge level and their selected demographic variables.

OBJECTIVES

Primary objectives:

To assess the effectiveness of planned teaching program on knowledge regarding exchange transfusion among nursing students in selected nursing institutions.

Secondary Objectives:

1. To associate the pretest knowledge score regarding exchange transfusion among nursing students with selected demographic variables.
2. To assess the pretest and posttest knowledge score regarding exchange transfusion among nursing students in selected nursing institutions.

METHODOLOGY

A quantitative research approach with a quasi-experimental one-group pre-test–post-test design was used to assess the effectiveness of a planned teaching programme on knowledge regarding exchange transfusion among nursing students.

The study was conducted in selected nursing institutions. A total of 100 nursing students studying in B.Sc. Nursing Semester V and second-year GNM were selected using a non-probability convenience sampling technique. Students who were willing, available during data collection, and had not

previously attended a teaching programme on exchange transfusion were included.

Data were collected using two sections. Section A consisted of demographic variables such as age, gender, religion, residence, course of study, previous knowledge, and source of information. Section B consisted of a 30-item structured knowledge questionnaire covering basic concepts, procedure and technique, post-procedure monitoring, and nursing responsibilities. Each correct answer carried one mark, with a maximum score of 30.

Content validity was established by 29 experts, including 20 Child Health Nursing experts, seven pediatricians, and two statisticians. The reliability coefficient of the questionnaire was r = 0.905, indicating good reliability.

Data were collected from 3 November to 30 November 2025. A pre-test was conducted, followed by the planned teaching programme using appropriate audio-visual aids. The post-test was administered after seven days using the same questionnaire.

Descriptive statistics such as frequency, percentage, mean, and standard deviation were used. A paired t-test was applied to assess the effectiveness of the teaching programme, while independent t-test and ANOVA were used to determine associations between knowledge scores and selected demographic variables. Statistical significance was considered at $p < 0.05$.

RESULT

Section I: Distribution Of Nursing Students With Regards To Demographic Variables

The demographic characteristics showed that the majority of nursing students 55% were aged 19–20 years, followed by 41% aged 21–22 years and 4% aged 23–24 years. Most participants were female (93%), while 7% were male.

Regarding religion, 73% were Hindu, 25% were Buddhist, and 2% were Christian. Most students 74% belonged to urban areas, while 20% were from rural areas and 6% from semi-urban areas.

With respect to the course of study, 64% were studying in II-year General Nursing and Midwifery, whereas 36% were studying in B.Sc. Nursing Semester V.

Regarding previous knowledge of exchange transfusion, 74% of students had no previous knowledge, while 26% reported having previous knowledge. Among those who had previous knowledge, all 26 students reported teachers as their source of information, while no student reported mass media, family, friends, or neighbors as a source of knowledge.

Section II: Assessment Of Level Of Knowledge Regarding Exchange Transfusion Among Nursing Students

Assessment Of Level Of Pre-Test Knowledge Regarding Exchange Transfusion Among Nursing Students In Selected Nursing Institutions.

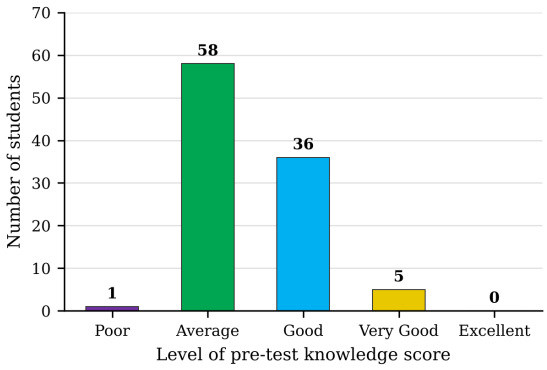


Figure 1: Pyramidal bar diagram representing assessment with level of pre-test knowledge regarding exchange transfusion.

Figure 1 shows that in the pre-test, the majority of nursing students 58% had average knowledge regarding exchange transfusion, followed by 36% with good knowledge and 5% with very good knowledge. Only 1% had poor knowledge, while none of the students demonstrated excellent knowledge. The pre-test knowledge scores ranged from 4 to 19, with a mean score of 13.14 ± 2.99. These findings indicate that most nursing students had only average to good baseline knowledge regarding exchange transfusion before administration of the planned teaching programme.

Assessment Of Level Of Post-Test Knowledge Regarding Exchange Transfusion Among Nursing Students In Selected Nursing Institutions.

Assessment with level of post-test knowledge regarding exchange transfusion

n=100

Level of post-test knowledge	Score Range	Level of Post-test Knowledge Score	
		Frequency	Percentage
Poor	0-20% (1-6)	0	0
Average	21-40% (7-12)	2	2
Good	41-60% (13-18)	17	17
Very Good	61-80% (19-24)	58	58
Excellent	81-100% (25-30)	23	23

		Level of Post-test Knowledge Score
Minimum score		12
Maximum score		29
Mean and SD knowledge score (Mean ± SD)		21.26±4.06

Table 1 shows that in the post-test, the majority of nursing students 58% had very good knowledge regarding exchange transfusion, followed by 23% with excellent knowledge and 17% with good knowledge. Only 2% had average knowledge, while none had poor knowledge. The post-test knowledge scores ranged from 12 to 29, with a mean score of 21.26 ± 4.06. The findings indicate a substantial improvement in knowledge following the planned teaching programme.

Assessment Of Effectiveness Of Planned Teaching Programme On Knowledge Regarding Exchange Transfusion Among Nursing Students In Selected Nursing Institutions

Table 2: Significance difference between knowledge score in pre-test and post-test of nursing students.

n=100

Overall	Mean	SD	Mean Difference	t-value	Tabulated t-value	p-value
Pre-test	13.14	2.99	8.12±1.07	16.035	1.98	p<=0.001
Post-test	21.26	4.06				S, p<0.05

Table 2 shows that the mean pre-test knowledge score was 13.14 ± 2.99, which increased to 21.26 ± 4.06 in the post-test, with a mean difference of 8.12. The calculated t-value was 16.035, which was higher than the tabulated value of 1.98. The difference was statistically significant at $p \leq 0.001$. Hence, the planned teaching programme was effective in improving nursing students' knowledge regarding exchange transfusion.

Association of Pre-test Knowledge Score with Selected Demographic Variables

Pre-test knowledge regarding exchange transfusion showed a significant association with previous knowledge about exchange transfusion ($p<0.05$). No significant association was found with age, gender, religion, area of residence, or course of study ($p>0.05$).

Association of Post-test Knowledge Score with Selected Demographic Variables

Post-test knowledge regarding exchange transfusion showed a significant association with previous knowledge about exchange transfusion ($p=0.005$). No significant association was found with age, gender, religion, area of residence, or course of study ($p>0.05$). The source of previous knowledge could not be statistically assessed.

DISCUSSION

The present study evaluated the effectiveness of a planned teaching programme on knowledge regarding exchange transfusion among 100 nursing students. Before the intervention, 58% of students had average knowledge, 36% had good knowledge, 5% had very good knowledge, and only 1% had poor knowledge. The mean pre-test knowledge score was 13.14 ± 2.99. Following the planned teaching programme, knowledge improved substantially; 58% demonstrated very good knowledge and 23% achieved excellent knowledge, while only 2% remained in the average category. The mean post-test score increased to 21.26 ± 4.06, with a mean difference of 8.12. The calculated t-value of 16.035 showed that the improvement was statistically highly significant ($p\leq0.001$), confirming the effectiveness of the planned teaching programme.

These findings are consistent with the study by Sachan et al. [7], who evaluated an educational intervention regarding exchange transfusion for severe neonatal hyperbilirubinemia among 60 student nurses in Kanpur. Their study also reported a significant improvement in knowledge following the intervention, supporting the usefulness of structured educational programmes for teaching complex neonatal procedures.

Similarly, Yadav and Karn [8] assessed an educational intervention regarding nursing care of neonates receiving phototherapy among 50 nurses. The mean knowledge score increased from 18.04 in the pre-test to 20.16 in the post-test, demonstrating improvement following educational intervention. They also reported no significant association between pre-test knowledge and demographic variables.

More recently, Tariq et al. [9] reported that an educational intervention on neonatal hyperbilirubinemia increased the mean competency score from 66.6 ± 4.8 to 81.2 ± 4.5, with a mean improvement of 14.6 and $p<0.001$. In the present study, previous knowledge regarding exchange transfusion was significantly associated with both pre-test and post-test knowledge, whereas age, gender, religion, residence, and course of study were not

significant. Overall, the findings demonstrate that focused planned teaching can substantially strengthen nursing students' knowledge regarding exchange transfusion.

CONCLUSION

The present quasi-experimental study concluded that the planned teaching programme was effective in improving nursing students' knowledge regarding exchange transfusion. Before the intervention, the majority of students had only average to good knowledge, with a mean pre-test score of 13.14 ± 2.99. After administration of the planned teaching programme, knowledge levels improved considerably, with most students attaining very good or excellent knowledge. The mean post-test score increased to 21.26 ± 4.06, producing a mean difference of 8.12. The observed difference between pre-test and post-test knowledge scores was statistically highly significant ($t = 16.035$, $p \leq 0.001$), demonstrating the effectiveness of the educational intervention.

The study also found that previous knowledge regarding exchange transfusion was significantly associated with both pre-test and post-test knowledge scores. However, age, gender, religion, area of residence, and course of study were not significantly associated with knowledge levels.

Overall, the findings indicate that a planned and systematically delivered teaching programme can substantially strengthen nursing students' knowledge regarding exchange transfusion. Such educational interventions can improve theoretical understanding and enhance preparedness for safe neonatal nursing care. Therefore, regular structured teaching sessions on complex and less frequently encountered neonatal procedures should be incorporated into nursing education and clinical training.

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