

A Study to Assess the Effectiveness of Structured Teaching Programme on Knowledge and Attitude Regarding Stem Cell Banking Among Nursing Students in a Selected Nursing College, Meerut, Uttar Pradesh

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ABSTRACT

Background: Stem cells represent a groundbreaking discovery in regenerative medicine with the potential to treat a wide range of chronic and life-threatening diseases. Despite this, awareness regarding stem cell banking remains limited among healthcare providers, including nursing students who play a crucial role in patient education.

Objectives: To assess the pre-test knowledge and attitude of nursing students regarding stem cell banking; to develop and implement a Structured Teaching Programme (STP); to assess post-test knowledge and attitude; to compare pre-test and post-test results; and to find associations with selected demographic variables.

Methodology: A pre-experimental one-group pre-test post-test research design was adopted. Ninety B.Sc. Nursing 4th semester students from L.L.R.M. Medical College, Meerut, were selected using purposive sampling. Data collection tools included a structured knowledge questionnaire and a Likert scale. The STP covered definition, sources, collection, processing, storage, applications, and ethical considerations of stem cell banking. Statistical analysis included descriptive and inferential statistics (paired t-test and Chi-square test).

Results: The mean knowledge score significantly increased from 19.42 ± 3.20 to 27.10 ± 2.73 ($t = 20.79$, $p < 0.05$). The mean attitude score also improved from 36.66 ± 5.24 to 44.32 ± 2.76 ($t = 5.50$, $p = 0.00001$). This indicates the STP was effective in improving knowledge and fostering a positive attitude toward stem cell banking.

Conclusion: The study concluded that structured teaching programmes are highly effective in enhancing knowledge and attitudes regarding stem cell banking among nursing students. Such interventions should be integrated into nursing education curricula to empower future healthcare professionals.

Keywords: Structured Teaching Programme, Stem Cell Banking, Nursing Students, Knowledge, Attitude.

INTRODUCTION

Stem cells are unique, undifferentiated cells with the ability to self-renew and differentiate into specialized cell types, acting as the body's natural repair system. Stem cell therapy has emerged as a promising field of regenerative medicine, offering potential treatments for conditions such as leukemia, lymphoma, thalassemia, spinal cord injuries, and autoimmune disorders. Stem cell banking involves collecting, processing, and preserving stem cells for future medical use. Among various sources—bone marrow, peripheral blood, menstrual blood, adipose tissue, and dental pulp—umbilical cord blood is considered most valuable due to its rich content of hematopoietic stem cells, ease of collection, and safety for both mother and baby.

The concept of stem cells dates back to 1868, when Ernst Haeckel first used the term. In the 1960s, James Till and Ernest McCulloch provided experimental proof of stem cells in bone marrow. A landmark event was the first successful cord blood transplant in 1988 for a child with Fanconi's anemia, which paved the way for thousands of successful transplants worldwide. In India, cord blood banking gained attention in the early 2000s with the establishment of both public and private banks. However, awareness among the general public and even healthcare professionals remains limited. Since nurses serve as vital health educators, their knowledge and attitude toward stem cell preservation are crucial in promoting its benefits.

This study was therefore conducted to assess and improve nursing students' knowledge and attitude through a Structured Teaching Programme (STP), enabling them to act as effective advocates and educators in this evolving area of healthcare.

OBJECTIVES

- To assess the pre-test knowledge and attitude of nursing students regarding stem cell banking.
- To develop and implement a Structured Teaching Programme on stem cell banking.
- To assess the post-test knowledge and attitude of nursing students regarding stem cell banking after the Structured Teaching Programme.
- To compare pre-test and post-test scores to determine the effectiveness of the Structured Teaching Programme.
- To find the association between pre-test knowledge and attitude scores with selected demographic variables.

Research Hypotheses

H1: There will be a significant difference in the pre-test and post-test scores of knowledge and attitude regarding stem cell banking among nursing students after the structured teaching programme.

H2: There will be a significant association between the pretest score of knowledge and attitude among nursing students regarding stem cell banking and selected sociodemographic variables.

METHODOLOGY

Research approach - quantitative research approach

Research design - pre-experimental 'one group pre test post test design'

Variables

The variables in present study includes -

1. **Independent variable** - structured teaching programme was used as an independent variable in the present study.
2. **Dependent variable** - knowledge and attitude was used as dependent variable in the present study.
3. **Demographic variable** - Age, gender, socioeconomic status, area of residence, previous knowledge etc.

Research setting - College Of Nursing, LLRM Medical College, Meerut.

Population - B.Sc. Nursing 4th semester students who meet the sampling criteria

Sample size - 90 B.Sc. Nursing 4th semester students

Sampling technique - Non probability purposive sampling technique

Description of tool

In the present study data collection tool was divided into 3 parts-

Tool A : Baseline Data of Participants

The research tool A included a section on background information, consisting of 8 items designed to gather demographic and personal data relevant to the study. These items covered key variables such as age, gender, marital status, religion, place of residence, type of family, monthly family income, and previous knowledge regarding stem cell banking

Tool B : Structured Questionnaire on Stem Cell Banking

To assess the knowledge regarding stem cell banking, a structured questionnaire was developed consisting of 30 multiple-choice questions.

Tool C: Likert Scale on Stem Cell Banking

To assess the attitude regarding stem cell banking, a five-point Likert scale was developed. The scale consisted of 10 statements, including both positive and negative statements, related to stem cell banking.

Scoring key

Level of Knowledge	Score
Poor	1-15
Moderately adequate	16-21
Adequate	22-30

Table 1.1: Classification of Knowledge Levels Based on Scores

Level of Attitude	Score
Unfavorable attitude	10-25
Neutral attitude	26-35
Favorable attitude	36-50

Table 1.2 Classification of Attitude Levels Based on Scores

Data Analysis

Data were analyzed using descriptive statistics (mean, frequency, percentage, standard deviation) and inferential statistics (paired t-test for comparing pre- and post-test scores, and Chi-square test for associations with demographic variables).

RESULTS

Section -A Findings Showing Distribution of Socio-Demographic Variables of B.Sc. Nursing 4th Semester Students at Selected Nursing College, Meerut (U.P.)

Table: 1.3 Frequency and Percentage Distribution of Samples with Selected Demographic Variables. N=90

S.NO.	DEMOGRAPHIC VARIBALES	FREQUENCY (f)	PERCENTAGE (%)
1.	Age in years		
	a. 18- 21 years	64	71%
	b. 22-25 years	23	26%
	c. 26-29 years	2	1%
	d. Above 30	1	1%
2.	Gender		
	a. Male	18	20%
	b. Female	72	80%
3.	Marital status		
	a. Unmarried	90	100%
	b. Married	0	0%
	c. Divorced	0	0%
	d. Widowed	0	0%
4.	Religion		
	a. Hindu	85	95%
	b. Muslim	4	4%
	c. Sikh	1	1%
	d. Christian	0	0%
	e. Others, specify	0	0%
5.	Area of residence		
	a. Urban	64	72%
	b. Rural	26	28%
6.	Family income		
	a. Below Rs. 10,000	12	14%
	b. Rs.10,001- Rs.20,000	18	20%

	c. Rs.20,001-Rs.30,000	13	14%
	d. Rs.30,001-Rs.50,000	25	27%
	e. Above Rs.50,000	22	25%
7.	Type of family		
	a. Nuclear family	69	77%
	b. Joint family	19	21%
	c. Extended family	02	2%
8.	Have you heard about stem cell banking		
	i. Yes	18	20%
	ii. No	72	80%
	If yes, specify		
	a. Mass media	16	18%
	b. Educational institutions	36	40%
	c. Healthcare professionals	18	20%
	d. Family or friends	2	2%
	e. Other, specify	0	0%

Section B : Findings Showing Distribution of Pre-test and Post-test Knowledge and Attitude Levels Regarding Stem Cell Banking Among B.Sc. Nursing 4th Semester Students at Selected Nursing College, Meerut (U.P.)

Table 1.4 Frequency and Percentage Distribution of Pre-Test and Post-Test Knowledge Scores
 N=90

Level of knowledge	Level Of Knowledge					
	Poor		Intermediate		Good/ High	
	f	%	f	%	f	%
Pre test	08	9%	61	68%	21	23%
Post test	01	1%	03	3%	86	96%

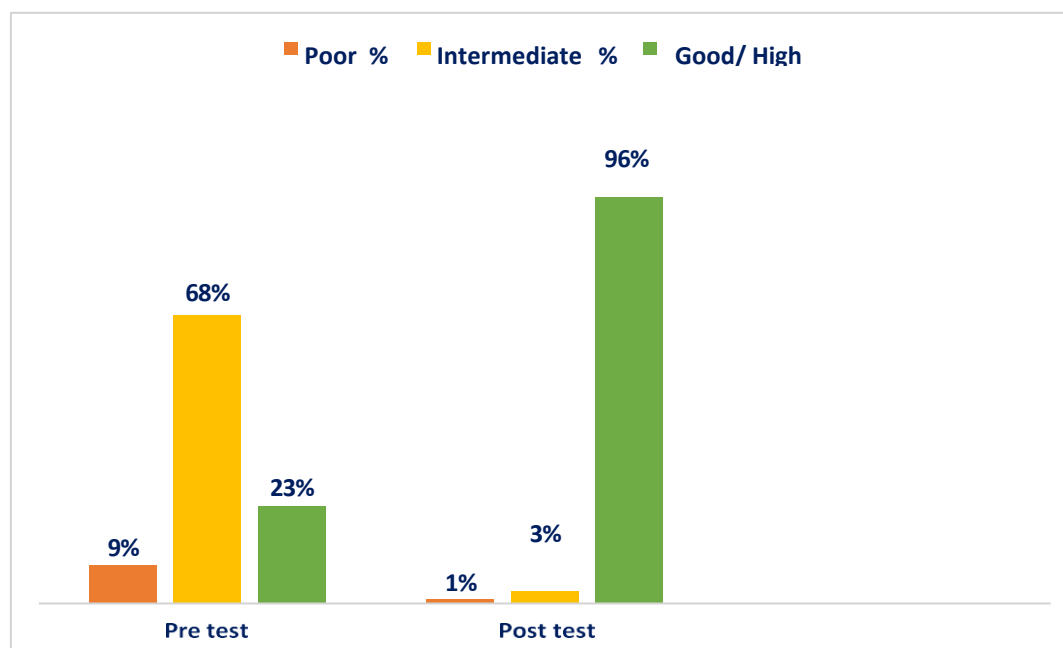


Figure 4.A : Frequency and Percentage Distribution of Pre-Test and Post-Test Knowledge Scores

Tables 1.5 Frequency and Percentage Distribution of Pre-Test and Post-Test Attitude Scores
 N=90

Level of Attitude	Unfavorable attitude		Neutral attitude		Favorable attitude	
	F	%	f	%	F	%

Pre test	09	10%	32	36%	49	54%
Post test	02	2%	11	12%	77	86%

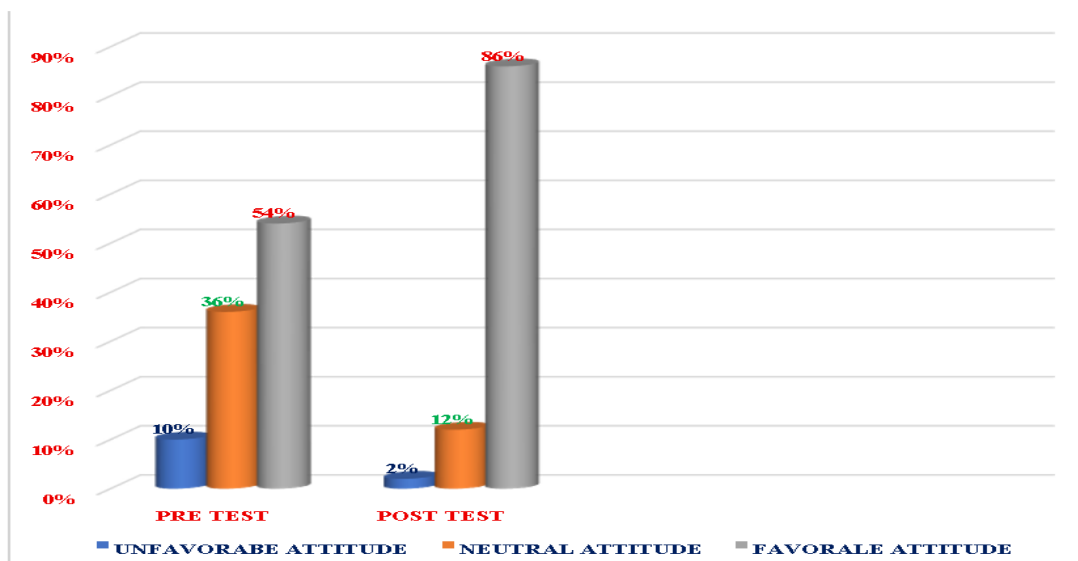


Figure 4.B: Frequency and Percentage Distribution of Pre-Test And Post-Test Attitude Scores

Section- C: Data on the Effectiveness of Structured Teaching Programme on Knowledge and Attitude Regarding Stem Cell Banking Among B.Sc. Nursing 4th Semester Students at Selected Nursing College, Meerut (U.P.)

Table 4.4 Mean, SD , 't' Test Value of Pre-Test and Post-Test Knowledge Scores on Stem Cell Banking

S.NO.	Test	Mean	SD	Mean Difference	Calculated value of paired 't'	Table of value of 't'	Df (n1)
1.	Pre- test	19.42	3.20	7.68	20.79*	1.987	89
2.	Post- test	27.1	2.73				

N=90

*= statistically significant at p <0.05 level

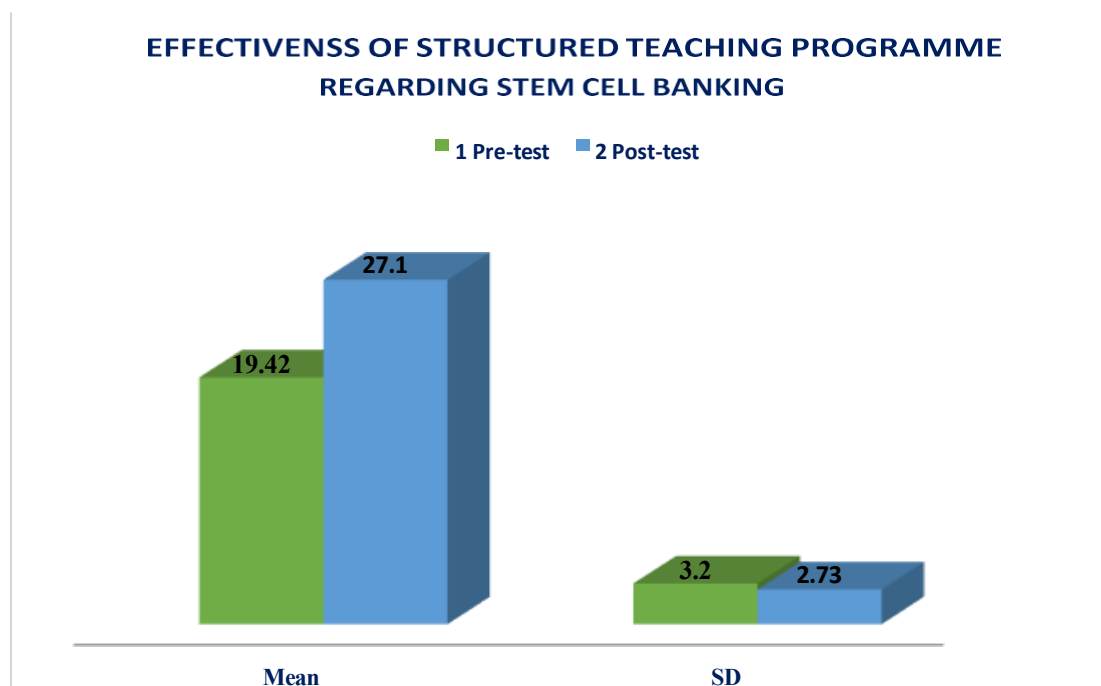
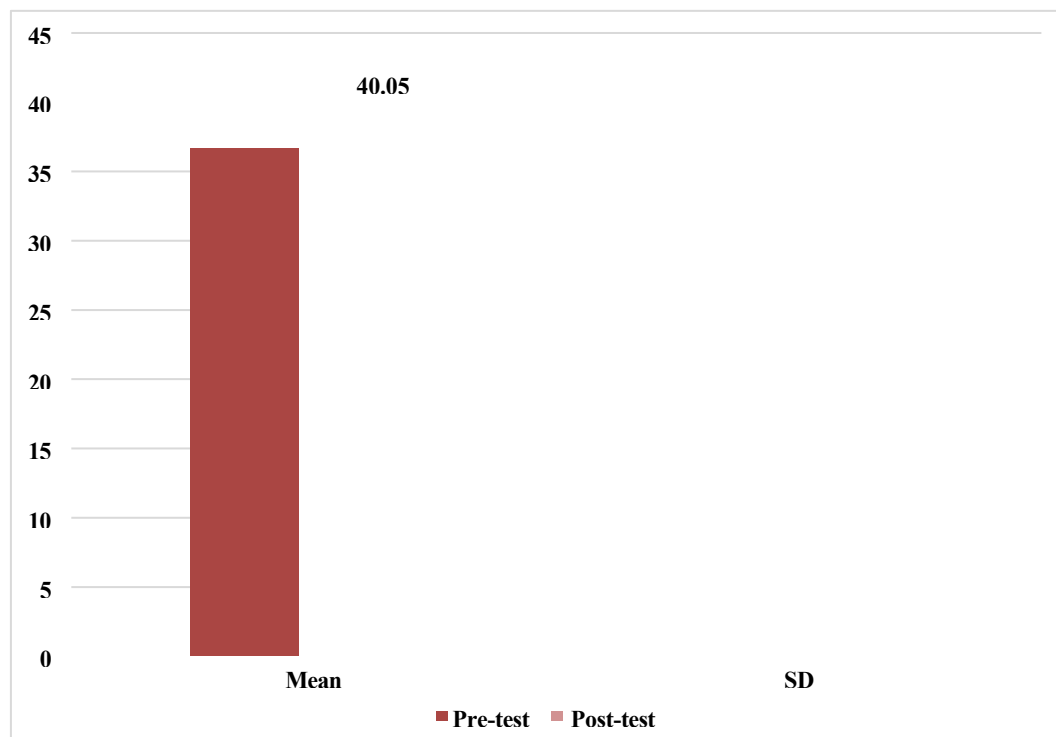


Figure 4.C: Effectiveness of structured teaching programme on knowledge regarding stem cell banking

Table 1.6 Mean, SD, 't' Test Value of Pre-Test and Post-Test Attitude Scores on Stem Cell Banking N=90

S.NO.	Test	Mean	SD	Mean Difference	Calculated value of paired 't'	Table value of 't'	Df (n-1)
1.	Pre-test	36.66	5.24	3.39	5.50*	1.987	89
2.	Post-test	40.05	4.14				



*= Statistically Significant at p <0.05 Level

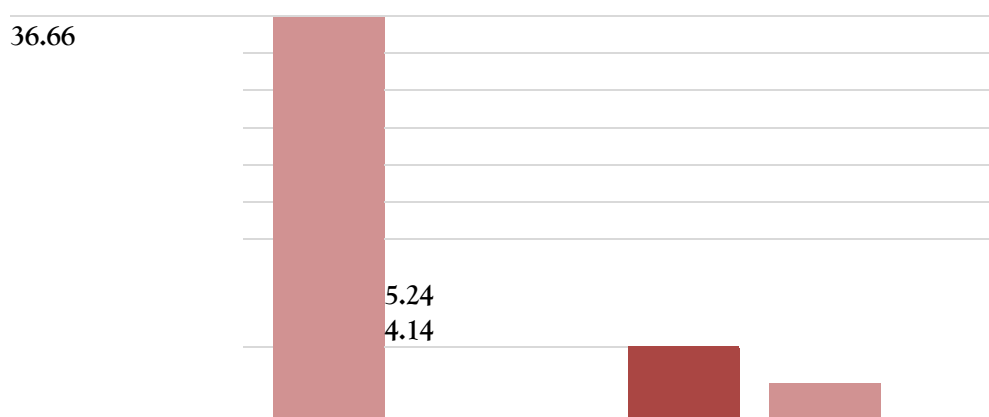


Figure 4.D: Effectiveness of Structured Teaching Programme on Attitude Regarding Stem Cell Banking

Section- D: Findings Related to the Association of Pre-test Knowledge and Attitude Scores with Selected Demographic Variables Regarding Stem Cell Banking Among B.Sc. Nursing 4th Semester Students at Selected Nursing College, Meerut (U.P.)

Table 1.7 Association Between Pre-Test Knowledge Scores and Demographic Variables N=90

S.No.	Demographic Variables	Category	Total score			Df	Chi-square χ^2	p value
			Poor	Intermediate.	Good			
1.	Age	A.18-21 Years	8	44	12	6	6.238*	0.013
		B.22-25 Years	0	15	08			

		C.26-30 Years	0	1	1			
		D. >30 Years	0	1	0			
2.	Gender	A.Male	1	11	6	02	1.393 ^{NS}	0.238
		B. Female	7	50	15			
3.	Marrital Status	A.Unmarried	8	61	21	6	0 ^{NS}	1.0000
		B.Married	0	0	0			
		C. Divorced	0	0	0			
		D. Widow	0	0	0			
4.	Religion	A.Hindu	8	59	18	8	6.716 [*]	0.010
		B.Muslim	0	1	3			
		C.Sikh	0	1	0			
		D.Christian	0	0	0			
		E. Other	0	0	0			
5.	Residence	A.Urban	6	43	15	2	0.071 ^{NS}	0.790
		B. Rural	2	18	6			
6.	Family Income	A.<10,000	1	7	4	8	7.232 [*]	0.007
		B.10,001-20,000	1	14	3			
		C. 20,001-30,000	1	6	6			
		D.30,001-50,000	3	19	3			
		D.>50,000	2	15	5			
7.	Type Of Family	A.Nuclear	7	49	13	4	5.570 [*]	0.018
		B. Joint	1	10	8			
		C. Extended	0	2	0			
8.	Have You Heard About Stem Cell Making	A. Yes	6	21	45	2	23.868 [*]	<0.001
		B. No	2	16	0			
	If Yes, Specify	A.Mass Media	2	14	02	8	5.927 [*]	0.015
		B.Educational Institutions	2	30	06			
		C.Healthcare Professionals	2	16	02			
		D.Family & Friends	0	02	00			
		E.Others,Specify	0	0	0			

*= Statistically Significant at p <0.05 Level

Table 1.8 Association Between Pre-Test Attitude Scores and Demographic Variables
 N=90

S.No	Demographic Variable	Category	Total Score			Df	Chi-Square X ²	p Value
			Unfav.	Neutra	Fav.			
1.	Age	A.18-21 Years	4	26	34	6	8.998 [*]	0.0027
		B.22-25 Years	5	4	14			
		C.26-30 Years	0	1	1			
		D. >30 Years	0	1	0			
2.	Gender	A.Male	1	5	12	2	1.939 ^{NS}	0.164
		B. Female	8	29	35			
3.	Marrital Status	A.Unmarried	9	32	49	6	0 ^{NS}	1.0000
		B.Married	0	0	0			
		C. Divorced	0	0	0			
		D. Widow	0	0	0			
4.	Religion	A.Hindu	9	32	44	8	3.508 ^{NS}	0.61
		B.Muslim	1	0	3			

		C.Sikh	0	0	1			
		D.Christian	0	0	0			
		E. Other	0	0	0			
5.	Residence	A.Urban	5	24	28	2	2.918 ^{NS}	0.088
		B. Rural	4	8	21			
6.	Family Income	A.<10,000	1	4	7	8	5.940*	0.015
		B.10,001-20,000	1	6	11			
		C. 20,001-30,000	2	5	6			
		D.30,001-50,000	1	12	12			
		D.>50,000	4	5	13			
7.	Type Of Family	A.Nuclear	5	25	39	4	6.803*	0.009
		B. Joint	4	7	8			
		C. Extended	0	2	0			
8.	Have You Heard About Stem Cell Making	A. Yes	5	21	46	2	13.392*	0.0003
		B. No	4	11	3			
	If Yes, Specify	A.Mass Media	2	4	10	8	2.2091 ^{NS}	0.137
		B.Educational Institutions	2	12	22			
		C.Healthcare Professionals	1	4	13			
		D.Family&Friends	0	1	1			
		E.Others	0	0	0			

*= Statistically Significant at p <0.05 Level

DISCUSSION

Section -A Findings Showing Distribution of Socio-Demographic Variables of B.Sc. Nursing 4th Semester Students at Selected Nursing College, Meerut (U.P.)

The study revealed that the majority of participants (71%) were aged 18–21 years, and most (80%) were female, reflecting the typical nursing student demographic. All were unmarried, with the majority (95%) belonging to the Hindu religion. A larger proportion (72%) came from urban areas, and over half (52%) were from families with a monthly income above Rs.30,000, indicating a middle to upper-middle-class background. Most participants (77%) lived in nuclear families, and importantly, 80% already had awareness about stem cell banking, primarily gained through educational institutions, healthcare professionals, and media sources.

Section B : Findings Showing Distribution of Pre-test and Post-test Knowledge and Attitude Levels Regarding Stem Cell Banking Among B.Sc. Nursing 4th Semester Students at Selected Nursing College, Meerut (U.P.)

In the pre-test, a majority of students (68%) demonstrated moderately adequate knowledge, while 23% had adequate knowledge and only 9% showed poor knowledge. However, following the intervention, a remarkable improvement was observed, with 96% of participants attaining adequate knowledge, 3% showing moderately adequate knowledge, and just 1% remaining in the poor category. This significant shift clearly highlights the effectiveness of the structured teaching programme in enhancing students' understanding of the subject.

In the pre-test, more than half of the students (54%) displayed a favorable attitude, while 36% were neutral and 10% had an unfavorable attitude. After the structured teaching programme, a clear improvement was noted, with 86% of participants showing a favorable attitude, 12% remaining neutral, and only 2% continuing to hold an unfavorable attitude. These findings indicate a significant positive shift in attitudes, further emphasizing the impact of the intervention.

Section- C: Data on the Effectiveness of Structured Teaching Programme on Knowledge and Attitude Regarding Stem Cell Banking Among B.Sc. Nursing 4th Semester Students at Selected Nursing College, Meerut (U.P.)

The findings showed a significant improvement in both knowledge and attitude after the intervention. The mean knowledge score rose from 19.42 to 27.10 (mean difference 7.68, $t = 20.79$, $p = .00001$), while the mean attitude score increased from 36.66 to 44.32 (mean difference 7.66, $t = 5.50$, $p = .00001$). These results confirm that the structured teaching programme was highly effective in enhancing nursing students' knowledge and attitude toward stem cell banking.

Section- D: Findings Related to the Association of Pre-test Knowledge and Attitude Scores with Selected Demographic Variables Regarding Stem Cell Banking Among B.Sc. Nursing 4th Semester Students at Selected Nursing College, Meerut (U.P.)

Association Between Pre test Knowledge Score and Demographic Variables

The analysis revealed significant associations between pre-test knowledge scores and several demographic variables. Age ($\chi^2 = 6.238$, $p = 0.013$), religion ($\chi^2 = 6.716$, $p = 0.010$), family income ($\chi^2 = 7.232$, $p = 0.007$), and type of family ($\chi^2 = 5.570$, $p = 0.018$) were all found to influence knowledge levels, with younger students, Hindus, those from lower to middle-income and nuclear families showing higher awareness. Prior awareness of stem cell banking ($\chi^2 = 23.868$, $p < 0.001$) and source of information ($\chi^2 = 5.927$, $p = 0.015$) also showed strong associations, particularly when information came from educational institutions. However, no significant association was found with gender, marital status, or place of residence.

Association Between Pre test Attitude Score and Demographic Variables

The analysis showed that attitude scores were significantly associated with certain demographic variables. Age ($\chi^2 = 8.998$, $p = 0.003$), family income ($\chi^2 = 5.940$, $p = 0.015$), and type of family ($\chi^2 = 6.803$, $p = 0.009$) were influential, with younger students, those from higher income groups, and nuclear families showing more favorable attitudes. Awareness about stem cell banking also had a highly significant association ($\chi^2 = 13.392$, $p = 0.0003$), as students who had prior awareness displayed more positive attitudes. However, no significant association was observed with gender, marital status, religion, residence, or source of information.

CONCLUSION

The Structured Teaching Programme was highly effective in enhancing nursing students' knowledge and attitudes regarding stem cell banking. Incorporating such educational interventions into nursing curricula will empower students to serve as competent educators and advocates, thus strengthening public awareness and utilization of stem cell preservation.

Recommendations

- Similar studies can be conducted on larger samples to improve generalizability of the findings.
- The structured teaching programme can be implemented in other nursing institutions to enhance awareness about stem cell banking.
- Further research can focus on the long-term impact of such educational interventions on clinical practice.
- A quasi-experimental study can be conducted with a control group for the effective comparison.
- Awareness campaigns or community outreach programs should be developed to educate the general public, especially antenatal mothers, about stem cell banking.
- Further qualitative research is recommended to explore perceptions, ethical concerns, and decision-making factors related to stem cell banking.

Ethical Clearance – Taken from ethical committee of L.L.R.M Medical College, Meerut.

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Conflicts of interest – Nil

REFERENCES

1. National Institutes of Health. Stem Cell Basics [Internet]. Bethesda (MD): National Institutes of Health; [cited 2025 Feb 4]. Available from: <https://stemcells.nih.gov/info/basics/stc-basics>.
2. Sell Stewart. Stem cells Handbook. 1st edition. New Jersey: Humana Press; 2004. p.1-13.
3. Cryo-Cell International, Inc. Cryo-Cell International: Cord blood & tissue banking [Internet]. Oldsmar (FL): Cryo-Cell International; [cited 2025 Jan 25]. Available from: <https://www.cryo-cell.com>
4. LifeCell International Pvt. Ltd. About Us [Internet]. Chennai (India): LifeCell International; [cited 2025 Jan 24]. Available from: <https://www.lifecell.in/lifecell-about-us>
5. Yadav N, D'Souza VL, Geethamani T. knowledge and attitude regarding umbilical cord blood and its banking among college students at selected college, Bangalore. Asian Journal of Nursing Education and Research. 2021;11(1):59-64.
6. Patel Vinodbhai Visha, Chaudhari S. Krupali, Patel Mayuri. Effectiveness of structured teaching programme on level of knowledge regarding menstrual blood stem cell banking among staff nurses. International journal for multidisciplinary research (IJFMR). 2024 Jan- Feb; 6 (1) : 1-10. DOI:// 10.36948/ijfmr.2024.v06i01.14153.
7. R Sreevani. Nursing Research & Biostatistics. 1st Edition. Delhi: Jaypee ; 2018.
8. Poilt F. Denise. Nursing Research. 11th Edition. Netherlands : Wolters Kluwer ; 2020