

# Assessment of Nursing Students' Perception at AL Azhar University Regarding Stem Cells Therapy

*Aya Atef Mohamed<sup>(1)</sup>, Amany Mohamed Saad<sup>(2)</sup>, Fatma Ali Eiz-Elregal<sup>(3)</sup>*

<sup>(1)</sup> Demonstrator of Community Health Nursing, Faculty of Nursing, Al-Azhar University,

<sup>(2)</sup> Assistant Professor of Community Health Nursing, Faculty of Nursing, Helwan University,

<sup>(3)</sup> Assistant Professor of Community Health Nursing, Faculty of Nursing, Al-Azhar University.

## Abstract

**Background:** Stem cell therapy represents a cutting-edge domain in medicine, prompting a need to discern the perspectives of nursing students to shape forthcoming healthcare practices. Stem cells are a fundamental part of healthcare. **Aim:** The study aimed to assess nursing students' perception at Al-Azhar University regarding stem cells therapy. **Design:** A descriptive research design was applied in this study. **Sample:** All nursing students in the third and fourth years of the faculty of nursing at Al-Azhar University include 242 students. **Setting:** The study was conducted at the Faculty of Nursing, Al-Azhar University, Egypt. **Tool I:** Interview questionnaire consisted of three parts: Part(I): Nursing students' demographic characteristics, Part (II): Nursing student's knowledge Part (III): Nursing student's attitude toward stem cells therapy. **Results:** 88% of students had unsatisfactory total knowledge about stem cells, and 90.1% of students had negative attitudes toward stem cells therapy. **Conclusions:** Majority of students had unsatisfactory knowledge about stem cells therapy, most of nursing students had negative attitudes toward stem cells therapy. There were no statistically significant relation between nursing students' knowledge regarding stem cell therapy and their demographic characteristics, there was a highly statistically significant negative correlation between studied students' total knowledge and total attitude toward stem cell therapy. **Recommendations:** Educational programs for nursing students about stem cell therapy should be developed and implemented to promote new ideas into nursing care.

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**Keywords:** Al-Azhar University, Nursing Students, perception, Stem Cells Therapy.

## 1. Introduction

Stem cells (SCs) are versatile cells and a type of biological cell with the remarkable ability to self-renewal, which refers to the capacity of stem cells to divide and produce identical daughter cells, maintaining the stem cell pool, this property ensures the continuous presence of undifferentiated stem cells, allowing them to persist throughout an organism's life (*Alzahrani et al., 2023*). Stem cells are classically plastic-adherent, expanding, non-hematopoietic cells that can differentiate into osteoblasts (bone cells), adipocytes (fat cells), chondroblasts (cartilage cells), and myocytes (skeletal muscle cells) *in vitro* (*Franklin, 2022*).

Embryonic Stem Cells (ESCs) are one of the classifications of stem cells that are derived from embryos that are typically 3 to 5 days old (blastocyst stage) and have the unique ability to differentiate into any cell type in the human body, making them pluripotent. Due to their pluripotent nature, embryonic stem cells have great potential for regenerative medicine and research (*Habiba et al., 2024*). Adult Stem Cells (ASCs) or Somatic or Tissue-specific Stem Cells that present in various tissues of the adult body, including bone marrow, brain, skin, liver, and muscle. Generally multipotent, meaning they can differentiate into a limited range of cell types related to the tissue from which they originate (*Idrees et al., 2023*).

Mesenchymal stem cells (MSCs) are a crucial subset of stem cells obtained from various tissues such as bone marrow, adipose tissue, dental pulp, umbilical cord tissue, and placenta. These cells possess the ability to differentiate into different cell types and exhibit immunomodulatory properties, making them valuable for tissue repair and treating inflammatory conditions (*Ebrahimi et al., 2021*). Stem cell therapy holds significant promise for treating various health conditions by repairing or replacing damaged tissues and organs. It offers potential treatments for diseases like Parkinson's, diabetes, and heart disease, and can lead to personalized, effective medical care. Advances in this field also enhance understanding of biological processes, aiding drug development and disease modeling. Continued investment and ethical considerations are crucial for harnessing the full potential of stem cell therapy (*Singh et al., 2021*).

Nursing students in stem cell therapy is hindered by challenges such as inadequate awareness and training on the advanced medical applications of stem cells. The complexity of this technology requires a high level of understanding. Ethical and legal concerns surrounding stem cell use add additional responsibilities for nurses to ensure compliance. Continuous training and awareness are crucial for nurses to effectively leverage advancements in stem cell science in their practice (*Alzahrani et al., 2023*). Nursing students' understanding of stem cell therapy is influenced by ongoing changes in medical research. While awareness of stem cell treatments has grown recently, students' knowledge levels may vary. Research indicates increasing student interest, underscoring the need for targeted educational efforts. Studies stress the importance of integrating comprehensive stem cell education into nursing programs to ensure students grasp both the potential benefits and ethical considerations of stem cell therapy (*Khasawneh & Rub, 2022*).

Community Health Nurses are crucial in spreading awareness and understanding of stem cell therapy within communities. To better educate nursing students in this complex area, curricula should be updated to include thorough coverage of stem cell technology and its medical and social impacts. Encouraging student involvement in stem cell research and workshops boosts motivation and interest, advancing the role of stem cell therapy in community health nursing (*Wergeland et al., 2022*). Community health nurses (CHNs) are expected to play a crucial role in integrating personalized stem cell treatments into patient care and addressing individual health needs. As the ethical and regulatory landscape evolves, nurses will be key in ensuring standards and patient advocacy. The integration of stem cell therapy signifies progress in medical science, highlighting the pivotal role nurses will play in delivering innovative, patient-centered healthcare solutions in Egypt (*Meng et al., 2024*).

### Significance of the study

In Egypt, stem cell therapy started in 1989 on a narrow scale. In 1997, the transplant rate increased dramatically with the opening of the stem cell therapy unit at the Nasser Institute. The total number of transplants performed until June 2007 was 1362 and reached 4256 by June 2017 (*Mahmoud et al., 2020*). Stem cell therapy is currently being successfully used to treat more than 90 life-threatening diseases, Egypt has released several stored stem cell units for use in the treatment of children with life-threatening illnesses in Egypt and outside Egypt, with a 100% success rate (*Mahmoud et al., 2020*). Uses of stem cell therapy include treating several types of diseases, and its therapeutic uses are expected to increase as new lines of evidence begin to appear. Furthermore, stem cells have the potential to make new tissues and organs. Thus, some scientists propose that organ transplantation will significantly rely on stem cell technology and organogenesis in the future (*Ebrahimi et al., 2021*).



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Globally, 139024 stem cell therapies were carried out in 2017, representing only 10% of the need for transplants. Kidney and liver transplants were the most frequent procedures (65% and 23% respectively). The true scale of the unmet organ transplantation needs is unknown in the African Region. The numbers were: 28980 in the Eastern Mediterranean; 8477 in Southeast Asia; and 21957 in the Western Pacific. There is no information about reproductive tissue transplantation as a method of treating infertility in the African Region (*World Health Organization, (WHO), 2020*). Stem cells are an essential part of healthcare. Nursing students' awareness is crucial to gaining knowledge and attitudes toward stem cells during their academic course (*Almaeen et al., 2021*). Therefore, the study aimed to assess the nursing students' perceptions regarding stem cell therapy.

### Aim of the study

The aim of this study was to assess nursing students' perception regarding stem cell therapy at AL-Azhar University through:

1. Assessing the knowledge of nursing students regarding stem cell therapy.
2. Determining the attitude of nursing students toward stem cell therapy.

### Research questions

1. What is the nursing students' perception toward knowledge regarding stem cell therapy?
2. What is the nursing students' attitude toward stem cell therapy?
3. Is there a relation between nursing students' knowledge and attitude regarding stem cell therapy and their demographic characteristics?

## 2. Subject and Methods

The subject and methods for this study was portrayed under the four main items as follows:

- I- Technical item.                      II- Operational item.  
III- Administrative item.              IV- Statistical item.

### I- Technical Item:

The technical item included research design, setting, sample, and tools for data collection.

**Research design:** A descriptive research design was used in this study.

**Setting:** The study was conducted at the Faculty of Nursing, Al-Azhar University in the Sixth District, Nasr City, Egypt.

**Sampling:** All nursing students in the third and fourth years of the Faculty of Nursing in the academic year 2023 / 2024 were selected.

**Sample size:** The third year included 126 students and the fourth year included 116, so the total number of nursing students were 242 students.

### Tool for data collection:

One tool was used to collect data in this study as the following:

**An interview questionnaire designed by the investigator included 3 parts:**

**Part(I): Nursing students' demographic characteristics included 12 questions**

Such as Age, nationality, academic year, latest academic qualification, residence, father's occupation, mother's occupation, father's education, mother's education, type of family, source of information, and training courses attended.

**Part (II): Assessment of nursing students' knowledge about stem cell and stem cell therapy .**The investigator developed it after reviewing the related literature which included:

**(A):** Assessment studied nursing students' knowledge regarding stem cells. Consisted of 11 questions such as: Meaning of stem cells, classification, characteristics, sources, least invasive source, main source, process, name of stem cells donated, adult stem cells used, name of stem cells used in a patient's stem cell transplant, and potential problems.

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**(B):** Assessment studied nursing students' knowledge regarding stem cell therapy. Consisted of 7 questions such as: Meaning of stem cell therapy, its uses, advantages, disadvantages, diseases treated, contraindications, and actual stem cells used.

**Scoring system:** It was followed to assess studied nursing students' knowledge regarding stem cell and stem cell therapy: The correct answer was scored one grade and the wrong answer or don't know was scored zero. The nursing students' knowledge was checked with a model key answer. Knowledge items contained 18 questions with total scores ranged from 0-18 grades. Total scores were summed and converted into a percent score. It was classified into 2 categories:

- **Satisfactory knowledge** if score  $\geq 60\%$  (11-18 grades).

- **Unsatisfactory knowledge** if score from  $<60\%$  ( $<11$  grades).

### **Part (III): Assessment studied nursing students' attitudes toward stem cell therapy.**

This scale was adapted from *Tork et al., (2018)* and modified by the investigator. The scale consisted of 16 questions as the following :There should be more education about stem cell therapy, The Egyptian government encouraged cell safe bank responsibilities, using stem cell therapy for treatment is a new drug, storing embryonic stem cells is illegal, the pregnant mothers should be advised to store umbilical cord stem cells for future purposes, if they become ill and cannot treat the disease by usual methods, they may resort to stem cell therapy, embryonic stem cell research that involves fetal destruction is immoral, illegal, and unnecessary, providing nursing students with knowledge of stem cells is important, stem cell transplantation is a life-saving treatment, worrying about stem cell transplantation might open doors to killing some people for the benefit of others, should be aware of the advantages and disadvantages of using stem cell therapy, the use of immunotherapy should be expanded in Egypt, the collection of stem cells must be approved by religious men, blastocysts should be given the same respect and the right to live as adults, accept to attend workshops about umbilical cord blood collection and stem cells, and competency in stem cell knowledge is important for me as a student nurse.

**Scoring system:** The total score of studied nursing students' attitudes toward stem cell therapy. consisted of 16 questions. Responses of students answered with a three-point Likert- scale ranged from "Agree, taken 3", "Neutral, taken 2" and " Disagree, taken 1" for responses. The score ranged from **16 to 48**, it was classified into two categories:

-Positive attitude if score  $\geq 60\%$  ( $\geq 29$  grades ).

-Negative attitude if score  $<60\%$  ( $<29$  grades).

### **Validity:**

The developed tool was formulated and submitted to five experts in Community Health Nursing Faculty of Nursing, Helwan University to assess the content validity of the tools. Needed modifications were done as a paraphrasing of some items.

### **Reliability:**

Reliability was estimated by using Cronbach's Alpha coefficient test which revealed that each of the knowledge and attitude tools consisted of relatively homogenous items as indicated by the high reliability.

Tool	Cronbach's Alpha	No of items
Knowledge	0.804	18
Attitude	0.743	16

**Ethical considerations:**

An official permission to conduct the proposed study was obtained from the Scientific Research Ethics Committee, Faculty of Nursing, Helwan University. Participation in the study was voluntary and subjects were given complete full information about the study and their role before signing the informed consent. The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, and confidentiality of the information where it was not accessed by any other party without taking the participants' permission. Ethics, values, culture, and beliefs were respected.

**II- Operational Item:*****Preparatory phase:***

It included reviewing of past, current, national, and international related literature and theoretical knowledge of various aspects of the study using books, articles, the internet, periodicals, and magazines to develop tools for data collection.

***Pilot study:***

A pilot study was carried out on 10% (24) of nursing students to examine the clarity of questions and the time needed to complete the study tools, based on the results, no modifications were done so the pilot study was included in the study sample.

**Fieldwork:**

- An official letter issued from the dean faculty of Nursing, Helwan University, to the dean of faculty of Nursing, Al-Azhar University including the aim of the study to obtain permission after establishing a trustful relationship. Each student was interviewed individually by the investigator to explain the study's purpose.
- Data was collected 3 days/week (Tuesday, Wednesday, and Thursday) from 9 am-1 pm of the academic year (2023-2024) in the first term within 3 months starting from the beginning of October till the end of December 2023. An average of 6-7 students per day till the needed sample was completed.
- The questionnaire took 30 minutes to fill in. Students were assured that the information of collected data recorded confidentially and used only for the purpose of the study.

**III- Administrative Item:**

Approval to carry out this study was obtained from the Dean of the Faculty of Nursing at Helwan University and directed to the Dean of the Faculty of Nursing, Al-Azhar University, Cairo for cooperation and permission to conduct the study. This letter included permission to collect the necessary data and explain the purpose and nature of the study.

**IV-Statistical analysis:**

Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and means and standard deviations for quantitative variables. It was analyzed with the program Statistical Package for Social Science (SPSS) version 26. Proper and suitable statistical tests were used to test the results' significance. Pearson correlation was used; The comparison of qualitative variables was conducted using the chi-square test. The Fisher exact test was employed also. P value was set at <0.05 for significant results, <0.001 for high significant results &  $\geq 0,05$  for not significant results.

**4. Results**

**Table (1):** Presents 69.8% of students were in the age group 20- >22 years old. Also, 95.9% of the students were Egyptian, 53.3% of them were in 4th-year, and 55% of the students resided in rural areas. 50.4% of student's fathers had university education or more ,while 34.3% of mothers had a university education or more. 76.0% of fathers were employed compared to 66.9% of mothers were employed.

**Figure (1):** Illustrates that 40.5% of the students' their source of information were from university followed by 32.6% of the students' source of information were from the Internet and 6.2% their source were from friends.

**Figure (2)** Describes that 83.1% of the students did not attend courses about stem cell therapy, and 16.9% of them were attended courses about stem cell therapy.

**Table (2):** Shows that 62.0% of students had correct knowledge regarding the meaning of stem cells, and 57.0% had correct knowledge regarding the characteristics of stem cells. 45% had correct knowledge regarding the least invasive source of stem cells from the human body. 67.3% correctly identified the process whereby stem cells are frozen. On the other hand, 58.7% of students had correct knowledge regarding the meaning of stem cell therapy. Also, 52.5% of students correctly identified the disadvantages of stem cell therapy, and diseases treated by stem cell therapy were identified by 47.1% of the students.

**Figure (3):** Reflects that 88% of students had unsatisfactory total knowledge regarding stem cells therapy, while 12% of them had satisfactory total knowledge.

**Table (3):** Shows that 1.2% of studied students agree about there should be more education about stem cell therapy. Also, 74.8% disagreed about using stem cell therapy for treatment is a new drug. Also, 25.2% disagreed about storing embryonic stem cells is illegal. Similarly, 61.2% disagreed about the pregnant mothers should be advised to store umbilical cord stem cells for future purposes. 57.8% of students disagreed about they accept to attend workshops about umbilical cord blood collection and stem cells and competency in stem cell knowledge is important for me as a student nurse.

**Figure (4):** Reflects that 90.1% of students had negative total attitude toward stem cells therapy, while 9.9% of them had positive total attitude.

**Table (4):** Shows no statistically significant relation between nursing students' knowledge and all items of demographic characteristics.

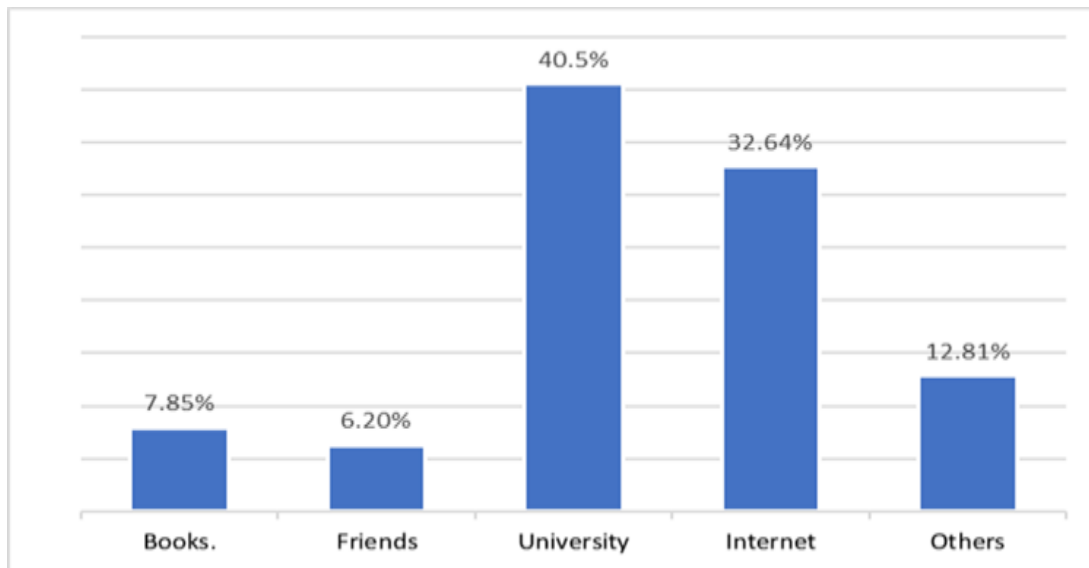
**Table (5):** Reveals that there were no statistically significant relation between students' attitude and all items of demographic characteristics. Except with the latest academic qualifications show highly statistically significant relation with attitude P value =0.001

**Table (6):** Presents highly statistically significant negative correlation between studied students total knowledge and total attitude toward stem cell therapy.

**Table (1): Frequency Distribution of Studied Students regarding Demographic Characteristics (n=242).**

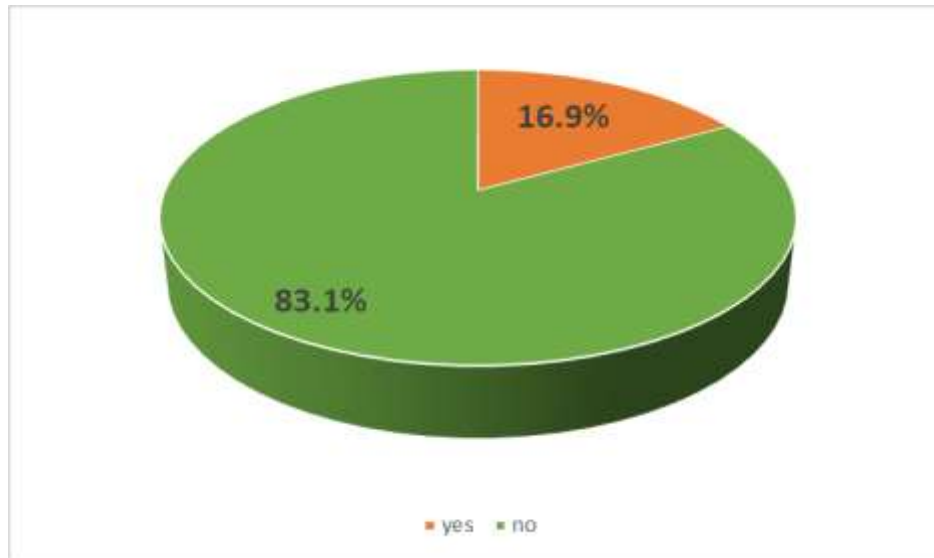
Demographic characteristics	No	%
<b>Age/ years.</b>		
< 20	58	24.0
20- >22	169	<b>69.8</b>
22- >24	15	6.2
<b>Mean ± SD</b>	<b>21.356±5.659</b>	
<b>Nationality.</b>		
Egyptian.	232	<b>95.9</b>
Non- Egyptian.	10	4.1
<b>Academic year.</b>		
4th year.	129	<b>53.3</b>
3rd year.	113	46.7
<b>Latest academic qualification.</b>		
Al-Azhar Secondary certificate.	180	<b>74.4</b>
Technical Institute of Nursing certificate.	62	25.6
<b>Residence.</b>		
Urban.	109	45.0
Rural.	133	<b>55.0</b>

<b>Father's occupation.</b>		
Employee.	184	<b>76.0</b>
Unemployed.	58	24.0
<b>Mother's occupation.</b>		
Housewife.	80	33.1
Employee.	162	<b>66.9</b>
<b>Father's education.</b>		
Not read and write.	5	2.1
Read and write.	27	11.2
Basic education.	34	14.0
Secondary education.	54	22.3
University and more.	122	<b>50.4</b>
<b>Mother's Education.</b>		
Not read and write.	12	5.0
Read and write.	32	13.2
Basic education.	36	14.9
Secondary education.	79	32.6
University and more.	83	<b>34.3</b>
<b>Type of family.</b>		
Nuclear.	119	49.2
Extended.	123	<b>50.8</b>



\*Others mean: Databases, papers, journals, articles and magazines.

**Figure (1):** Percentage Distribution of Studied Students regarding their Source of Information about Stem Cell Therapy (n=242).



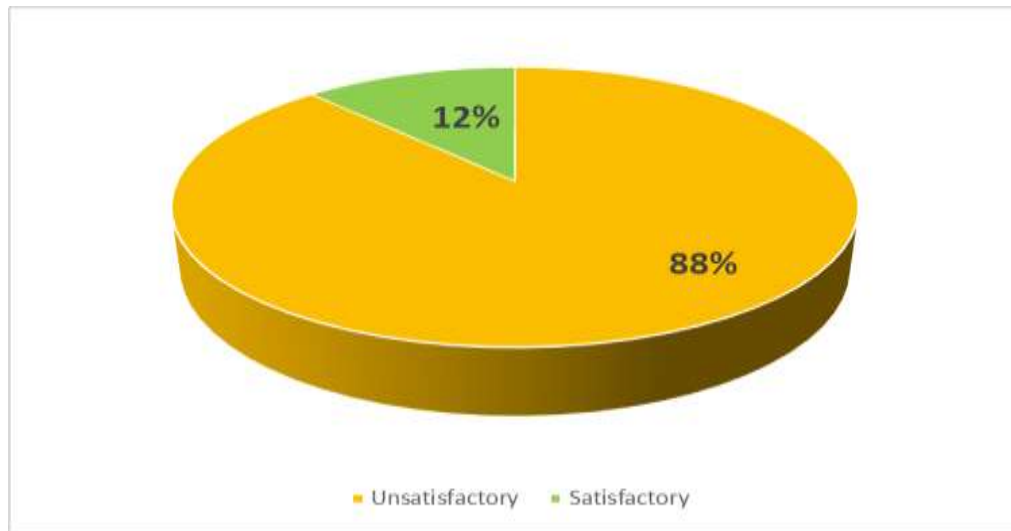
**Figure (2):** Percentage Distribution of Studied Students regarding Attended Training Courses about Stem Cell Therapy (n=242).

**Table (2):** Frequency Distribution of Studied Students regarding their Knowledge related to Stem Cells and Stem Cell Therapy (n=242).

Items	Correct		Incorrect		Don't know	
	No	%	No	%	No	%
Meaning of stem cells.	150	62	32	13.2	60	24.8
Classification of stem cells.	106	43.8	16	6.6	120	49.6
Characteristics of stem cells.	138	57	51	21.1	53	21.9
The sources of stem cells.	105	43.4	55	22.7	82	33.9
The least invasive source of stem cells from the human body.	109	45	49	20.2	84	34.8
The main source of stem cells, which produces new red blood cells, WBC, and platelets.	73	30.2	114	47.1	55	22.7
The process whereby stem cells are frozen.	163	67.3	27	11.2	52	21.5
the name of stem cells or tissue donated by related or unrelated individuals.	61	25.2	63	26	118	48.8
The adult stem cell that is used in stem cell therapy.	48	19.8	55	22.7	139	57.5
The name of stem cells used in a patient's stem cell transplant.	61	25.2	62	25.6	119	49.2
The potential problems with using embryonic stem cells in humans.	128	52.9	35	14.5	79	32.6
Meaning of stem cell therapy.	142	58.7	47	19.4	53	21.9



Uses of stem cell therapy.	69	28.5	58	24.0	115	47.5
Advantages of stem cell therapy.	107	44.2	49	20.2	86	35.6
Disadvantage of stem cell therapy.	127	<b>52.5</b>	82	33.9	33	13.6
The contraindications of stem cell therapy.	53	21.9	101	41.7	88	36.4
Diseases treated by stem cell therapy.	114	<b>47.1</b>	52	21.5	76	31.4
The name of the adult stem cells used in stem cell therapy.	53	21.9	84	34.7	105	43.4
Stem cells are known as actual stem cells used in stem cell therapy.	33	13.6	166	68.6	43	17.8

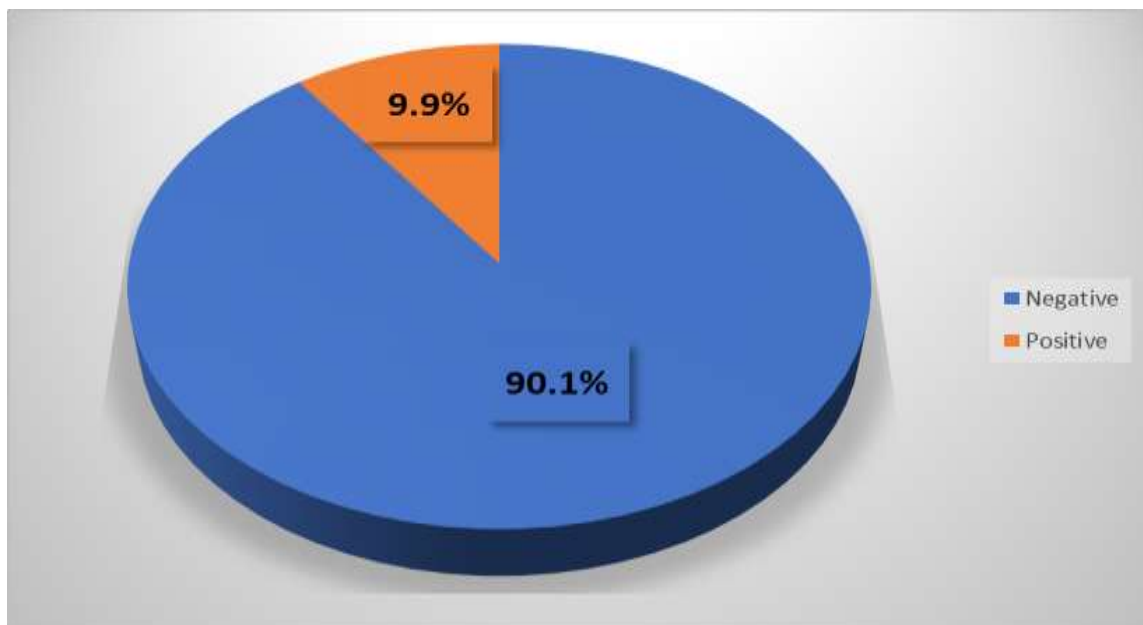


**Figure (3):** Percentage Distribution of Studied Students regarding their Total Knowledge regarding Stem Cell Therapy (n=242).

**Table (3):** Frequency Distribution of Studied Students regarding their Attitude toward Stem Cell Therapy (n=242).

Attitude items	Disagree		Neutral		Agree	
	No	%	No	%	No	%
<b>Think that:</b> There should be more education about stem cell therapy.	209	86.4	30	12.4	3	<b>1.2</b>
The Egyptian government encouraged cell safe bank responsibilities.	138	57.0	85	35.1	19	7.9
Using stem cell therapy for treatment is a new drug.	181	<b>74.8</b>	44	18.2	17	7.0
Storing embryonic stem cells is illegal.	61	<b>25.2</b>	81	33.5	100	41.3
The pregnant mothers should be advised to store umbilical cord stem cells for future purposes.	148	<b>61.2</b>	56	23.1	38	15.7
If become ill and cannot treat the disease by usual methods, may resort to stem cell therapy.	164	67.8	61	25.2	17	7.0

Embryonic stem cell research that involves fetal destruction is immoral, illegal, and unnecessary.	97	40.1	70	28.9	75	31.0
Providing nursing students with knowledge of stem cells is important.	200	82.6	33	13.7	9	3.7
Stem cell transplantation is a life-saving treatment.	181	74.8	53	21.9	8	3.3
Worrying about stem cell transplantation might open doors to killing some people for the benefit of others.	98	40.5	95	39.3	49	20.2
Should be aware of the advantages and disadvantages of using stem cell therapy.	198	81.8	33	13.7	11	4.5
The use of immunotherapy should be expanded in Egypt.	171	70.7	55	22.7	16	6.6
The collection of stem cells must be approved by religious men.	111	45.9	98	40.5	33	13.6
Blastocysts should be given the same respect and the right to live as adults.	115	47.5	108	44.6	19	7.9
Accept to attend workshops about umbilical cord blood collection and stem cells.	140	<b>57.8</b>	82	33.9	20	8.3
Competency in stem cell knowledge is important for me as a student nurse.	140	<b>57.8</b>	82	33.9	20	8.3



**Figure (4):** Percentage Distribution of Studied Students regarding their Total Attitude toward Stem Cell Therapy (n=242).

**Table (4):** Relation between Studied Students' Knowledge and Demographic Characteristics (n=242).

Demographic characteristics	Knowledge				$\chi^2$ test	P value
	Satisfactory (n= 29)		Unsatisfactory (n= 213)			
	No	%	No	%		
<b>Age/ years</b>						
< 20	8	3.3	50	20.7	0.586	0.746
20>22	20	8.3	149	61.6		
22 >24	1	0.4	14	5.8		
<b>Nationality</b>						
Egyptian	27	11.2	205	84.7	0.636	0.425
Non- Egyptian	2	0.8	8	3.3		
<b>Academic year.</b>						
The 4th year	11	4.5	118	48.8	3.129	0.077
The 3rd year	18	7.4	95	39.3		
<b>Latest academic qualification</b>						
Al-Azhar Secondary certificate	21	8.7	159	65.7	0.067	0.796
Technical Institute of Nursing certificate	8	3.3	54	22.3		
<b>Residence</b>						
Urban.	12	5	97	40.1	0.178	0.673
Rural	17	7	116	47.9		
<b>Father's occupation</b>						
Employee	23	9.5	161	66.5	0.194	0.659
Unemployed	6	2.5	52	21.5		
<b>Mother's occupation</b>						
Housewife	6	2.5	74	30.6	2.278	0.131
Employee	23	9.5	139	57.4		
<b>Father`s education.</b>						
Not read and write.	0	0	5	2.1	6.652	0.155
Read and write	2	0.8	25	10.3		
Basic education	2	0.8	32	13.2		
Secondary education	4	1.7	50	20.7		
University and more	21	8.7	101	41.7		
<b>Mother`s education.</b>						
Not read and write.	0	0	12	5	3.059	0.548
Read and write	3	1.2	29	12		
Basic education	3	1.2	33	13.6		
Secondary education	11	4.5	68	28.1		
University and more	12	5	71	29.3		
<b>Type of family.</b>						
Nuclear	14	5.8	105	43.4	0.011	0.918
Extended	15	6.2	108	44.6		

**Table (5):** Relation between Studied Students' Attitude and Demographic Characteristics (n=242).

Demographic characteristics	Attitude				$\chi^2$ test	P value
	Positive (n=24)		Negative (n=218)			
	No	%	No	%		
<b>Age/ years</b>						
< 20	4	1.7	54	22.3	0.890	0.641
20>22	18	7.4	151	62.4		
22 >24	2	0.8	13	5.4		
<b>Nationality</b>						
Egyptian	23	9.5	209	86..4	0.000	0.993
Non- Egyptian	1	0.4	9	3.7		
<b>Academic year.</b>						
The 4th year	14	5.8	115	47.5	0.271	0.603
The 3rd year	10	4.1	103	62.4		
<b>Latest academic qualification</b>						
Al-Azhar Secondary certificate	11	4.5	169	69.8	11.393	0.001**
Technical Institute of Nursing certificate	13	5.4	49	20.2		
<b>Residence</b>						
Urban.	12	5	97	40	0.265	0.607
Rural	12	5	121	50		
<b>Father's occupation</b>						
Employee	17	7	167	69	0.395	0.530
Unemployed	7	2.9	51	21.1		
<b>Mother's occupation</b>						
Housewife	12	5	68	28	3.456	0.063
Employee	12	5	150	62		
<b>Father's education.</b>						
Not read and write.	0	0	5	2.1	2.566	0.633
Read and write	4	1.7	23	9.5		
Basic education	2	0.8	32	13.2		
Secondary education	7	2.9	47	19.4		
University and more	11	4.5	111	45.9		
<b>Mother's education.</b>						
Not read and write.	1	0.4	11	4.5	5.061	0.281
Read and write	6	2.5	26	10.7		
Basic education	1	0.4	35	14.5		
Secondary education	7	2.9	72	28.9		
University and more	9	3.7	74	30.6		
<b>Type of family.</b>						
Nuclear	9	3.7	110	45.5	1.453	0.228
Extended	15	6.2	108	44.6		

\*\*Highly statistically significant at  $P < 0.001$

**Table (6):** Correlation between Studied Students Total Knowledge and Attitude toward Stem Cell Therapy (n=242).

Variables	Total attitude	
	r	P value
Total knowledge	-.234	0.000**

r = correlation coefficient test. P= p-value \*\*Highly statistically significant at  $P=0.000$

#### 4. Discussion

Stem cells are principal cells that can form fundamentally any tissue in the human body. They have the ability to build every tissue in the human body. Therefore, stem cells research is one of the most important and, most controversial topics of medicine and nursing as well as technology today. Nurses' knowledge of stem cells and their attitude towards stem cell application in medical settings are very important (Kaur et al., 2023).

Professional health care providers, including nurses and nursing students (who are future nurses), must play their role in educating their patients to avoid the unethical use of stem cell-based therapy (Alzahrani et al., 2023). For that reasons this study conducted to assess nursing students' perception regarding stem cell therapy. Concerning residence of the studied students, the present study demonstrated that more than half of them resided in rural areas. This result was in accordance with a study adopted by Mansour et al., (2020), in Egypt, entitled "Effect of an educational program on nurses' knowledge and attitudes regarding umbilical cord-blood stem cells preservation" (n=128) and stated that 71.9% of nurses were from rural residents.

##### Part I: Nursing student's demographic characteristics:

Regarding the demographic characteristics of studied nursing students, the results of the current study illustrated that, more than two thirds of them ranged in age from 20 to less than 22 years old with mean  $21.356 \pm 5.659$  years and majority of them were Egyptians (Table 1). This result agreed with the result of the study conducted by Daud et al., (2020) in Pakistan entitled "Knowledge and attitude regarding stem cell research and its application among medical students" (n=206) who found that the mean age of the studied students was  $21 \pm 1.43$  years. Pertaining academic year of studied nursing students, the results of the present study revealed that, more than half of them were 4th-year students. This finding contradicted with a study conducted by Lohani et al., (2021), in India and entitled "The study to assess the effectiveness of structured teaching programme on menstrual blood stem cells banking among nursing student at selected college of nursing, Uttrakhand" (n=60) and reported that 90% of the studied students were 1<sup>st</sup> and 2<sup>nd</sup> year students.

From the investigator point of view, this could be due to different study subjects and settings.

Concerning residence of the studied students, the present study demonstrated that more than half of them resided in rural areas. This result was in accordance with a study adopted by Mansour et al., (2020), in Egypt, entitled "Effect of an educational program on nurses' knowledge and attitudes regarding umbilical cord-blood stem cells preservation" (n=128) and stated that 71.9% of nurses were from rural residents.

As regard educational level of fathers and mothers of the studied nursing students, the current study showed that slightly more than half of fathers had university education or more, while more than one third of mothers had university education or more. This result was congruent with a study done by Aftab & Khyzer, (2021), to assess "Knowledge and attitude about stem cells and their potential applications in the field of medicine among medical students of Arar" in Saudi Arabia (n=150) and declared that 62% of the studied students' fathers had university education and 44% of mothers had university education.

Considering occupation of fathers and mothers of the studied students, the present study clarified that more than three-quarters of fathers were employed and about two-thirds of mothers were employed. On the contrary, a study conducted by Sekerci & Bicer, (2020) in Turkey, about "Knowledge, attitude, and practice of health education students



for stem cell donation and transplantation” (n= 419) who reported that 65.2% of fathers were working, while 86.6% of mothers were housewives.

Regarding the studied students’ source of information about stem cell therapy (**figure 1**), the present study represented that slightly more than two-fifths of them their source of information were university followed by almost one third of them were from the internet. In contrast, a study carried out by **Franklin, (2022)** in the Kingdom of Saudi Arabia, entitled “Stem cells: Knowledge and attitude before and after the summer training program among nursing students in Al-Namas”, (n= 57) and found that 66.7% of the studied students their source of information was social medias.

According to the studied students attending training courses about stem cell therapy (**figure 2**), the current study indicated that majority of them did not attend courses about stem cell therapy, and less than one-fifth of them were attended. In the same line, a study carried out by **Abo-Baker & Masoud, (2021)** in Egypt, about “Stem cell therapy: Health care providers’ knowledge and attitude”, (n= 104) and reported that 86.5% of the studied subjects didn’t attend training courses. This may be due to the limited availability of training courses specifically focused on stem cell therapy within the educational institutions or professional development opportunities accessible to the students.

Pertaining the studied nursing students’ knowledge related to stem cells and stem cell therapy (**table, 2**), the current study demonstrated that more than three fifths of students had correct knowledge regarding the meaning of stem cells and more than half of them correctly identified their characteristics. These results were consistent with **Kaur & Kaur, (2023)** who entitled a study in India about “ Assess the effectiveness of laptop-assisted teaching on knowledge regarding stem cell therapy and its association with selected socio-demographic variables among nursing students” (n=40) who reported that, 58% of the studied students had correct knowledge regarding meaning and characteristics of stem cells In addition, the current study represented that less than half of the studied nursing students correctly identified the least invasive source of stem cells from the human body. These results were congruent with study conducted by **Singh et al., (2021)** in India, about “A pre-experimental study to assess the effect of educational package on knowledge regarding hematopoietic stem cell transplantation among staff nurses working in selected hospitals Bhopal, Madhya Pradesh”, (n= 60) and stated that 67% of the studied participants had incorrect knowledge regarding the least invasive source of stem cells from the human body.

As well, the present study declared that more than two thirds of the studied nursing students correctly identified the process of whereby stem cells are frozen. These findings was similar to a study in Jordan performed by **Abdulrazeq et al., (2022)** to investigate “Effectiveness of interactive teaching intervention on medical students’ knowledge and attitudes toward stem cells, their therapeutic uses, and potential research applications” (n= 71) and found that, 62% of the students know about process of stem cells preservation.

Furthermore, the present study displayed that more than half of the studied nursing students had correct knowledge regarding the meaning of stem cell therapy, while more than one quarter of them correctly identified the uses of stem cell therapy. These results were supported by **Esmail et al., (2022)** in Egypt, entitled “Assessment of knowledge and attitude of maternity nurses regarding umbilical cord stem cells collection and banking” (n= 60) found that 69% of nurses had poor knowledge regarding meaning of stem cell therapy. Additionally, the current study demonstrated that more than half of the studied nursing students correctly identified the disadvantages of stem cell therapy. These results were compatible with a study in India, conducted by **Moirangthem& Manu, (2023)**, entitled “Descriptive study to assess the knowledge regarding umbilical cord blood banking among final year nursing students at selected nursing college of kanpur ” in uttar pradesh (n= 100) who stated that, 81% of the sample had inadequate knowledge about disadvantages of stem cells therapy.

Also, the current study portrayed that diseases treated by stem cell therapy were identified by nearly half of the studied nursing students. More than two thirds of students had incorrect answers of the actual stem cells used in stem cell therapy. These results matched with a study adopted by **Hassan et al., (2022)** in Egypt, about “Assessment of Knowledge and Attitude of Maternity Nurses Regarding Cord Blood Collection”, (n= 250) and reported that 63.2% of the studied nurses had incorrect knowledge regarding stem cell therapy.

Regarding nursing students' total knowledge about stem cell therapy, the current study highlighted that majority of students had unsatisfactory total knowledge about stem cells, while more than one tenth of them had satisfactory total knowledge (**figure 3**). In the same context, the results of a study by **Saraswat & Singh, (2021)**, to assess "Effectiveness of structure teaching programme on knowledge regarding umbilical cord stem cell therapy among staff nurses in Apollo hospital at Gandhinagar, Gujarat" (n= 40) and reported that 78.6% of the studied nurses had poor knowledge regarding stem cells therapy.

From the research investigator point of view, this may be attributed to the existing nursing curriculum that may not adequately cover stem cell therapy in depth or may not prioritize it as a core subject. It's possible that the students found it challenging to grasp all aspects of this intricate topic, leading to a majority having unsatisfactory knowledge.

On contrary, a study carried out by **Pingale, (2019)** in India, entitled "A Study to assess the effectiveness of information booklet on knowledge regarding cord stem cell banking among staff nurses in selected hospitals" (n= 60) who stated that, it was seen that, 61.66% of the nurses had average knowledge regarding stem cell.

From the investigator point of view, this contradiction may be related to different characteristics of study subjects, training courses and work experience among nurses of their study.

### **Part III: Nursing student's attitude regarding stem cell therapy:**

#### **Answered research question No. (2) What is the nursing students' attitude toward stem cell therapy?**

Considering the studied nursing students regarding their attitude toward stem cell therapy, the current study indicated that majority of them were disagreeing with stem cell therapy, and a minority of them were agreeing with that more education should be provided about stem cell therapy, while more than half of them disagreed and almost one fifth of them agreed about that the Egyptian government encouraged cell safe bank responsibilities (**table 3**).

Conversely, **Almaeen et al., (2021)** who performed a study and found that 70% of the students possessed high attitude score towards stem cell therapy.

From the investigator point of view, this contradiction may be due to the studies may have sampled different populations with varying levels of knowledge and awareness towards stem cell therapy. Another reason is that the studies might have been conducted at different times or in different contexts, leading to variations in attitudes and perceptions towards stem cell therapy.

Pertaining the studied nursing students' total attitude toward stem cell therapy (**figure 4**), the present study highlighted that, most of students had negative attitude toward stem cells, while less than one tenth of them had positive total attitudes. These results were supported by **Shaban et al., (2019)** who conducted a study in Egypt, entitled "Effect of an educational program on perception and practices of nursing students regarding the cord blood collection technique and stem cells" (n= 120) who reported that 64.2% of the nursing students had a negative attitude towards stem cells.

From the investigator point of view, this can be attributed to the student's lack of knowledge of emerging medical technologies such as stem cells because they are not taught to them in the course. In the opposite line, a study done by **Mohammed, (2019)**, in Saudi Arabia entitled "Stem cells: Knowledge and attitude among health care providers in Qassim region KSA", (n= 250) and indicated that 76.4% of the participants exhibited positive attitude towards stem cell use.

### **Part IV: Relation and correlations between variables:**

#### **Answered research question No. (3) Is there a relation between nursing students' knowledge and attitude regarding stem cell therapy and their demographic characteristics?**

Concerning relation between demographic characteristics of the studied nursing students and their knowledge, the current study revealed that, there was no significant association between students' knowledge and all items of their demographic characteristics (**table 4**). This result was consistent with study done by **Idrees et al., (2023)** to assess "Knowledge and attitude towards stem cell science and technology among medical field students in Sudan" (n=395), who found that there was no significant association between students' level of knowledge and their demographic characteristics. Likewise, a study performed by **Moirangthem & Manu, (2023)**, who stated that there was no significant association between the students' knowledge score and their selected demographic variables.

From the investigator's point of view, it can be rationalized by considering factors such as constant educational exposure, varied learning sources, individual interest and motivation, professional standards in education .

According to the relation between studied nursing students' attitude and their demographic characteristics ,the present study reflected that there was no significant relation between students' attitudes and all items of their demographic characteristics, except with the latest academic qualifications showed highly significant relation with attitude (**table 5**). These results were in harmony with a study adopted by **Hassan et al., (2022)** in Egypt, about "Assessment of knowledge and attitude of maternity nurses regarding cord blood collection", (n= 250), reported that, there was highly statistically significant relation between the attitude of studied nurses and their academic qualifications.

This can be interpreted as, while most demographic characteristics may not significantly influence nursing students' attitudes towards stem cell therapy, their latest academic qualifications appear to play a crucial role. This highlights the importance of continued education and professional development in shaping health care professionals' perspectives on cutting-edge medical interventions.

On the other hand, these findings were contradicted with study conducted by **Al-Shammary & Hassan, (2023)**, who declared that acceptance attitudes are considerably higher among older participants than younger participants ( $p < 0.05$ ).

Regarding correlation between the studied nursing students' knowledge and attitude toward stem cell therapy the current study illustrated that there was negative correlation between their total knowledge and total attitude toward stem cell therapy(**table 6**). In the same context, a study carried out by **Baghmisheh et al., (2021)** who conducted a study in Iran entitled "The knowledge and attitude of medicine students towards stem cells application and donation in neurologic disorders" (n=424) who stated that, there was no correlation between knowledge and attitude about application of stem cells. Interestingly, the students had higher scores in knowledge about stem cells application, had no more positive attitude about using these cells in treatment of neurological disorders ( $p > 0.05$ ).

**From investigator point of view**, a negative correlation between the total knowledge of nursing students and their attitude toward stem cell therapy can be rationalized by considering factors such as understanding levels, ethical considerations, critical evaluation skills, cultural and religious beliefs, professional norms, and risk perceptions that may evolve as students deepen their knowledge in the field.

However, these results of the current study were in contrast with study by **Esmail et al., (2022)** who stated that, there was a highly positive statistically significant correlation between total knowledge and total attitude scores of the studied nurses regarding umbilical cord stem cell collection and banking.

### **Conclusion:**

**In light of the current study results and answered the research questions it can be concluded that:**

Majority of students had unsatisfactory knowledge about stem cells therapy, most of nursing students had negative attitudes toward stem cells therapy. There were no statistically significant relation between nursing students' knowledge regarding stem cell therapy and their demographic characteristics. Also, there were no significant relation between nursing students' attitudes regarding stem cell therapy and demographic characteristics except the latest academic qualifications show a highly statistically significant relation with attitude, and there were highly statistically significant negative correlation between studied students total knowledge and total attitude toward stem cell therapy.

### **Recommendations**

**In the light of the results of this study, the following recommendations were suggested:**

- Educational programs for nursing students about stem cell therapy should be developed and implemented to promote new ideas into nursing care.
- Develop training programs for nursing students to enhance their understanding of stem cell therapy.
- Disseminate research findings through academic presentations at conferences, and workshops to raise awareness and stimulate discussions among nursing students.

### **For further researches:**

Further studies are required on a larger sample of nursing students in another setting for generalizing the research findings.





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