

Assessment of Knowledge and Attitude of Maternity Nurses regarding Umbilical Cord Stem Cells Collection and Banking

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Abstract

Back ground: Umbilical cord blood banking and collection is the process of collecting and storing umbilical cord blood in the immediate period after the birth of a baby. Cord blood is considered as an alternative to bone marrow for treatment of blood immune system and metabolic disorders because of its rich source of stem cells and considered the therapy for over 80 medical condition. **Design:** A descriptive study design was utilized. **Setting:** The study was conducted at obstetrics & gynecological department at Benha University hospital. **Sampling:** A convenient sample included 60 nurse. **Tools of data collection:** Two tools were used tool (I) A structured interviewing questionnaire to assess nurse's knowledge regarding umbilical cord stem cell collection and banking. tool (II) Modified likert scale to assess maternity nurse's attitude. **Results:** More than two thirds of maternity Nurses had poor knowledge regarding umbilical cord stem cell collection and banking, additionally, more than half of studied sample had negative attitude. Also, 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:** Nearly more than two thirds and more than half of the studied nurses had poor knowledge and negative attitude regarding umbilical cord blood stem cell collection and banking respectively. **Recommendation:** An educational guideline regarding stem cell collection and banking should be available at all maternity departments to help nurses to acquire the basic knowledge and practices.

Keywords: Attitude, Knowledge, Stem Cells, Umbilical Cord.

1. Introduction

Stem cells (SC) exist in all multicellular organisms and are characterized by the capacity to regenerate through mitotic cell division and differentiate into a variety of specialized cell types. The two main types of mammalian stem cells are adult stem cells that are found in adult tissues and embryonic stem cells that are isolated from the inner cell mass of blastocysts [1].

Umbilical cord is the vital direct interlink between mother and fetus, which always depicted as the relationship of an emotional bonding of motherhood. After delivery the blood that remains in the placenta and umbilical cord is referred as cord blood and contains numerous haematopoietic stem cells that have the ability to differentiate into other cells and the ability to self-degenerate [2].

Umbilical cord blood (UCB) is the blood which is found in the umbilical cord and has the same ingredients as that of the other blood available in any organ, in addition of being a very rich source of hematopoietic stem cells. Hematopoietic stem cells are still primitive or immature, which can possibly frame into platelets, red or white blood cells. With some scientific intervention, stem cells may even have the capacity to shape into other cell types that make up the human body [3].

Additionally, cord blood stem cells are pluripotent, which is the capability to differentiate into not solely different blood cell types, however, probably into various sorts of tissue, including

cartilage, hepatic, skin, pancreatic, muscle, epithelial, neurologic, endothelial, and bone. Furthermore, UCB is increasingly being used as a source of stem cells within the treatment of over eighty diseases, including blood cell disorders, myelomas, leukemia, genetic disorders, immune system deficiencies, and lymphomas [4].

The stem cells obtained from umbilical cord blood are less likely to be rejected in transplants than bone marrow stem cells as the result of being immunologically immature, umbilical cord blood stem cells produce significantly fewer natural killer cells, creating a substantial decrease in rejection, and can be used as a truly ethical therapy. Consequently, cord blood stem cells require less rigorous antigen tissue matching for transplants than bone marrow stem cells. In fact, the rate of rejection for cord blood stem cell transplants is half the rate of rejection for bone marrow transplants [5].

Umbilical cord blood banking (UCB) is the process of collecting and storing umbilical cord blood, in the immediate period after the birth of a baby. Cord blood can be collected, and stored either publicly or privately. Public cord blood banks operate in all developed countries, and within most developing countries. By 2014, the international cord blood banking network comprised over 160 public cord blood banks in 36 countries, with over 731,000 umbilical cord blood units stored [6],[7].

Additionally, a cord blood bank is utilized for storing UCB for future use. In response to the possibility of using cord blood in treating blood diseases and immune systems, both private and public cord blood banks have been developed. Likewise, UCB can be collected without danger to the mother or infant donor. The collection of UCB from the placenta is performed within ten to fifteen minutes after the placental delivery through puncturing one of the umbilical veins with a needle, and is done under sterile technique and collected into a sterile bag containing an anticoagulant to prevent clotting [8].

Umbilical cord blood collection is primarily carried out by obstetricians, midwives and nurses who have received training in such area. Cord blood is collected by a non-invasive and painless technique after cutting the umbilical cord from the newborn. The two methods of cord blood collection are in-utero and ex-utero methods more commonly used. The in-utero method involves the collection of cord blood after the newborn's delivery but before the delivery of placenta, whereas in the ex-utero method, the cord blood is collected after the delivery of the placenta [9].

Nurses is the most important health care provider in the entire machinery that deals with stem cell banking, nurses can be involved in collecting cord blood or assisting doctors in stem cell infusion procedures. Another study conducted in Egypt concluded that nurses must be aware of every step of the stem cell collection process, from understanding that the source of blood is venous to following strict protocol when collecting umbilical cord blood into special closed collection kits provided by private and public blood banks [10].

Significance of the Study:

The international cord blood banking network comprised over 160 public cord blood banks in 36 countries, with over 731.000 umbilical cord blood units stored by (2014). Despite the numerous benefits of the stem cell obtained from the blood of the umbilical cord, it considered medical waste, and also all women prefer to eliminate of placenta after delivery that happens due to a lack of knowledge about its benefits and uses in addition to the negative attitude of maternity nurses about cord stem cell collection [11],[12].

In addition, from the researchers' clinical experience, poor knowledge and negative attitude regarding cord blood collection and stem cells among maternity nurses were found. Nurses especially in maternity field have to be informed about the most modern advances and receive the required training. So that, increase the level of knowledge and improve attitude regarding umbilical cord blood banking among the

maternity nurses will help in developing cord blood banking as an essential aspect of Egyptian healthcare team[13].

There was no study conducted at faculty of nursing, Benha university regarding assessment of knowledge and attitude of maternity nurses regarding umbilical cord blood stem cell collection and banking, hence, this study was conducted.

Aim of the study:

The study aimed to assess knowledge and attitude of maternity nurses regarding umbilical cord stem cell collection and banking.

Research questions:

1. What is the nurse's knowledge about umbilical cord blood collection?
2. What is the nurse's attitude about umbilical cord blood collection and stem cells banking?

Operational definitions:

-stem cell: refers to unspecialized cells of the human body, able to differentiate into any cell of an organism and have the ability of self-renewal.

-umbilical cord stem cell collection: refers to The cord blood which can be collected from the umbilical cord of a baby after its birth and consists of hematopoietic and mesenchymal stem cells.

- umbilical cord stem cell banking: Refers to the entire procedure of collecting blood from the umbilical cord after or before the placenta is removed and stored in a special place.

Subjects and method:

Study design: A descriptive design was used to conduct the study.

Study Setting

The study was conducted at obstetrics and gynecology department affiliated to Benha University Hospital.

Sampling

Type: A convenient sample.

Size: 60 nurse(all available nurses at obstetrics and gynecology department)

Tools of data collection

Two tools were used and included:

Tool(I):A Structured interviewing questionnaire included 2 parts:

Part (1):General characteristics of studied nurses and included 7items as(age, educational qualification, residence, current job, years of experience, attendance of training courses ,site of attendance courses

Part (2): Assessment of maternity nurse's knowledge regarding umbilical cord stem cell collection and banking, It was adapted from (14) and included [17] closed ended questions in form of multiple choice question such as (definition of umbilical cord, anatomy of umbilical cord, indication of umbilical cord blood, disadvantages of cord blood collection, proper time of clamping

umbilical cord blood ,Values of umbilical cord blood, Places of cord blood storage , Preparation of umbilical cord blood collection , length of time for cord blood storage , Definition of stem cells , Characteristics of stem cell , Sources of stem cells in the body ,Types of stem cells , Ethical consideration of obtaining stem cells from umbilical cord , definition of cord blood stem cell banking , Procedures for preserving umbilical cord blood stem cells in banks , Costs of storage of stem cells and cord blood banking).

Knowledge scoring system

Nurse's knowledge was calculated for each item as the following :Each item was assigned a score (2) for correct answer and a score (1) for incorrect answer. the total score was considered and classified into 3 categories:

- Good knowledge $\geq 75\%$.
- Average knowledge from 60 - $< 75\%$.
- Poor knowledge $< 60\%$.

Tool (II):Modified likert scale(Appendix II): It was designed to assess maternity nurse's attitudes regarding umbilical cord stem cell collection and banking. It was adapted from[14] The scale was consisted of 22 items such as(collection of umbilical cord blood immediately after delivery is necessary, blood is not necessary for life, baby's cord blood may be used for different purposes ,storage of cord blood is necessary, stem cell cross matching is necessary before use ,cord blood is useful only for baby, Stem cells transplantation should be widely practiced).

Scoring system of attitude

Each item of the attitude scale was given a score based on three points likert scale. Each statement was scored as (3) for agree, (2)for uncertain and (1)for disagree. The total score of attitude was considered and classified into 2 categories:

- Positive attitude $\geq 60\%$.
- Negative attitude $< 60\%$.

Tools validity and reliability:

The tools of data collection were tested by three panel experts of obstetrics and gynecology nursing to test the tool for clarity, relevance, applicability and validity of the contents. Reliability was applied for testing the internal consistency of the tools by administration of the same subjects under similar conditions on one or more occasions through Cronbach's Alpha coefficient test, it was revealed that the Internal consistency of knowledge questionnaire was 0.94, and the Modified likert scale was 0.87

Ethical consideration:

- Approval to conduct the study was obtained from scientific Research Ethical Committee at Faculty of Nursing Benha University.
- An official letter was obtained from dean of faculty of nursing to the director of

Benha university hospital before data collection.

- The aim of the study was explained to all participants to obtain their consent to participate in the study.
- Data included in the tools did not touch tradition, culture, religious and ethical issues.
- Studied nurses were interviewed individually to maintain confidentiality.
- All tools of data collection were burned after statistical analysis to maintain confidentiality of the participants.

Pilot study:

A pilot study was conducted on 10% of the total sample (6 nurses). In order to test the applicability of the tools, clarity of questions, estimate the time needed for each nurse to fill in the questions and to identify the problems that may be encountered during the study. According to the results of the pilot study some corrections of items were performed ,so nurses included in the pilot study were not included in the main study sample.

Field Work:

The study was carried out from the beginning of April 2021 to the end of June 2021 covering 3 months, then the researcher visited the previous mentioned study setting 3 days per weekly (Sunday, Tuesday and Thursday) from 9.00 Am to 2.00 Pm to collect data according to the schedule of obstetrics and gynecological department to fulfill the aim of the study. The following phases were adopted preparatory phase and implementation phase

Preparatory Phase:

The preparatory phase was the first phase of the study and included reviewing of related past, current, local and international literatures as well as theoretical knowledge of various aspects of the study using books, articles, internet, and magazines to develop tools of data collection. During this phase, the researcher visited the selected study settings. Development of the tools of data collection were done under supervisors' guidance and experts' opinions were considered.

Implementation phase:

At The beginning the researcher introduced herself to nurses then explained the aim of the study to each nurse. Oral consent was obtained from every nurse. Then the researcher interviewed two nurses during the day in separate place to maintain the confidentiality of the study. Then, the researcher used the structured interviewing questionnaire (tool I) to assess the studied nurse's general characteristics and maternity nurse's knowledge regarding umbilical cord blood stem cell collection and banking. At last, the researcher used Modified likert scale (tool II) to assess the studied nurses' attitudes regarding umbilical cord stem cell collection and banking and the average time needed

for the interviewing to every nurse was 20-30 minutes and this was repeated until all nurses were interviewed.

Statistical analysis:

Data collected from the studied sample was revised, coded and entered using Personal Computer. Computerized data entry and Statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 25. Data were presented using descriptive statistics in the form of frequencies, percentages. Chi-square test (X^2) was used for comparisons between qualitative variables. Spearman correlation measures the strength and direction of association between two ranked variables. A highly statistical significant was considered at p-value <0.001 , a statistical significant was considered at p-value <0.05 and non-significant at p-value >0.05 .

Results:

Table (1): showed that, about two fifth of the studied nurses (40.0%) were in age group 30 < 35 years old with the mean age of 30.47 ± 6.07 years. Less than half of the studied nurses (43.3%) had technical nursing education. Regarding current job, the majority (86.7%) of the studied nurses were nurses. Less than two thirds (63.3%) of the studied nurses were from rural area and less than half (46.6%) of them had 10 < 15 years of experiences. Majority of the studied nurses (95.0%) not attended training courses regarding umbilical cord blood stem cell collection

Table (2) showed that, most of studied nurses (90.0%) reported correct answer regarding definition of umbilical cord. Moreover, Less than two thirds (61.7% and 58.3%) of the studied nurses reported correct answer regarding anatomy of umbilical cord and indication of umbilical cord blood respectively. On other hand, the majority of studied sample (95%, 91.7%, 91.7%, 93.3% and 91.7%) reported incorrect answer regarding length of time for cord blood storage, definition of stem cells, definition of cord blood stem cell banking, procedures for preserving umbilical cord blood stem cells in banking, costs of storage of stem cells and cord blood banking respectively.

Fig. (1): showed that 71,6 % of the studied sample had incorrect knowledge regarding umbilical cord stem cell collection and banking while 16,7 had correct knowledge.

Fig. (2): showed that 53.3% of the studied sample had negative attitude regarding umbilical cord stem cell collection and banking while 46.7% had positive attitude .

Table (3) showed that ,about two thirds of the studied nurses (68.3% and 65.0%) agreed that, it is necessary to attend workshops regarding umbilical cord blood stem cell collection and

banking and have a consent form parents before the process of collecting stem cells respectively. Also, less than two thirds of the studied nurses (60.0%, 61.7% and 58.3%) agreed that, stem cell cross matching is necessary before use, it is necessary to know benefits, uses and possible harms of stem cells collection and It is necessary to match the tissues of the donor and the patient to avoid the patient's body rejecting the stem cells which may occur because the immune system attacks the new cells which may lead to failure operation respectively. On other hand, more than half (58.3%, 55.0% and 55.0% 45.8%) of the studied nurses disagreed that, cord blood is useful for life, baby's cord blood may be used for different purposes and the process of collecting umbilical cord blood doesn't pose any danger or cause any harm to the mother or the fetus respectively.

Table (4) showed that, there was a highly statistically significance relation between the total knowledge score of the studied nurses and their general characteristics (age, educational qualification, residence as well as years of experience) ($p \leq 0.001$).

Table (5) showed that there was a statistically significance relation between the total attitude score of the studied nurses and their general characteristics (age, residence as well as years of experience) ($p \leq 0.05$). As well, there was a highly statistically significance relation between the total attitude score of the studied nurses and their educational qualification ($p \leq 0.001$).

Table (6) indicated 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 among studied sample ($p \leq 0.001$).

Table(1) Frequency Distribution of the studied sample according to their general characteristics (n=60).

General characteristics	No	%
Age (years)		
20 <25 years	7	11.7
25<30 years	13	21.6
30<35 years	24	40.0
≥35 years	16	26.7
Mean ±SD	30.47±6.07	
Educational qualification		
Diploma nurse.	17	28.3
Technical nurse.	26	43.3
Bachelor degree.	13	21.7
Master degree	4	6.7
Current job		
Nurse	52	86.7
Specialized nurse	6	10.0
Head nurse	2	3.3
Residence		
Rural	38	63.3
Urban	22	36.7
Years of experience		
< 5 years.	7	11.7
5 < 10 years.	12	20.0
10 < 15 years.	28	46.6
≥15 years	13	21.7
Mean ±SD	30.98	±5.09
Attendance of training courses		
Yes	3	5.0
No	57	95.0
Site of training (n=3)		
Outside the hospital	3	100.0
At hospital	0	0.0

Table (2) Frequency distribution of studied sample knowledge regarding umbilical cord stem cell collection and banking (n=60)

Knowledge Items	Correct answer		Incorrect answer	
	No	%	No	%
Definition of umbilical cord	54	90.0	6	10.0
Anatomy of umbilical cord	37	61.7	23	38.3
Indication of umbilical cord blood	15	25.0	45	75.0
Disadvantages of cord blood collection	19	31.7	41	68.3
Proper time of clamping umbilical cord	35	58.3	25	41.7
Values of umbilical cord blood	18	30.0	42	70.0
Places for cord blood storage	16	26.7	44	73.3
Preparation of umbilical cord blood collection	8	13.3	52	86.7
length of time for cord blood storage	3	5.0	57	95.0
Definition of stem cells	5	8.3	75	91.7
Characteristics of stem cell	11	18.3	49	81.7
Sources of stem cells in the body	16	26.7	44	73.3
Types of stem cells	9	15.0	51	85.0
Ethical consideration of obtaining stem cells from umbilical cord	20	33.3	40	66.7
Definition of cord blood stem cell banking	5	8.3	75	91.7
Procedures for preserving umbilical cord blood stem cells in banks	4	6.7	56	93.3
Costs of storage of stem cells and cord blood banking	5	8.3	75	91.7

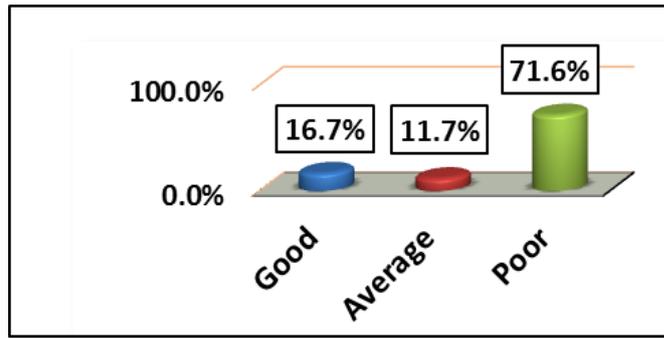


Fig. (1) Percentage distribution of studied sample' total knowledge regarding umbilical cord stem cell collection and banking (n=60)

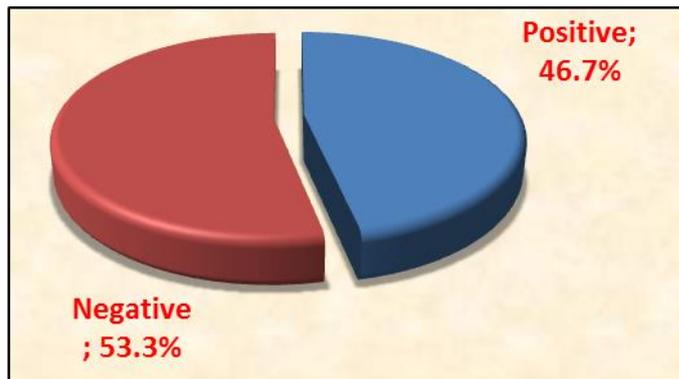


Fig. (2) Percentage distribution of studied sample' total attitude regarding umbilical cord stem cell collection and banking (n=60)

Table (3) Frequency distribution of studied sample' attitude regarding umbilical cord blood stem cell collection and banking (n=60).

Items	Agree		Uncertain		Disagree	
	No	%	No	%	No	%
Collection of umbilical cord blood immediately after delivery is necessary.	18	30.0	17	28.3	25	41.7
Cord blood is useful for life.	13	21.7	12	20.0	35	58.3
Baby's cord blood may be used for different purposes.	17	28.3	10	16.7	33	55.0
It's necessary to maternity nurse to have Experience for cord blood collection.	27	45.0	18	30.0	15	25.0
Stem cell cross matching is necessary before use.	36	60.0	15	25.0	9	15.0
Storage of cord blood is necessary.	29	48.3	11	18.3	20	33.4
Like to attend workshops regarding umbilical cord blood stem cell collection and banking.	41	68.3	12	20.0	7	11.7
It's necessary to have a consent form parents before the process of collecting stem cells.	39	65.0	16	26.7	5	8.3
It is necessary to know benefits, uses and possible harms of stem cells collection.	37	61.7	14	23.3	9	15.0
Cord blood is useful only for baby.	13	21.7	23	38.3	24	40.0
Health care of mother and baby is affected by collection of cord blood.	12	20.0	16	26.7	32	53.3
Stem cells transplanted should be widely practiced.	26	43.3	13	21.7	21	35.0
Competency regarding stem cell knowledge and practice is important for you as a health care provider.	35	58.3	12	20.0	13	21.7
The government should exhibit all researches regarding umbilical cord stem cells from embryo or aborted fetus	34	56.7	17	28.3	9	15.0

Cont.Table(3) Frequency distribution of studied nurses' attitude regarding umbilical cord blood stem cell collection and banking (n=60).

Items	Agree		Uncertain		Disagree	
	No	%	No	%	No	%
The process of collecting umbilical cord blood doesn't pose any danger or cause any harm to the mother or the fetus.	15	25.0	12	20.0	33	55.0
It is necessary to match the tissues of the donor and the patient to avoid the patient's body rejecting the stem cells which may occur because the immune system attacks the new cells which may lead to failure operation	35	58.3	13	21.7	12	20.0
Ease of bacterial infection of the umbilical cord blood during the process of collecting stem cells.	30	50.0	13	21.7	17	28.3
Preserving umbilical cord blood in stem cell banks is a personal decision and must be taken by parents thinking and planning for the umbilical cord blood bank before birth	29	48.3	9	15.0	22	36.7
Cord blood doesn't contain enough stem cells to treat adults	12	20.0	16	26.7	32	53.3
Storing of the umbilical cord blood is not waste of time and effort.	22	36.6	13	21.7	25	41.7
Stem cell storage is a rewarding wading process	18	30.0	11	18.3	31	51.7
Cord blood stem cells extraction is easy and simple in comparison present in the bone marrow	16	26.7	14	23.3	30	50.0

Table (4) Relation between total knowledge score of studied nurses and general characteristics (n=60)

General characteristics	Knowledge						X ²	P-value
	Poor (n=43)		Average (n=7)		Good (n=10)			
	No	%	No	%	No	%		
Age (years)								
20 < 25 years	7	16.3	0	0.0	0	0.0	26.3	0.000**
25 < 30 years	12	27.9	0	0.0	1	10.0		
30 < 35 years	20	46.5	3	42.9	1	10.0		
≥35 years	4	9.3	4	57.1	8	80.0		
Educational qualification								
Diploma nurse.	17	39.5	0	0.0	0	0.0	37.9	0.000**
Technical nurse.	23	53.5	1	14.3	2	20.0		
Bachelor degree.	3	7.0	5	71.4	5	50.0		
Master degree	0	0.0	1	14.3	3	30.0		
Residence								
Rural	32	74.4	5	71.4	1	10.0	14.7	0.000**
Urban	11	25.6	2	28.6	9	90.0		
Years of experience								
< 5 years.	7	16.3	0	0.0	0	0.0	30.4	0.000**
5 < 10 years.	11	25.5	1	14.2	0	0.0		
10 < 15 years.	23	53.5	3	42.9	2	20.0		
≥15 years	2	4.7	3	42.9	8	80.0		

Table (5) Relation between studied nurses' total attitude score and general characteristics (n=60).

General characteristics	Positive (n=28)		Negative (n=32)		X ²	P-value
	No	%	No	%		
Age (years)						
20 < 25 years	2	7.1	5	15.6	10.7	0.01*
25 < 30 years	4	14.3	9	28.1		
30 < 35 years	9	32.1	15	46.9		
≥35 years	13	46.4	3	9.4		
Educational qualification						
Diploma nurse.	2	7.1	15	46.9	20.6	0.000**
Technical nurse.	11	39.3	15	46.9		
Bachelor degree.	12	42.9	1	3.1		
Master degree	3	10.7	1	3.1		
Residence						
Rural	12	42.9	26	81.2	9.4	0.002*
Urban	16	57.1	6	18.8		
Years of experience						
< 5 years.	0	0.0	7	21.9	14.3	0.003*
5 < 10 years.	6	21.4	6	18.8		
10 < 15 years.	11	39.3	17	53.1		
≥15 years	11	39.3	2	6.2		

Table (6) Correlation between total knowledge score and total attitude score among studied nurses (n=60).

Total attitude	Total knowledge	
	R	P-value
	0.631	0.000***

Discussion:

The current study was aimed to assess knowledge and attitude of maternity nurses regarding umbilical cord stem cell collection and banking. This aim was significantly achieved within the framework of the present study research question.

Regarding general characteristics of the studied nurses, the finding of the current study revealed that, two fifth of the studied nurses were in age group 30 < 35 years old with the mean age of 30.47±6.07 years. These results similar with the result of study performed by (15) about "Urban Chinese nurses' knowledge, attitudes and practices toward umbilical cord blood donation", and found that half of the participants were between 25 to 35 years of age with mean age of 30.98 ± 5.09 year.

On other hand, this result is disagreed with [16] who conducted a study to assess the knowledge and attitude of nurses regarding stem cell and umbilical

cord blood banking in selected hospital of Ambala, Haryana" and revealed that more than half of the studied nurses were between 20 to 25 years of age.

These results are congruent with [17] in their study which "assess the effect of an educational guideline on maternity nurse's knowledge regarding process of cord blood collection" and mentioned that, less than half of the studied nurses had technical nursing institute. Also, the highest proportion of them working as staff nurse.

From the researcher's point of view, education is considered as one of the decisive and highly influential factors in behavior. The present study showed that, less than half of the studied nurses had technical nursing education and the majority of the studied nurses were assigned as nurses. These results might be due to preference of bachelor degree nurses to work at private hospitals and travel abroad, and when working in the governmental hospitals, bachelor degree nurses work as a head nurses not as bedside nurse.

This finding is in agreement with [18] who conducted a study about "Nurse's knowledge about umbilical cord blood banking and its barriers at Assuit university" and clarified that, most of studied sample were working as nurse.

On the other hand, this result is disagreed with (9) who conducted "a study to assess the Stem cells Knowledge and attitude among health care providers in Qassim region KSA" and reported that more than half of the studied nurses had bachelor degree.

The present study revealed that, less than half of the studied nurses had 10 < 15 years of experiences. These results are consistent with (17) who mentioned that, less than half of the studied nurses had >10 years of experiences.

From the researcher's point of view, These results attributed to the nurses who working at obstetrics and gynecological department had high years of experience.

On other hand, this finding is in disagreement with [19] who conducted "a study to assess effect of teaching program on nurse's performance regarding bone marrow transplantation" and mentioned that the majority of the studied nurses have 1 < 5 years of experience.

In relation to the residence of the studied nurses, it was found that, less than two thirds of the studied nurses were from rural area. This result is consistent with [20] who conducted "a study to assess the effectiveness of structured teaching program regarding collection of cord blood for stem cell therapy in terms of knowledge among staff nurses in selected hospitals at Bangalore" and revealed that more than half of the studied nurses were from rural area.

This finding is in disagreement with [21] who conducted "a study to assess pediatric nurse's knowledge, awareness and attitude towards application of stem cells therapy in children" and reported that more than half of nurses under the study were residing at urban area.

Regarding nurses' knowledge about umbilical cord stem cell collection and banking, the finding of the current study revealed that most of the studied nurses reported correct answer regarding definition of umbilical cord. Moreover, less than two thirds of the studied nurses reported correct answer regarding anatomy of umbilical cord and indication of umbilical cord blood, respectively. These results are approved with the study performed by [15] who stated that more than three quarters of the studied nurses had correct knowledge regarding definition, anatomy of umbilical cord and indication of umbilical cord blood.

In the same line, these results are congruent with [22] who conducted "a study in Malaysia about Association between nurses' knowledge and attitudes toward stem cell application in medicine" and revealed that the majority of the studied sample have correct knowledge about anatomy of umbilical cord and indication of umbilical cord blood.

On other hand, the majority of studied nurses reported incorrect answer regarding types of stem cells and costs of storage of stem cells and cord blood banking respectively. As well as, most of studied nurses reported incorrect answer regarding length of time for cord blood storage and procedures for preserving umbilical cord blood stem cells in banks respectively. These results are in accordance with [23] who conducted "a study to assess the knowledge and attitude of nurses regarding stem cells and umbilical cord blood banking in a selected tertiary care facility" and revealed that more than half of studied sample had poor knowledge about the processing of umbilical cord blood banking.

From the researcher point of view, these findings could reflect the importance of continuing education that help nurses to update their knowledge and practices, especially where the majority of the studied sample is young adults who have the ability to acquire knowledge and change their attitudes and practices.

According to the studied sample's total knowledge regarding umbilical cord stem cell collection and banking, the finding of the current study revealed that, less than three-quarters of the studied nurses had poor level of total knowledge about umbilical cord stem cell collection and banking.

These results are approved with the study performed by [24] who conducted "a study to assess the knowledge regarding umbilical cord stem cell therapy among staff nurses" and found that, the majority of staff nurses had poor knowledge and only tenth of them had average knowledge about stem cell therapy and umbilical cord collection. But the present study is inconsistent with [16] who reported that more than half of the nurses under study had average knowledge.

From the researcher point of view, the This result may be due to absence of pre-employment orientation, and training courses, low educational level and increased work load which may hinder the ability to read and upgrade their knowledge regarding umbilical cord stem cell collection and banking. Hence, there is a need for continuing training in this area to acquire adequate knowledge among all nurses.

Regarding to nurses' attitude about umbilical cord blood stem cell collection and banking, the finding of the current study showed that about two thirds of the studied nurses agreed that, it is necessary to attend workshops regarding umbilical cord blood stem cell collection and banking and have a consent form parents before the process of collecting stem cells respectively. These results are supported with the study done by [25] who conducted "study to assess health care professionals' knowledge, attitudes and practices relating to umbilical cord blood banking and donation" and found that more than half of the studied sample agreed that it is necessary to attend courses on umbilical cord blood stem cell collection.

In the same line, the finding of the current study indicated that less than two thirds of the studied nurses agreed that, stem cell cross matching is necessary before use, it is necessary to know benefits, uses and possible harms of stem cells collection and it is necessary to match the tissues of the donor and the patient to avoid the patient's body rejecting the stem cells which may occur because the immune system attacks the new cells which may lead to failure of operation respectively.

From the researcher point of view, These results may be attributed to professional roles within the maternity setting, individual provider practices.

These results are in agreement with the study performed by [26] who conducted "study to assess attitudes and practices of midwives in Irish hospitals" and found that more than half of nurses under study reported that stem cell cross matching is required before use and it is essential to perform cross matching to avoid the patient's body rejecting.

On other hand, more than half of the studied nurses disagreed that, cord blood is useful for life, baby's cord blood may be used for different purposes and the process of collecting umbilical cord blood doesn't pose any danger or cause any harm to the mother or the fetus respectively. These results are approved with the study performed by [27] who conducted "a study about "Implementing delayed umbilical cord clamping in Nepal—Delivery care staff's perceptions and attitudes towards changes in practice "and found that less than two thirds of the studied sample disagreed that cord blood would be useful in regenerating organs in future. Also, minority of nurses believed it would be useful to treat cancer and chronic illness.

Concerning nurses' total attitude regarding umbilical cord stem cell collection and banking, the finding of the current study revealed that more than half of the studied nurses had negative attitude regarding umbilical cord stem cell collection and banking. These results are supported with the study done by [28] who conducted a study to assess the knowledge and attitude of maternity nurses regarding cord blood collection and stem cells and found that the majority of the studied sample had negative attitude toward cord blood collection and stem cells before intervention.

From the researcher's point of view, These results may be due to decrease awareness of nurses about umbilical cord stem cell collection and banking due to lack of continuous training and instruction from supervisors.

But this result disagrees with the study performed by [23] and found that the most of the subjects had neutral attitude concerning stem cells and umbilical cord blood banking. Additionally, [22] who conducted "a study in Malaysia about Association between nurses' knowledge and attitudes toward stem cell application in medicine", and revealed that the majority of the studied sample have good attitude toward stem cell therapy.

From researcher's point of view, According to the relation between total knowledge score of studied

nurses and general characteristics, the present study revealed that there was a highly statistically significance relation between the total knowledge score of the studied nurses and their general characteristics (age, educational qualification, residence as well as years of experience). This might be explained as, good level of knowledge was higher among nurses in age group ≥ 35 years with high education and more years of experience.

These results are in agreement with the study achieved by [6] about knowledge and practice of pediatric providers in umbilical cord blood banking and found that level of education, years of experience had a significant effect on nurses' awareness level about umbilical cord blood banking.

In the same line, these results are congruent with [17] who revealed that there was a highly statistically significance relation between total knowledge score of the studied nurses and their years of experience.

On other hand, this finding is in disagreement with [24] who mentioned that there was no association found between knowledge score and the selected demographic variables like age, year of experience and educational status.

From researcher's point of view, Regarding to the relation between studied nurses' total attitude score and general characteristics, the present study revealed that there was a highly statistically significance relation between the total attitude score of the studied nurses and their educational qualification. This might be explained as, positive attitude was higher among nurses with high education.

These results are in agreement with the study achieved by [8] to "assess the knowledge and attitude of staff nurses regarding umbilical cord stem cells "and found that there was highly significant relation between total attitude of studied nurses and their educational level.

In the same line, these results are supported with the study done by [28] who stated that there was a positive statistically significant correlation between total attitude scores and educational level.

Also, the present study indicated that there was a statistically significance relation between the total attitude score of the studied nurses and age, residence as well as years of experience. These results are approved with the study performed by [29] about "Stem Cells and Cord Blood Collection: Knowledge and Attitude of Maternity Nurses in Maternity and Children Hospital" and revealed that, there was statistically relation between total attitude of studied nurses and their age and years of experience.

From researcher's point of view, it is expected that This could be explained as, positive attitude was higher among nurses with more years of experience and more age as they have a good experience and can deal effectively with these procedures .

In the same line, these results are congruent with [31] who revealed that, there was a positive

statistically significant relation between studied nurses' attitude' and years of experience and educational level.

From researcher's point of view, According to the correlation between total knowledge score and total attitude score among studied nurses, the present study indicated 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. This could be explained as good level of knowledge among nurses was more encountered among those nurses with positive attitude.

These results are approved with the study performed by [31]who reported a significant correlation between health care providers' knowledge and attitude.

In the same line, this result is in agreement with the study performed by [32]who conducted" a study to assess stem cell therapy health care providers' knowledge and attitude" and found that there was a significant positive correlation between knowledge and attitude of health care providers.

Conclusion

Based on the results of the present study, it could be conducted that more than two thirds and more than half of the studied nurses had poor knowledge and negative attitude regarding umbilical cord blood stem cell collection and banking. Also there was a highly statistically significance relation between the total knowledge score of the studied nurses and their general characteristics ($p \leq 0.001$). Moreover, there was a statistically significance relation between the total attitude score of the studied nurses and their general characteristics ($p \leq 0.05$). Additionally, there was positive statistically significant correlation between total knowledge and total attitude scores of the studied nurses regarding umbilical cord stem cell collection and banking. Hence, the present study answered the research question and achieved the aim of the study.

Recommendation:

- Nursing protocol and guidance including the importance of technique for umbilical cord stem cell collection and banking in antenatal , post natal clinics at Benha university hospital
- An educational guideline regarding stem cell collection and banking should be available at all maternity departments to help nurses to acquire the basic knowledge
- In-service training related to stem cells collection and banking should be conducted to improve nurses' knowledge, attitudes and practice in order to fit this trends in health care

Further studies should be performed:

- Effect of training programs on improving maternity nurses' knowledge, attitudes and practices regarding stem cell collection and banking.
- Replication of the study on a large sample size in different settings for generalizing the findings.

Reference

- [1] S.Koshy , A study to assess the effectiveness of Self-Instructional Module (SIM) on knowledge and attitude regarding stem cell and cord blood banking among antenatal mothers in perinthalmanna nursing home at Malappuram (Doctoral dissertation, Ellen College of Nursing, Coimbatore),pp55-68,2018
- [2] A.B.Rashed and H.S.Shehata , Evaluation of Pregnant Women's Knowledge and Attitude Toward Banking of Stem Cells from the Umbilical Cord Blood Before and After Counseling. Evaluation, pp.53, 2018
- [3] A.R..Nabil , E.A.Mohamed , A.A.Roshdi and G.A.Arafat ,Assessment of Pregnant Women knowledge and attitude towards Umbilical Cord Banking and Stem Cell. Egyptian Journal of Health Care, vol.12(2),pp.1152-1164, 2021
- [4] H.El-Sayed, H.Elmashad, and S.Aboud, Application of Counseling about Umbilical Cord Stem Cell Collection and Banking among Pregnant Women: Its Effect on Their Knowledge and Attitude. American Journal of Nursing Research, vol.6(5), pp.214221., 2018.
- [5] T.Aftab, and E.Khyzer , Knowledge and Attitude about Stem Cells and their Potential Applications in Field of Medicine among Medical Students of Arar, Saudi Arabia. Journal of Clinical & Diagnostic Research, vol.15(10), pp.22, 2021.
- [6] A.E.Armstrong., R.Fonstad ., S.Spellman., Z.Tullius and S.Chaudhury ,Current knowledge and practice of pediatric providers in umbilical cord blood banking. Clinical pediatrics, vol.57(2), pp.161-167, 2018.
- [7] L.Peberdy, J.Young , D.L.Massey ., and L.Kearney ,Parents' knowledge, awareness and attitudes of cord blood donation and banking options: an integrative review. BMC pregnancy and childbirth, vol.18(1), pp.1-21, 2018
- [8] M.Jenishia , A Study to assess the Knowledge and Attitude of staff Nurses regarding Umbilical Cord Stem cells before and after the Structured Teaching Programme at selected Hospitals, Coimbatore. International Journal of Nursing Education and Research, vol.7(4), pp.475-478, 2019.
- [9] S.Mohammed , Stem cells: Knowledge and attitude among health care providers in Qassim region KSA. London Journal of Research in Science: Natural and Formal,vol.2(1),pp.114-119, 2019.
- [10] Y.G.Sekerci and E.K.Bicer , Knowledge, attitude and practice of health education students for stem cell donation and transplantation. Annals of Medical Research, vol.27(10), pp.2737-2744, 2020.
- [11] R.Sahoo and L.Rana , Pregnant women's Knowledge and Attitude about Stem Cells and Cord Blood Banking. Asian Journal of Nursing Education and Research, vol.10(4), pp.452-456, 2020.
- [12] N.K.Velikonja , K..Erjavec and M.Knežević , Knowledge, Awareness, and Attitudes toward Umbilical Cord Blood Biobanking. Open Access

- Macedonian Journal of Medical Sciences, pp.702-709, 2021.
- [13] S.E.Mansour, Gouda A.M.Gouda , and A.Ibrahim, Effect of an Educational Program on Nurses' Knowledge and Attitudes Regarding Umbilical Cord-blood Stem Cells Preservation, 2020.
- [14] N.Patyal , R.Kaur , R.Singh ., A. Reetu ., R.Ritu, R.Kaur , S.Kumar, S.Kaur and J.Sarin , A Study to Assess the Knowledge and Attitude of Nurses Regarding Stem Cell and Umbilical Cord Blood Banking in Selected Hospital of Ambala, Haryana. The Pharma Innovation Journal. Vol.7(6), pp.154-159, 2018
- [15] K.P.Lee , E.Y.Lau , T.S.Sumerlin and J.H.Kim , Urban Chinese nurses' knowledge, attitudes and practices toward umbilical cord blood donation. Midwifery, vol.69, pp.59-66, 2019.
- [16] R.Ridhim , R.Kaur , S.Kumar and J.Sarin , A study to assess the knowledge and attitude of nurses regarding stem cell and umbilical cord blood banking in selected hospital of Ambala, Haryana. The Pharma Innovation Journal, vol.7(6), pp.154-159, 2018.
- [17] O.Fadeel , M. Moustafa and A.Hafez , Effect of an educational Guideline on Maternity Nurses Knowledge regarding process of cord blood collection. Minia Scientific Nursing Journal, vol.2(1), 2017.
- [18] M.F., Moustafa , E.M.Youness , Nurses' knowledge about umbilical cord blood banking and it's barriers. IOSR J Nurs Health Sci, vol.4(2), pp.44-53, 2015
- [19] A.Ali, M.Mohmed, D.Sayed, and Ahmed N., Effect of Teaching Program on Nurse's Performance Regarding Bone Marrow Transplantation. Assiut Scientific Nursing Journal, vol.7(18), pp.12-21, 2019.
- [20] V.Pinto, N.Pushpaveni, A study to Evaluate the effectiveness of Structured Teaching Program regarding collection of cord blood for stem cell therapy in terms of knowledge among staff nurses in selected hospitals at Bangalore. Asian Journal of Nursing Education and Research, vol.8(1), pp.07-10, 2018.
- [21] A.Khalil, and, S.Sharshor, Pediatric Nurses Knowledge, Awareness and Attitude towards Application of Stem Cells Therapy in Children. IOSR Journal of Nursing and Health Science, vol.5(4), pp.88-96, 2016.
- [22] L.J.Leng, S.L.Keng, Wan Ahmad W.A.N and T.S.Cheng, Association between nurses' knowledge and attitudes toward stem cell application in medicine. The Malaysian Journal of Nursing (MJN), vol.7(3), pp.3-9, 2016.
- [23] A.Venugopal, P.Joshi, D.Deka and T.Seth , Knowledge and attitude of nurses regarding stem cells and umbilical cord blood banking in a selected tertiary care facility. Asian Journal of Nursing Education and Research, vol.6(2), pp.240-244, 2016.
- [24] A.Amin, V.Kumary, and C.VijiPrasad, Knowledge regarding umbilical cord stem cell therapy among staff nurses with the view to develop self-instructional module. IJHSR, vol.6(11), 209213. Cells, vol.24(03), 2017.
- [25] L.Peberdy , J.Young, and L.Kearney, Health care professionals' knowledge, attitudes and practices relating to umbilical cord blood banking and donation: an integrative review. BMC pregnancy and childbirth, vol.16(1), pp.1-19, 2016.
- [26] J.Devin and P.Larkin , Delayed cord clamping in term neonates: attitudes and practices of midwives in Irish hospitals. Int J Childbirth, vol.8(1), pp.4-17, 2018.
- [27] N.Rana , O.Brunell and M.Målqvist , Implementing delayed umbilical cord clamping in Nepal—Delivery care staff's perceptions and attitudes towards changes in practice. PloS one, vol.14(6), e0218031, 2019.
- [28] H.Mohammed and H.El Sayed, Knowledge and attitude of maternity nurses regarding cord blood collection and stem cells: An educational intervention. Journal of Nursing Education and Practice, vol.5(4), p.58, 2015.
- [29] H.Ibrahim, A.M. Al-Qahtani , W.T.Elazar and N.H.Alnagrany, Stem Cells and Cord Blood Collection: Knowledge and Attitude of Maternity Nurses in Maternity and Children Hospital, Najran. Stem, 2019.
- [30] A.N.Tawfiq, H.Salah Eldein, R.Mohammed AbdElhady and R.S.Abd El Aliem , Effect of an Educational Program on Maternity Nurses Knowledge and Attitude about Umbilical Cord Blood Banking and its Barriers. Journal of Nursing Science Benha University, vol.3(1), pp.536-552, 2022
- [31] H.Tork, S.Alraffaa , K.Almutairi, N.Alshammari , A.Alharbi and A.Alonzi , Stem cells: knowledge and attitude among health care providers in Qassim region, KSA. International Journal of Advanced Nursing Studies, vol.7(1), p.1, 2017.
- [32] H.Abo-Baker and D.Masoud , Stem Cell Therapy: Health Care Providers' Knowledge and Attitude. Egyptian Journal of Health Care, vol.12(3), pp.1547-1558, 2021.