

Assessment of Knowledge regarding Menstrual Blood Stem Cell Banking among Nursing Students

Lily Podder

Associate Professor, Bharati Vidyapeeth (Deemed to be University), Pune, Maharashtra

Abstract

Emergence of stem cell technology and the successful impact of the stem cells research has brought ray of hope to the diseased population of the world. Menstrual stem cells could offer a lot of advantages over the other stem cells as the source is easy to find. This study was conducted to assess the knowledge regarding menstrual blood stem cell banking among nursing students studying in nursing colleges of Pune, Maharashtra and to associate the knowledge with selected demographic variables. A quantitative approach with non-experimental evaluative research design was adopted; 100 samples were selected through non-probability purposive sampling technique from selected nursing education institutes of Pune city, Maharashtra. Data were collected by using a valid and reliable tool that consisted of a knowledge questionnaire regarding menstrual blood stem cell banking from the selected student nurses during March 2018 to June 2018. Paper and pencil and observation technique was used for data collection. Data was analysed by using descriptive and inferential statistics. The findings revealed that majority of the nursing students (92%) belonged to 21-25 years of age group; maximum were female (77%); 45 percent of the samples were 4th year BSc Nursing students and 30 percent were from 3rd year in BSc Nursing; 64 percent students possessed Average knowledge, 32 percent had Good knowledge and 4 percent had Poor knowledge. Regarding menstrual blood stem cells banking, there was no statistically significant association between knowledge and demographic variables at 0.05 level of significance. The advantages of the menstrual blood stem cells seem to be more as the availability of the sample though it is restricted because of the myth surrounding the use of menstrual blood.

Till date women have been discarding menstrual blood as an unwanted sanitary waste. However, researchers found that menstrual blood is a rich source of stem cells with ability to multiply and differentiate into any kind of cells. Earlier, blood from umbilical cord was regarded as the ultimate reserve for stem cells. But researches have now discovered and successfully harvested stem cells from menstrual blood making it possible for all the women including those who have never given birth to preserve stem cells for themselves. Stem cells in menstrual blood have regenerative capabilities similar to that of the stem cells in umbilical cord blood and bone marrow. Discovery of stem cells in the menstrual blood has given a new meaning to menstruation for women who considered menstruation as a necessary evil.

Menstrual blood bank: Menstruation is the visible manifestation of cyclic physiologic uterine bleeding due to shedding of the endometrial. It occurs in a rhythmic cycle of 28 to 30 days in healthy women who is fertile. The uterus experiences changes like endometrial thickening, proliferation of the vascular system,

secretions from the glands which happen in preparation for receiving a fertilised ovum. But if the women fails to conceive, functional endometrial is shed off which is visibly known as menstruation, and believed that it is the “weeping of the uterus over the lost ovum”. From a “monthly curse” as expressed by many women, menstruation has turned out to be a “monthly boon” and the derivation of stem cells from the menstrual blood has become a great scope for the regenerative medicine. The stem cells derived from the menstrual blood are a promising source in the stem cell research due to their immaturity that warrants migration, growth factor secretions, cell differentiation, and immune modulation embedded with angiogenic potential of the cells, it has caught the attention of researchers who are using the same in the restorative treatment approaches.

Menstrual blood banks charge minimal annual fee for storage and preservation and allow women to have lifelong benefits from them. Menstrual blood stem cells banking concept was started in the year 2007 by an American company Cryo cell, and in India it was

started by Life Cell International on 8 March, 2011 by film actress Lisa Ray, who won the battle with cancer and recovered from deadly disease. The cost of private banking storage varies depending on the bank, around Rs. 1,500 per year. The process for collection of menstrual blood is simple; like a tampon, a silicone cup is inserted in the vagina on the day of heaviest flow. The cup needs to be placed inside the vagina for at least three hours so as to collect approximately 20 ml of blood. This is then poured in the collection kit and is sent back to the menstrual blood bank laboratory where it is processed, frozen and stored. The stem cells in menstrual blood are highly proliferative, replicating every 24-36 hours. It is important to note that menstrual stem cells retain embryonic stem cell markers, giving them the remarkable potential to morph into many different healthy cell types. The unique properties of these cells demonstrate the exciting possibilities they offer in future therapeutic applications.

Use of stem cell transplant has shown drastic increase in countries like United States, Europe and Japan. Researches show favourable results in different settings, even though its use and success is restricted by many difficulties, including the need for a HLA match. Without a close match for HLA, HPC transplant from any source is linked with a high risk of rejection.

Studies have reported the presence of stem cells in the intact endometrial lining of the uterus. It was the findings of the studies by Cho et al, Schwab et al, Du & Taylor that led to the idea of identifying stem cells in the menstrual blood which is the shed endometrium. Two laboratories namely the Bio communications Research Institute, Frincy Francis et al, Journal of Medical Biomedical and Applied Sciences, Jan (2016), 4 Wichita, Kansas, United States and Cryo Cell International, World's biggest cord blood bank, Oldsmar, Florida independently reported the research findings of the discovery of a new type of stem cell that may overcome obstacles like the availability of limited number of stem cells and non-invasive method of obtaining it (Table 1).

Menstrual Blood Banking has a wide scope as the

Table 1: Comparison of stem cells derived from intact endometrium

Stem cells from intact endometrium	Menstrual blood stem cells
Mesenchymal cells	Morphologically look like Mesenchymal cells but differ
Multipotent	Pluripotent
Able to differentiate into cells from only 2 germ layers	Able to differentiate into cells from 3 germ layers like the endoderm, ectoderm and mesoderm. Unlike the other adult stem cells, these cells demonstrate embryonic properties too

need for regenerative therapies incorporating cells that can engraft and differentiate is vast. The research has established the beneficial properties of these cells and their potential use in treatment of several medical conditions like atherosclerosis, diabetes, stroke, rheumatoid arthritis, Parkinson disease and many more. Alongside, menstrual blood can overcome the problem of immune rejection during the transplant, allowing the female patients to use their own stem cells for the treatment. Thus there should be adequate knowledge and awareness among nursing students regarding menstrual blood banking and stem cell therapy, so they can educate the public about the potential uses and advantages.

Objectives

1. To assess the knowledge regarding menstrual blood stem cell banking among the nursing students, and
2. To associate the knowledge with selected demographic variables.

Variables

Research variable: Knowledge regarding menstrual blood stem cell banking among nursing students.

Demographic variable: Age, gender and class of the nursing students

Hypothesis

There is no association between the knowledge and demographic variables at 0.05 level of significance.

Review of Literature

Patel et al (2008) stated that menstrual stem cells (MeSCs) have a great importance for clinical translation of regenerative therapies. The studies demonstrate that these are a unique population of cells that can be safely isolated and can provide us with an expandable source of stem cells from women until they reach menopause. Considering their relevance and importance in treatment of rare diseases including certain neuro disorders, it becomes crucial for women to preserve their menstrual blood in the Menstrual Blood Bank.

Mehrabani et al (2016) stated that one of the readily available sources of mesenchymal stem cells (MSCs) is menstrual blood-derived stem cells (Men-SCs), which exhibit characteristics similar to other types of MSCs. This study was performed to determine the growth kinetics, plasticity, and characterization of Men-SCs in women. Menstrual blood (5 ml) was obtained from 10 women on their third day of menstruation in 2 age groups of 30 to 40 and 40 to 50 years old. Ficoll was used to separate the mono-

nuclear cell fraction. After the Men-SCs were cultured, they were subcultured up to passage 4. Growth behaviour and population doubling time were evaluated by seeding 5×10^4 cells into 12- and 24-well culture plates, and the colonies were enumerated. The expression of CD44, CD90, and CD34 was evaluated. The osteogenic potential was assessed by alizarin red staining. The Men-SCs were shown to be plastic adherent and spindle-shaped. Regarding the growth curves in the 12- and 24-well culture plates, it was demonstrated that in the women aged between 30 and 40 years, population doubling time was 55.5 and 62 hours, respectively, while these values in the women aged between 40 and 50 years were 70.4 and 72.4 hours, correspondingly. Positive expression of CD44 and CD90 and negative expression of CD34 were noted. In the osteogenic differentiation medium, the cells differentiated toward osteoblasts. As human Men-SCs are easily collectable without any invasive procedure and are a safe and rapid source of MSCs, they can be a good candidate for stem cell banking and cell transplantation in women.

The authors of the study Process in menstrual blood-derived mesenchymal stem cells for treatment of central nervous system diseases (2018) reported that stem cell research has become a frontier in the field

of life sciences, and provides an ideal model for exploring developmental biology problems such as embryogenesis, hystiocytosis, and gene expression regulation, as well as opens up new doors for clinical tissue defective and inheritance diseases. Among them, MenSCs are characterised by wide source, multi-directional differentiation potential, low immune rejection characteristics. Thus, MenSCs can achieve individual treatment and have the most advantage of the clinical application. The central nervous system, including brain and spinal cord, is susceptible to injury. And lethality and morbidity of them tops the list of all types of trauma. Compared to peripheral nervous system, recovery of central nervous system after damage remains extremely hard. However, the treatment of stem cells, especially MenSCs, is expected to solve this problem. Therefore, biological characteristics of MenSCs and their treatment in the respect of central nervous system diseases have been reviewed at home and abroad in recent years, so as to provide reference for the treatment of central nervous system diseases

Paolo et al 2010 found that up to a third of people are insensitive to the traditional revascularisation and it may be helpful to use stem cell therapies. This study aimed to find out efficacy of autologous cell therapy in the treatment of PAD. The researcher searched the literature in various database related to this subject. In an analysis of a total of 37 trials, autologous cells therapy was found to be effective in enhancing alternate indexes for ischaemia, individual symptoms and difficult resultants. The intramuscular route of administration and use of bone-marrow cells was found to be more effective than intrarterial administration and the use of mobilised peripheral blood cells. The interventions were tolerated well and considered safe.

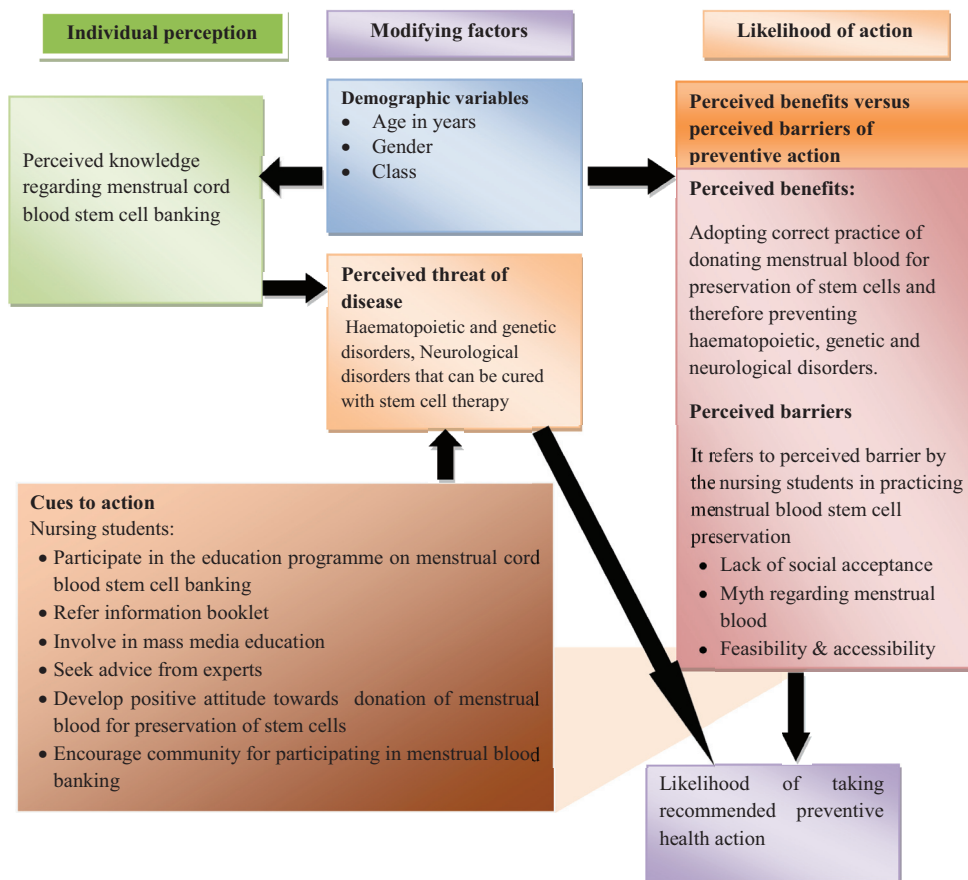


Fig 1: Conceptual framework of the study based on modified health belief model by Becker, Rosenstoch and Kegels.

Materials & Methods

In order assessment of knowledge regarding menstrual blood stem cells banking among nursing students, a quantitative non-experimental evaluative research design was adopted. The study was conducted in selected nursing institutes in Pune,

Table 2: Sample characteristics in terms of frequency and percentage (N=100)

S. No	Demographic variables	f	%
1. Age			
	21– 25 years	92	92
	26 – 30 years	8	8
	31 years & above	0	0
2. Gender			
	Male	23	23
	Female	77	77
3. Class			
	1 st year BSc Nursing	10	10
	2 nd year BSc Nursing	15	15
	3 rd year BSc Nursing	30	30
	4 th year BSc Nursing	45	45

Maharashtra. The rationale for selection of the setting for the study was researcher’s familiarity with the setting, convenience, feasibility, expected cooperation from the authorities in getting permission. The investigator selected 100 nursing students who fulfilled the inclusion criteria by using purposive sampling technique. After obtaining administrative approval and written consent from the participants, tool was administered for data collection. Data collection was accomplished by using tool comprised of structured knowledge questionnaire regarding menstrual blood stem cell banking. Knowledge was measured by structured knowledge questionnaire which has total 20 questions. Data was collected using paper & pencil technique. The time taken by each respondent for filling the tool was 20- 25 minutes. Data was analysed by using descriptive and inferential statistics.

Table 3: Item wise knowledge of the nursing students regarding concept of menstrual blood stem cell banking in terms of frequency & percentage (N=100)

S.No.	Items	Correct answer	
		Frequency (f)	Percentage (%)
1	Meaning of stem cells	57	57
2	Functions of stem cell	61	61
3	Types of stem cells	37	37
4	Meaning of mesenchymal stem cells	14	14
5	Source of hematopoietic stem cell	59	59
6	Timing of collection of menstrual blood to store in menstrual blood bank	43	43
7	Function of haematopoietic cell	73	73
8	The first menstrual blood stem cell bank in India	65	65
9	The year when menstrual blood stem cell banking launched in India	45	45
10	The place where the first menstrual blood stem cell banking in India launched	19	19

Results

Findings regarding sample characteristics

Table 2 shows that 92 percent of nursing students belong to 21-25 years of age group. Majority of the students (77%) were female and 45 percent of the nursing students were studying in 4th year BSc nursing course.

Findings related to the knowledge of the nursing students regarding menstrual blood stem cell banking.

Percentage distribution of nursing students according to their knowledge level regarding menstrual blood stem cell banking is shown in Fig 2.

The data presented in Table 3 depicted that maximum of the students (65%) did know about the name of the pioneer menstrual blood stem cell bank in India and only 14% of the students did know about the meaning of mesenchymal stem cells.

Table 4 depicts that maximum of the students (75%) did know about the meaning of menstrual blood stem cell bank and only 7 percent of the students did know about the test to be performed before the collection of menstrual blood stem cells. The conceptual framework of the study based on modified health belief model of Becker et al is in Fig 1.

Discussion

Menstrual Blood Banking” is an emerging new concept of collecting, preserving and storing the menstrual blood for the purpose of isolating stem cells. It is similar to that of the umbilical cord blood sampling that’s been promoted in most hospitals. Though the advantages of the menstrual blood stem cells seem to be more as the availability of the sample is frequent obtained from all healthy women having regular cycles who can

donate the menstrual blood than the other available sources of stem cells yet only very few studies have demonstrated its effectiveness on humans and many of the studies have proved the same in the mice. Social acceptance and the myth surrounding the use of menstrual blood is predicted as a reason for the wide non acceptance like the other available sources of stem cells. Generating more studies and proving its benefits in the curative aspects of major diseases could result in the menstrual blood stem cells giving a promising future to many who are sick.

Implications

Nursing education: Standard nursing care is only possible through standard education. The nursing personnel should acquire the ability to conduct health education programmes. Therefore, knowledge regarding various method of education

Table 4: Item wise knowledge of the nursing students regarding collection and storage of menstrual blood in terms of frequency & percentage (N=100)

S.No.	Items	Correct answer	
		Frequency (f)	Percentage (%)
1	Meaning of menstrual blood stem cell banking	75	75
2	Type of menstrual blood stem cell banking procedure	3	3
3	Steps of stem cell banking	32	32
4	Amount of blood required for menstrual blood stem cell banking	35	35
5	The temperature at which the menstrual blood stem cell is stored	23	23
6	The gas used to store the menstrual blood stem cell	23	23
7	Before the collection of menstrual blood stem cell the sample is tested for the which disease	7	7
8	The timing within which the collected menstrual blood samples must reach to laboratory	42	42
9	Material of the collection cup of menstrual blood	55	55
10	The time period up to which the menstrual blood bank maintains the potency and viability of menstrual blood stem	49	49

should be included in nursing curriculum. Specially knowledge booklet can be referred afterwards and can be used for reinforcement of knowledge.

Nursing practice: Nursing students and those working in Gynaecological unit should be well equipped to deal with physiological, psychological, social, vocational aspect of patient care. Nurses may conduct teaching programme through TV channel. They can prepare structured teaching programme, or teaching material as leaflet, pamphlet, brochure etc. Nurses can educate students, mothers and other community people regarding the knowledge of menstrual blood banking & stem cell therapy as a structured method of teaching rather than through unstructured teaching.

Nursing administration: The goal of good administration is improvement of patient care. Until the people are motivated properly a change in knowledge, attitude and practice is not possible. Administrator should arrange at least one yearly education programme for the women, antenatal mothers, couples, to provide adequate knowledge regarding menstrual blood banking and stem cell therapy.

Nursing research: Emphasis should be given on research in the area of Menstrual Blood Stem Cell Banking & Stem Cell Therapy, Researchers should publish finding of research carried out and its implication for nursing society.

Recommendations

A similar study may be done on a larger sample. An identical study can be done (a) among the community people, (b) on pan India basis, (c) in community settings, (d) on the other populations like doctors, par-

ents, staff nurses, lab technicians, etc.

A study can be conducted to assess the effectiveness of Health education programme, knowledge booklet, awareness programme, planned teaching programme or video-assisted teaching etc.

Conclusion

Student nurses should advocate for the “Menstrual Blood Banking, the best out of waste concept of collecting, preserving and storing the menstrual blood for the purpose of isolating stem cells which is similar to that of the umbilical cord blood sampling, as the future first line professional figure in the health care delivery. Menstrual blood stem cells can be obtained from all healthy women having regular cycles. More studies, and proving its benefits in the curative aspects of major diseases could result in the menstrual blood stem cells giving a promising future to many who are sick.

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