



Effect of Jigsaw Teaching Strategy on Internship Nursing Students' Health Literacy Regarding Menstrual Blood Banking

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ABSTRACT

Stem cells research and associated therapies are advancing remarkably. The potential to separate stem cells from menstrual blood has created a new avenue in stem cells research that may one day provide mankind with therapeutic advantages. **Aim:** The current study aimed to examine the effect of jigsaw teaching strategy on internship nursing students' health literacy regarding menstrual blood banking. **Methods:** A quasi-experimental design (one-group pretest-posttest) was adopted. A convenience sample of 100 internship nursing students were recruited. Data were collected using two tools: structured self-administered questionnaire and menstrual blood banking attitude assessment scale. **Results:** Study findings revealed that, pre-intervention the mean knowledge score was 7.70 ± 2.40 while at post-intervention it was significantly increased to 12.2 ± 2.02 ($p = 0.02$). Concerning attitude, only 6.0% of students expressed positive attitude regarding menstrual blood banking pre-intervention as compared to 78.0% of them post-intervention ($p < 0.001$). The current study declared that, there was a statistically significant correlation between knowledge and attitude at post-intervention ($p = 0.003$). **Conclusion:** jigsaw teaching strategy had a significant positive impact on internship nursing students' health literacy towards menstrual blood banking. **Recommendation:** Utilization of such teaching strategy should be encouraged to improve health literacy among internship nursing students.

Key words: Jigsaw teaching strategy, internship nursing students, health literacy, menstrual blood banking.

Introduction

Menstrual blood banking is the practice of storing a woman's menstrual blood in order to utilize the stem cells inside it in the future (Manu et al., 2022). The idea of menstrual blood stem cell banking was first introduced in 2007 by the American company Cryo Cell (Dhaka, 2021). The process of menstrual blood banking typically involves collecting menstrual blood in a very quick, easy, and non-invasive manner; on the day

of the heaviest menstrual flow, a silicone cup is put into the vagina similarly to a tampon. To collect about 20 ml of blood, the cup must be inserted into the vagina and left there for at least three hours. After being processed, frozen, and kept for later use, this is emptied into the collection kit and returned to the menstrual blood bank laboratory. Private banking costs vary depending on the bank, but typically begin with annual storage fees of about 1,500 per year (Dhaka, 2021).

Stem cells are unspecialized cells of the human body. They have the capacity to self-renew and can differentiate into any type of organism's cell (Andrzejewska et al., 2019); (Zakrzewski 2019). A number of ailments, including cancer, cerebrovascular disease, and immunological disorders, may be treated using stem cells (Leng et al., 2016); (Phougeishangbam and Mayanglambam, 2016). Moreover, stem cell therapy probably would be the only therapeutic approach that can potentially cure neurodegenerative illness (Ahmadian-Moghadam et al., 2020). The transplantation of stem cells that have been extracted from menstrual blood can be used to treat many disorders such as Alzheimer's disease, amyotrophic lateral sclerosis, stroke, and other neurological illnesses. Stem cells also may be used therapeutically to treat disorders where there is an inflammatory component because these cells were discovered to possess anti-inflammatory qualities (Rosy, 2017); (Mirzaei et al., 2018).

Health literacy is a multifaceted concept that includes an individual's, a family's, or a community's knowledge, confidence, and comfort with accessing, understanding, appraising, remembering, and using information about health and healthcare that accumulates through daily activities and social interactions (WHO, 2022). Therefore, nursing students must acquire the necessary knowledge and attitude about stem cell therapy through adequate instruction during their academic careers. Given the recent nature of this medical discovery, nurses face a problem in integrating newly gained concept knowledge and

attitude into clinical practice. To achieve the standards of nursing practice, nursing curricula should be continuously reviewed throughout the year to ensure that the teaching methods and course contents are still grounded in the most recent research. Future revision of the course could also implement more interactive teaching techniques in every lesson (Mitchell and Laing, 2019).

Jigsaw is a teaching strategy that encourages student participation and cooperative learning. It was first created by social psychologist Elliot Aronson in 1970, and has demonstrated efficacy in high school and college education. The Jigsaw technique is useful for teaching; it is a way that aids in the development of teamwork abilities in students (Dhull and Verma, 2019). As a method of cooperative learning, it is successful at fostering good student attitudes towards their learning as well as practical learning skills, efficient communication, and proficiency in terms of understanding knowledge (Tekdal and Sonmez, 2018). Additionally, it aids with academic performance enhancements and greater self-esteem (Winslow, 2020).

Using the jigsaw method, students are divided into groups and then reorganized into new ones to share what they have learned through peer teaching. It is expected of the students in the expert groups to master the material given to them and to debate the best ways to teach the material to their peers. One student from each expert group joins a pre-arranged jigsaw group once the group

discussions are over. As they learn from the assigned materials, the jigsaw group members impart their knowledge to one another (Tomaswick, 2017). The group discussions are supervised by a single faculty facilitator who makes sure the groups stay on topic and dispel any misconceptions the students may have. Throughout the group discussions, students are encouraged to think critically and solve problems in order to gain an understanding of the material that would be impossible for them to learn on their own. With this cooperative learning strategy, peers can collaborate in a team environment while maintaining individual accountability for the course material and peer teaching (Hance, 2021).

Significance

Menstrual blood has traditionally been disposed of as unhygienic waste and is not anyone's feeling of pleasure. Women will have a new attitude toward menstruation, which has been stigmatized in low- and middle-income countries, following the discovery of stem cells in menstrual blood that anyone can use (Kuhlmann et al., 2017); (Menstrual Health in India, 2023).

According to literature review, staff nurses have a significant prevalence of ignorance regarding menstrual stem cells. Therefore, it is important to empower them with proper knowledge because nurses are the primary advocates for novel life-saving modalities and treatments in the community (Sasikala, 2021). Jomon et al. (2019) conducted a study about "Knowledge and attitude regarding menstrual

blood banking" and found that, most of the participants had negative attitudes towards menstrual stem cells. Additionally, Singh et al. (2023) stated that further researches can be done to determine how nursing students feel about and behave in relation to menstrual blood banking in their study about "The effectiveness of planned teaching program regarding menstrual blood banking among B. Sc. nursing Iv year students".

Previous researches acknowledged the majority of internship nursing students believe that menstruation is an unwelcome and unsanitary waste, despite the fact that they are expected to be nursing leaders because they have already completed their undergraduate studies and are now ready to face reality and begin their professional lives. That is why the researcher is interested in this population. They must keep up with new technological developments in both knowledge and practice. To change this conception and shed light on the innovative uses of menstrual blood, the aim of this research was to examine the effect of jigsaw teaching strategy on internship nursing students' health literacy regarding menstrual blood banking.

Aim of the study

This research aimed to examine the effect of jigsaw teaching strategy on internship nursing students' health literacy regarding menstrual blood banking.

Operational definition

In this study health literacy refers to knowledge and attitude regarding menstrual blood banking and

was measured using structured self-administered questionnaire and menstrual blood banking attitude assessment scale.

Research hypotheses

Main hypothesis

Internship nursing students who are subjected to Jigsaw teaching strategy will have a higher health literacy regarding menstrual blood banking than before.

Sub-hypotheses

H.1. Internship nursing students who are subjected to Jigsaw teaching strategy will have a higher mean knowledge score regarding menstrual blood banking post-intervention than pre-intervention.

H.2. Internship nursing students who are subjected to Jigsaw teaching strategy will have positive attitude regarding menstrual blood banking post-intervention than pre-intervention.

Subjects & Methods

Research design

The current study adopted a quasi-experimental (Pre-test/Post-test) design. This research design manipulates the independent variables but does not involve a control group or randomization. Pre-test/post-test design involves measuring the dependent variable twice: once before and once after the intervention (LoBiondo-Wood & Haber, 2018).

Research Setting

The present study was carried out at Faculty of Nursing Menofia University, Shebin-Elkom,

Menofia Governorate, Egypt. The faculty building located at Menofia University campus and consisted of 7 floors. It provides bachelor degree in nursing on 4 studying years and a mandated internship training for 12 months. The number of internship nursing students was 488 in the academic year 2022/2023.

Sample

A convenience sample of 100 internship nursing students were recruited based on the following inclusion criteria: female internship nursing student, single or married. However, rejection to participate in the study was the only exclusion criterion.

Sample size calculation

Based on data from literature (Hans and Kaur, 2016), considering level of significance of 5%, and power of study of 80%, the sample size can be calculated using the following formula:

$$n = \frac{2(Z_{\alpha/2} + Z_{\beta})^2 \times p(1-p)}{(d)^2}$$

where, p = pooled proportion obtained from previous study; d = expected difference in proportion of events; $Z_{\alpha/2} = 1.96$ (for 5% level of significance) and $Z_{\beta} = 0.84$ (for 80% power of study). Therefore,

$$n = \frac{2(1.96 + 0.84)^2 \times 0.885(1-0.885)}{(0.121)^2} = 99.5$$

Accordingly, the sample size required is 100.

Tools of data collection

For data collection, two tools were constructed by the researchers after reviewing

related literature: structured self-administered questionnaire and menstrual blood banking attitude assessment scale.

I. Structured self-administered questionnaire

It involved two parts: *A. Demographic data:* This part comprised data regarding student's age, residence, marital status, previous knowledge regarding menstrual blood banking, and if yes, source of knowledge; *B. Pre/post-test regarding menstrual blood banking:* This part concerned with assessment of internship nursing students' knowledge and consisted of fifteen multiple choices questions: 1 question about definition, 2 questions about goals, 2 questions about characteristics of menstrual blood, 1 question about cost of banking, 4 questions about procedure, 3 questions about advantage, and 2 questions about storage of menstrual blood.

Scoring system:

The correct and complete answer received a score of 2, correct but incomplete answer received a score of 1, and incorrect answer or "I do not know" response received a score of 0. The score awarded for each question were summed up to calculate the total knowledge score ranging from 0 to 30. Then, the total knowledge scores were classified into three levels: Poor knowledge (< 15), average knowledge (15 to < 23), and good knowledge (≥ 23).

II. Menstrual blood banking attitude assessment scale

Intended to assess internship nursing students' attitude towards menstrual blood banking. It

consisted of nine statements to which the students were requested to respond on a three-point Likert-scale ranging from (2) agree, (1) neutral, and (0) disagree. Examples of these statements include, I Think it is necessary for everyone to take the advantage of stored stem cells from menstrual blood, The process of collecting stem cells from menstrual blood did not harm me, If the cost is reasonable, I can save it, I will store menstrual blood as a source of stem cells, Menstrual blood stem cells can be used for different purposes, etc.....

Scoring system:

The total attitude was determined by summing up the score of each statement which ranging from 0 to 18. Then, the total attitude score was divided into three categories: negative attitude (< 6), neutral attitude ($6 - < 12$), and positive attitude (≥ 12).

Tools validity and reliability

Five scholarly nursing specialists in the field of maternity nursing were given the tools to test for both face and content validity. Tools contents were validated for its appropriateness, completeness, and clarity. Modifications were implemented in accordance with the experts' recommendations. Cronbach's alpha was used to test the suggested tools' reliability. With a Cronbach's alpha of 0.81, the structured self-administered questionnaire revealed a highly significant positive correlation between its items. For the menstrual blood banking attitude assessment scale, however, the score was 0.79, indicating the tool's acknowledged reliability.

Ethical Considerations

The Menoufia University faculty of Nursing's Scientific Research Ethics Committee granted

ethical permission for this study at 18/1/2023. After that, the significance and goal of the study were explained to the students. The researchers emphasized that involvement in the research is entirely voluntary, and that students are free to leave the study at any time. Students received assurances that the research goal would be the only use of their data. Anonymity and confidentiality were guaranteed through data coding. Written consent was given by students who consented to take part in the study.

Pilot Study

Ten students (10% of the sample) were involved in a pilot study to test the feasibility of the study process, the clarity of the tools, as well as, to determine the required time to complete them. According to the pilot study, the needed modifications in the study tools were performed and those students weren't included in the study's main sample.

Procedure

Over the course of three months, from the beginning of March 2023 to the end of May 2023, data pertinent to this study was collected. The study was carried out through four phases: preparation, assessment, implementation, and evaluation.

Preparation phase: This phase involved an updated review of pertinent literature for the purpose of constructing data collection tools and content outlines of menstrual blood banking. Additionally, an official permission to carry out the study was taken from aforementioned setting's administrative personnel.

Assessment phase: This phase aimed to obtain baseline data about internship nursing students' knowledge and attitude regarding menstrual blood banking. The researchers hold a meeting at one of the faculty classrooms during the orientation period of the internship program and distributed the structured self-administered questionnaire and menstrual blood banking attitude assessment scale to all students and each student completed both tools independently. Each student took about 20-30 minutes to respond to those tools.

Implementation phase: During this phase, students were divided into ten groups, each group is referred to as "jigsaw group" and consisted of 10 students. Next, the content of the topic (menstrual blood banking) was divided into ten outlines and each member of a single jigsaw group was assigned on a specific outline. Each student was asked to search and study her assigned outline within a period of three days. Then, all students who were assigned for the same outline in all the 10 jigsaw groups were collected together in a group called "expert group". In that expert group, each student was requested to share and discuss her acquired knowledge regarding the specific outline with other students in order to exchange their knowledge, clearing their doubts, and improving their understanding. Finally, each student was returned to her original jigsaw group and explain her specific outline to all students in the group in the presence of the researchers. So that, each student in a single jigsaw group was oriented to all outlines.

Evaluation phase: One month following the implementation phase, the evaluation phase was conducted to examine the student's knowledge and attitude regarding menstrual blood banking using structured self-administered questionnaire and menstrual blood banking attitude assessment scale. The tools were completed by each student, and the total scores were calculated and classified by the researchers.

Data analysis

Collected data were organized, coded, and statistically analyzed using an IBM personal computer with the Statistical Package of Social Science (SPSS) version 22 (SPSS, Inc, Chicago, Illinois, USA). Quantitative variables were presented as mean, standard deviation, and range. Whereas, qualitative data were presented as numbers and percentages. Paired t- test was used to compare between two normally distributed quantitative variables. While Wilcoxon test (nonparametric test) was used to compare between two quantitative variables that were not normally distributed. Qualitative variables were compared using Marginal homogeneity test. Spearman's correlation (r) was used for correlating quantitative variables. P- values less than or equal to 0.05 were considered statistically significant and less than 0.01 were considered highly statistically significant.

Results

Study finding reveals that, students' age ranged between 21-24 years with a mean of

22.1±1.3 years, 73.0% of them live in rural areas, and 74.0% of them were single. Additionally, 10.0% of students reported that they have previous knowledge regarding menstrual blood banking, 80.0% of them reported social media as the source of their knowledge (**Table, 1**).

Regarding students' knowledge, the current study finding reveals that, pre-intervention the mean knowledge score was 7.70 ± 2.40 while at post-intervention it was significantly increased to 12.2 ± 2.02 ($p = 0.02$) (**Table, 2**). In relation to knowledge level, **figure (1)** shows that pre-intervention 93.0% of students have poor knowledge level while post-intervention 85.0% of them have good knowledge level and the difference between knowledge levels was highly statistically significant ($p < 0.001$).

Table (3) illustrates that, pre-intervention 90.0% of students have negative attitude regarding menstrual blood banking as compared to 78.0% of them have positive attitude at post-intervention. Moreover, the difference between total attitude at pre- and post-intervention was highly statistically significant ($p < 0.001$).

Table (4) and Figure (2) declares that, there was a statistically significant correlation between total knowledge and attitude regarding menstrual blood banking among students at post-intervention ($p = 0.003$). On the other hand, there was no significant correlation between total knowledge and attitude regarding menstrual blood banking at pre-intervention ($p = 0.511$).

Table (1): Demographic data of the studied sample

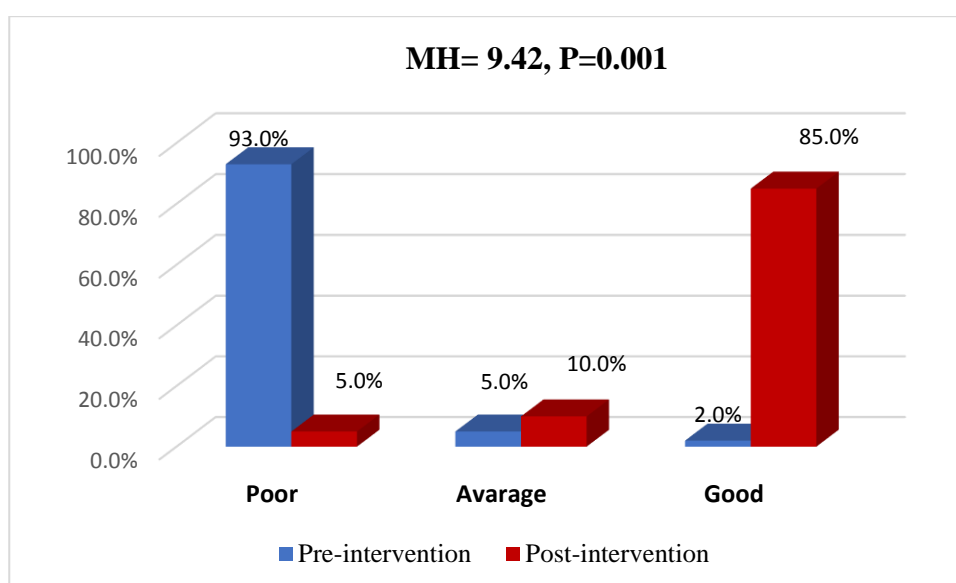
Studied variables	Freq. n=100	%
Age / years		
≤ 22 years	89	89.0
≥ 23 years	11	11.0
Range 21-24 years		
Mean± SD 22.1±1.3		
Residence		
Rural	73	73.0
Urban	27	27.0
Marital status		
Single	74	74.0
Married	26	26.0
Do you have previous knowledge about menstrual blood banking		
Yes	10	10.0
No	90	90.0
Source of knowledge	n=10	
Social media	8	80.0
Physician	2	20.0
Nursing curricula	0	00.0

Table (2): Comparison of students' knowledge regarding menstrual blood banking pre- and post-intervention

Studied variables	Pre-intervention n=100		Post- intervention n=100		Marginal homogeneity test	P-value
	Freq.	%	Freq.	%		
Definition						
Incorrect or do not know	98	98.0	2	2.00	9.72	0.001
Correct but incomplete	1	1.00	9	9.00		
Correct and complete	1	1.00	89	89.0		
Goals						
Incorrect or do not know	95	95.0	1	1.00	9.80	0.001
Correct but incomplete	1	1.00	4	4.00		
Correct and complete	4	4.00	95	95.0		
Characteristics of menstrual blood						
Incorrect or do not know					9.70	0.001
Correct but incomplete	100	100	2	2.00		
Correct and complete	0	0.00	16	16.0		
	0	0.00	82	82.0		
Costs						
Incorrect or do not know	100	100	0	0.00	9.27	0.001
Correct but incomplete	0	0.00	8	8.00		
Correct and complete	0	0.00	92	92.0		
Procedure						
Incorrect or do not know	98	98.0	10	10.0	9.20	0.001
Correct but incomplete	1	1.00	12	12.0		
Correct and complete	1	1.00	78	78.0		
Advantages						
Incorrect or do not know	95	95.0	1	1.00	9.71	0.001
Correct but incomplete	2	2.00	5	5.00		
Correct and complete	3	3.00	94	94.0		
Storage						
Incorrect or do not know	100	100	8	8.00	9.42	0.001
Correct but incomplete	0	0.00	13	13.0		
Correct and complete	0	0.00	79	79.0		
Total knowledge						
Poor	93	93.0	5	5.00	9.42	0.001
Average	5	5.00	10	10.0		
Good	2	2.00	85	85.0		
Mean ±S	7.70±2.40		12.2±2.02		4.24*	0.002

*Comparison using Paired t- test

Figure (1): Comparison of total knowledge levels pre-intervention and post-intervention



MH: Marginal homogeneity test

Table (3): Comparison of students' attitude regarding menstrual blood banking pre- and post-intervention

Studied variables	Pre-intervention n=100		Post-intervention n=100		Test of significance	P-value
	Freq.	%	Freq.	%		
Total attitude					MH	
Positive	6	6.00	78	78.00	9.76	0.001
Negative	90	90.00	15	15.00		
Neutral	4	4.00	7	7.00		
Mean ±SD	18.7±4.00		36.0±6.89		Wilcoxon- test	
					8.58	0.002

Table (4): Correlation between total knowledge and attitude about menstrual blood banking pre and post program

Studied variables	Knowledge			
	Pre-intervention		Post-intervention	
	r	P Value	r	P Value
Attitude	0.237	0.511	0.294	0.003

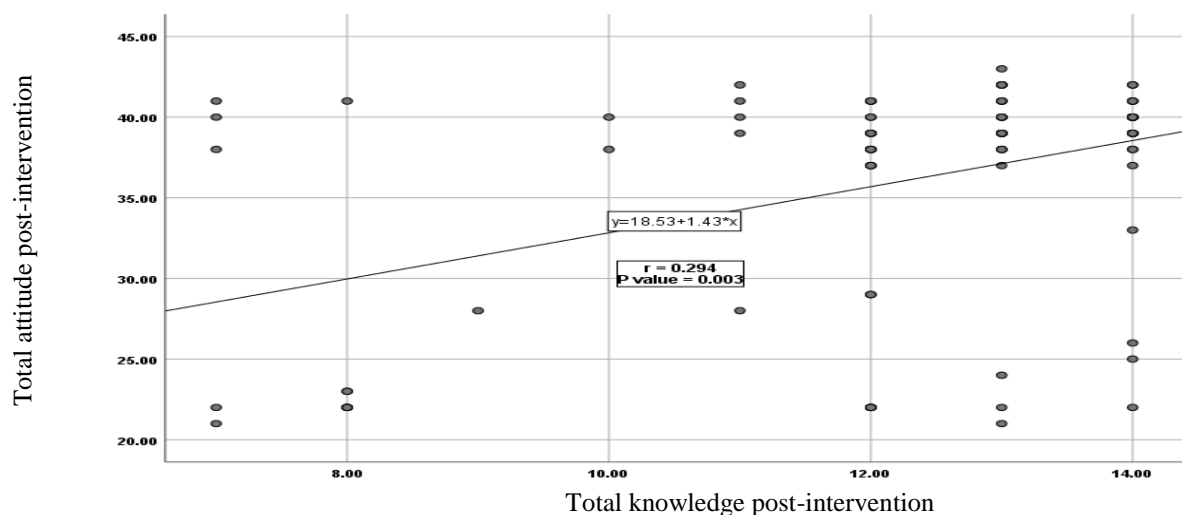


Figure (2): Correlation between total knowledge and attitude about menstrual blood banking post program

Discussion

The main purpose of education for nurses is to improve nursing students' knowledge and abilities to guarantee the high standard of nursing care practice after graduation. This goal would motivate nursing educators to implement advanced teaching and training methods for nursing students (Fawaz et al., 2018). The Jigsaw teaching method is a successful method for delivering the course information in a cooperative learning environment (Susanti & Subekti, 2020). Therefore, the current study was conducted aiming to examine the effect of jigsaw teaching strategy on internship nursing students' health literacy regarding menstrual blood banking.

In relation to student's knowledge regarding menstrual blood banking findings of the present study showed that, pre-intervention the majority of students have poor knowledge level while post-

intervention more than four-fifths of them have good knowledge and the difference between knowledge level was highly statistically significant ($p < 0.001$). The poor knowledge level at pre-intervention assessment is alarming because it could be explained by the absence of this topic in nursing curricula as none of the students reported nursing curricula as the source of their knowledge regarding menstrual blood banking. Therefore, nursing curricula should be updated to include such novel theme. While the improvement of students' knowledge at post-intervention may indicate the effectiveness of Jigsaw teaching strategy as it encourages self- and cooperative learning. So that, the first research hypothesis "Internship nursing students who are subjected to jigsaw teaching strategy will have a higher mean knowledge score regarding menstrual blood banking post-intervention than pre-intervention" was supported.

These findings were supported by numerous studies. The first; a study of Singh et al. (2023)

about" Effectiveness of planned teaching program regarding menstrual blood banking among B.Sc. Nursing fourth year students" in Mehcko college of nursing. The second; a study conducted by **Meena (2022)** about "Effectiveness of structured teaching program on knowledge regarding menstrual blood banking among 3rd year B.Sc., nursing students at selected college, Chinaka ani, Guntur district, Andhra Pradesh". The third; a study by **Manimegalai (2021)** about "Effectiveness of structured teaching program on knowledge regarding menstrual blood banking among nursing students in selected college of nursing at Gonda". All reported that, posttest knowledge score was greater than pretest knowledge score among students.

The current research findings declared that, jigsaw teaching strategy was effective on increasing students' knowledge regarding menstrual blood banking as the difference between mean knowledge score at pre-intervention and post-intervention was statistically significant ($p=0.002$). This finding is corroborated by **Abd ElAliem et al. (2019)** who carried out a research to determine "The effect of the utilization cooperative jigsaw learning strategy on maternity nursing students' attitudes and achievements at faculty of nursing, Benha university". They concluded that students' learning achievement was higher in the jigsaw group compared to the lecture group immediately after intervention and at follow up with highly statistically significant differences.

As for students' attitudes toward menstrual blood banking, the results of the current study indicated a significant improvement in attitude level from the pre- to post-intervention period. While most of students expressed a negative attitude at pre-intervention; however, over three-quarters of them displayed a positive attitude at post-intervention. In actuality, knowledge is one of the important factors that influence human attitude. Therefore, when internship students gain more knowledge after implementation of the proposed intervention, they express a more positive attitude. So that, the second research hypothesis "Internship nursing students who are subjected to Jigsaw teaching strategy will have positive attitude regarding menstrual blood banking post-intervention than pre-intervention" was supported.

These results were corroborated by a study of **Manley et al. (2019)** about "Menstrual blood-derived mesenchymal stem cells: Women's attitudes, willingness, and barriers to donation of menstrual blood" reported that menstrual blood contains mesenchymal stem cells was met with an overall positive response, and most menstruating women were willing to donate menstrual blood. In the same line **Azzazy and Mohamed (2016)** who studied "The effect of educational intervention on knowledge and attitude of nursing students regarding stem cells therapy" at collage of nursing, KSAU-HS, Riyadh, Kingdome of Saudi Arabia and reported that the majority of research participants showed a positive attitude in the post-test toward stem cell therapy and the intervention

was successful in raising future nurse's awareness and attitude toward stem cells therapy.

In relation to the effectiveness of jigsaw teaching strategy on attitude of internship nursing student regarding menstrual blood banking, there was a highly statistically significant difference between total attitude pre and post-intervention. It has been improved post intervention than pre intervention. This finding is supported by a study about "Cognitive and attitudinal effects of jigsaw technique as a collaborative learning strategy in literature teaching in the Philippines" by **Charernnit et al. (2021)** who reported that, using the jigsaw method in teaching improved students' attitudes about group learning as well as their academic performance. They added that students who have had greater academic preparation may probably gain more from collaborative learning. In the same line, **Solehati and Kosasih (2020)** conducted a study about "Effect of jigsaw technique on the education of menstrual self-care behavior to female adolescents" and stated that the jigsaw technique might be used to enhance teenage behavior. As well as, the jigsaw approach might be useful for improving female adolescents' knowledge, attitudes, and behaviors related to menstrual self-care.

Conclusion

The results of the current study declared that, implementing jigsaw teaching strategy was effective in improving internship nursing students' health literacy regarding menstrual blood banking.

Recommendations

The results of this research suggest the following recommendations:

- Employ jigsaw teaching strategy in all academic nursing courses as a complement to the standard teaching strategies.
- Indorse menstrual blood banking in Nursing syllabus.
- Replication of the current study on a larger probability sample and in other settings is necessary.

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