

Original Research Article

Knowledge, attitude and practice related to menstrual blood-derived mesenchymal stem cells donation among female students and faculties in a tertiary care hospital

Nikila Radhakrishnan Suguna¹, Vishaalpalaniswamy Ramaswamy^{1*}, Siva Iyyappan¹,
Narmada Ravindran¹, Umamaheswari Ramasamy², Pradeepa M. Haribaskar²

¹Institute of Obstetrics and Gynecology, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai, Tamil Nadu, India

²Institute of Community Medicine, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai, Tamil Nadu, India

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*Correspondence:

Dr. Vishaalpalaniswamy Ramaswamy,

E-mail: drvishaalpalaniswamy08@gmail.com

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ABSTRACT

Background: Mesenchymal stem cells (MSCs) are multipotent progenitor cells that play a significant role in regenerative medicine and tissue repair. Menstrual blood, similar to umbilical cord blood and bone marrow, is a rich, renewable, and non-invasive source of MSCs. Menstrual blood-derived mesenchymal stem cells (MenSCs) have shown promising potential in the treatment of various degenerative, inflammatory, and autoimmune conditions. Therefore, this study was conducted to assess the knowledge, attitude, and practice regarding menstrual blood donation and MenSCs among female students and faculty in a tertiary care hospital.

Methods: A cross-sectional study was conducted during the period of January 2026 to July 2026 in Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai, among 197 female medical students and faculty chosen by convenience sampling. Data were collected using a self-administered semi-structured questionnaire.

Results: Out of 197 participants, 49.2% of participants had good knowledge, 61.4% had a good attitude, and only 1% of the participants had donated menstrual blood.

Conclusions: This research revealed that both female students and faculty possessed limited knowledge and engaged in less-than-ideal practices regarding MenSCs, even though they generally held a positive view towards donating MenSCs. These results underscore a notable gap between knowledge and practice, necessitating focused educational efforts.

Keywords: Mesenchymal stem-derived menstrual blood donation, Female medical graduates, Mesenchymal stem cells

INTRODUCTION

Stem cells are undifferentiated cells characterized by their capacity for prolonged self-renewal and their ability to develop into specialized cell types.¹ Among these, mesenchymal stem cells (MSCs) are multipotent cells that have attracted considerable attention due to their therapeutic potential in a wide range of diseases and medical conditions.² MSCs have been successfully

isolated from several tissues, including bone marrow, adipose tissue, synovial membrane, and dental pulp.³ Bone marrow was the first identified source of MSCs, with their isolation dating back to 1957.⁴ However, obtaining these cells from bone marrow involves invasive and often painful procedures.⁵ In 2004, Chan and colleagues reported the presence of mesenchymal-like cells within the human endometrium, comprising approximately 1% of the total endometrial cell population.⁶ Patel et al demonstrated

that menstrual blood serves as a non-invasive and readily accessible source of these endometrial-derived mesenchymal stem cells.⁷ These cells possess the ability to differentiate into multiple cell types representing all three germ layers.

Further studies have highlighted the advantages of menstrual blood-derived mesenchymal stem cells (MenSCs).⁸ In 2013, Rossignoli and co-workers reported that MenSCs exhibit a faster proliferation rate and greater clonogenic potential compared to MSCs obtained from other sources.⁹ Autologous transplantation of MenSCs has demonstrated beneficial outcomes in women diagnosed with Asherman's syndrome and type 1 diabetes, liver cirrhosis, and acute lung injury.¹⁰ Their regenerative capacity is largely attributed to their secretome, particularly extracellular vesicles (EVs), which play a crucial role in intercellular communication.^{11,12} Recent studies have demonstrated that extracellular vesicles derived from MenSCs can stimulate chondrocyte activity and enhance cartilage extracellular matrix synthesis in vitro, indicating their promise in cartilage repair and regeneration. The discovery of stem cells in menstrual blood will give new perceptions by highlighting its biomedical value. Due to their easy accessibility and regenerative capacity, MenSCs are considered as a promising resource for future therapeutic strategies, including the possibility of standardized "off-the-shelf" treatments.¹³⁻¹⁵ Despite these advantages, there remains limited research on women's awareness, perceptions, and willingness to donate menstrual blood for medical purposes. Therefore, it is interesting to assess the knowledge, attitudes, and practices related to menstrual blood-derived mesenchymal stem cell donation among female students and faculty members in a tertiary care hospital.

Aim and objective

The main aim of this study was to evaluate the knowledge, attitude and practice of menstrual blood-derived mesenchymal stem cell donation among the female students and faculty in a tertiary care hospital.

METHODS

A cross-sectional study was conducted among the female MBBS under graduate from first year to final year, post graduate students and faculties of any specialty of Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai during the period of January to July 2026 after getting approval from ethics committee in Madras Medical College and Rajiv Gandhi Government General Hospital. Participants with a history of hysterectomy or congenital absence of uterus and post-menopausal women were excluded from this study. A sample size of 197 was calculated based on the previous study done by Kaur et al by using a prevalence of adequate knowledge regarding MenSCs of 49%, with relative precision kept as 12%, and 10% non-response rate.¹⁶ The

study participants were informed about the study purpose, and those who were willing to participate provided informed consent. Study participants were selected using convenience sampling techniques.

Data were collected using a self-administered semi-structured questionnaire from participants. Data were entered in Excel, and statistical analysis was done using JAMOV software version 26. Descriptive statistics regarding knowledge, attitude and practice were expressed as percentages. Knowledge scores above the mean value were considered to have good knowledge about MenSCs donation. Attitude scores above the mean value were considered a good attitude regarding MenSCs donation. The association between knowledge and attitude regarding menstrual blood-derived mesenchymal donation was analyzed using odds ratio (OR).

RESULTS

A total of 197 participants were included in this study. 152 participants (77.2%) were aged 17-29 years, while 45 (22.8%) were aged ≥ 30 years. The overall mean age of the participants was 23.6 ± 7.1 years. Based on professional status, 113 (57.4%) were undergraduates, 84 (42.6%) were postgraduates and faculty (Table 1).

Among the under graduates, 34 (26.2%) were first year students with a mean age of 18.2 ± 0.64 years, 44 (33%) were second year students with a mean age of 19.3 ± 0.76 years, 27 (20.8%) were third year students with a mean age of 19.9 ± 0.68 years, 25 (19.2%) were fourth year students with a mean age of 21.4 ± 1.00 years. The postgraduates had a mean age of 29.3 ± 4.38 years, while faculty members (Assistant Professors and Professors) had a mean age of 43.4 ± 3.32 years.

Table 1 shows the demographic data of the participants.

Table 2 depicts that 86.3% of the participants were unaware that menstrual blood can be donated, 69% don't know MenSCs exist, and social media (8.1%) plays a major role in getting knowledge regarding MenSCs. Only 24.9% of the participants knew about the usage of MenSCs in regenerative medicine, and around 27.9% of the participants had knowledge about MenSCs banks in India.

Table 3 reveals that 80.2% of the participants supported the notion of menstrual blood donation and 91.4% felt that more awareness is needed regarding MenSCs. Also, 85.8% of the participants wanted this topic to be included in the medical course curriculum. 70.1% of the participants felt that society will accept MenSCs in practice, and 80.2% want more menstrual blood banks to be established in India.

Figure 1 depicts that only 1% of participants had donated menstrual blood prior to the study.

Table 4 reveals that the participants in the good knowledge group have 2.5 times higher odds of a positive attitude

towards menstrual blood-derived mesenchymal stem cell donation than those with poor knowledge.

Table 1: Demographic data of the participants of the study.

Characteristics	Variable	Frequency (n=197)	Percentage
Age (in years)	18-29	152	77.2
	≥30	45	22.8
Gender	Female	197	100
Professional status	Under graduate	113	57.4
	Post graduate and faculty	84	42.6

Table 2: Knowledge of the participants regarding menstrual blood-derived mesenchymal stem cell donation. (n=197).

Q. no.	Category	Variable	Frequency	Percentage (%)
1	Menstrual stem cell derivation	Aware	61	31
		Not aware	136	69
2	Menstrual blood donation	Aware	27	13.7
		Not aware	170	86.3
3	Source of information	Social media	16	8.1
		Academic events	8	4.1
		Others	3	1.5
4	Applications in regenerative medicine	Aware	49	24.9
		Not aware	148	75.1
5	Menstrual stem cell banks	Aware	55	27.9
		Not aware	142	72.1

Table 3: Attitude of the participants regarding menstrual blood-derived mesenchymal stem cell donation (n=197).

Q. no.	Questions	Variable	Frequency	Percentage (%)
1	Supporting menstrual blood donation	Yes	158	80.2
		No	39	19.8
2	Necessity to promote awareness	Yes	180	91.4
		No	17	8.6
3	Inclusion in curriculum	Yes	169	85.8
		No	28	14.2
4	Social acceptance of treatment derived from MenSCs	Yes	138	70.1
		No	59	29.9
5	Health concerns on MenSCs donation	Yes	25	12.7
		No	172	87.3
6	Establishment of menstrual blood-derived stem cell banks	Yes	158	80.2
		No	39	19.8
7	Willingness for donation	Willing	136	69
		Not willing	61	31
8	Acceptance of treatment from menstrual stem cells	Yes	153	77.7
		No	44	22.3

Table 4: Association between knowledge and attitude regarding menstrual blood-derived mesenchymal stem cell donation.

Characteristics	Variable	Attitude	OR* with confidence interval	P value
Knowledge	Good	69 (71.1)	2.56 (1.42-4.62)	0.002
	Poor	49 (49)		

*OR – odds ratio

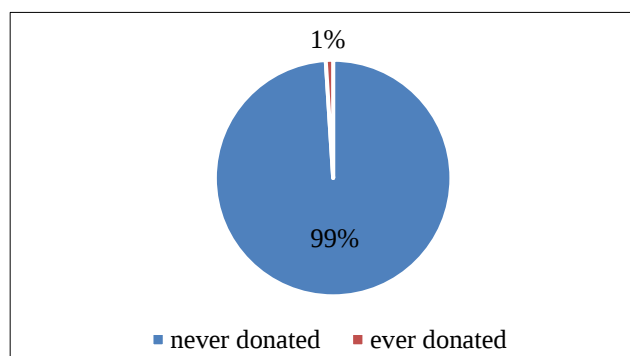


Figure 1: Practice regarding menstrual blood-derived mesenchymal stem cell donation (n=197).

DISCUSSION

This study evaluated the knowledge of female students and faculty members of Madras Medical College about menstrual blood-derived mesenchymal stem cells. In this study, less than half of the participants, around 49.2% of participants, had prior knowledge about its existence. A similar study was done among female healthcare workers all over the country by Kaur et al, in which 33.7% of them had good knowledge about the existence of menstrual blood-derived stem cells.¹⁶ The reason for this difference is that only medical students were included in this study, whereas female health care workers (medical students, paramedical students, health care workers) were included in that study.

Around 13.7% of participants had known that menstrual blood can be donated through social media (8.1%), academic events (4.1%), others (1.5%). In comparison with previous study done by Kaur et al, reported that 33.7% participants had prior knowledge about menstrual blood donation through social media (29.2%), educational courses (50.6%).¹⁶ Due to large sample size, there is major difference noted in that previous study compared to this study.

In this study, 24.9% of the participants were aware of its applications in regenerative medicine. This highlights the need for dedicated efforts to improve awareness and promote its use in the coming years. Also, 27.9% were aware of menstrual blood stem cell banks, indicating a need to improve public knowledge in this area. Awareness programs and educational initiatives can help people better understand MenSCs.

In our study, 61.4% of participants reflected a positive attitude towards the therapeutic and research potential of menstrual blood-derived stem cells. Similar findings were reported by Manley et al, where approximately 78% of women expressed willingness to donate menstrual blood for stem cell-based applications.² The growing acceptance may be attributed to the non-invasive, painless, repeatable, and ethically less controversial nature of MenSCs, thereby improving acceptability among potential donors.¹⁷⁻²²

Around 91.4% of participants in the present study strongly favoured increasing awareness regarding menstrual blood-derived mesenchymal stem cells. 85.8% of participants supported inclusion of menstrual blood donation concepts within the medical curriculum. Educational exposure may improve scientific acceptance and encourage future research participation. About 29.9% of respondents believe that society would accept menstrual blood-derived stem cells in clinical practice. This reflects the need to increase confidence of the public in stem cell-based therapies by advocating the promising regenerative capabilities of MenSCs in neurological, cardiovascular, reproductive, and inflammatory disorders, further supporting optimism regarding future clinical applications.^{23,24} An important observation from the study was that 12.7% of participants expressed concern regarding possible effects on menstrual health due to menstrual blood donation. This concern is understandable considering limited public knowledge about the procedure.

The majority of participants (80.2%) supported the establishment of more menstrual blood banks in India. The creation of menstrual blood banks may significantly contribute to regenerative medicine research by ensuring systematic collection, preservation, and utilization of MenSCs.²² Around 69 % of participants expressed willingness to donate menstrual blood if a standardized, safe, and ethical collection system were available. Previous studies have similarly shown that women are more likely to donate menstrual blood when assured regarding safety, privacy, and clinical utility.²² Furthermore, the acceptance of MenSC-based therapy shown by 77% of participants in this study reflects growing public confidence in stem cell-based interventions. Overall, the findings of the present study indicate a positive attitude toward menstrual blood donation and MenSC applications.

Out of 197 participants, only 1% (2 participants-1 UG and 1 PG) had previously donated menstrual blood for research purposes. 5% of participants donated menstrual blood for research purposes in the study conducted by Kaur et al.¹⁶ This shows a lack of awareness regarding MenSC. Improving scientific literacy and public engagement may help enhance acceptance and utilization of menstrual blood-derived stem cells in future therapeutic practice.¹⁷

Limitations

Focusing on one particular profession is not enough to understand the truth regarding MenSCs, so an extensive study should be conducted in the community to give the real picture of MenSCs because menstrual blood is considered dirty blood in our community.

CONCLUSION

This research revealed that both female students and faculty possessed limited knowledge and engaged in less-than-ideal practices regarding MenSCs, even though they

generally held a positive view towards donating MenSCs. These results underscore a notable gap between knowledge and practice, necessitating focused educational efforts. Incorporating MenSC-related topics into the medical curriculum, alongside organised awareness and sensitisation initiatives, could enhance comprehension and encourage informed donation behaviours. Additionally, broadening research on the collection, preservation, storage, and therapeutic uses of MenSCs is crucial to bolster the evidence base, dispel existing misconceptions about menstruation, and support the integration of this promising regenerative resource into clinical settings, ultimately advancing scientific progress and public health.

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