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Menstruation, Hygiene Practice and Menstrual Distress in Female Undergraduate Students

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ABSTRACT

Background: Currently, there is no up-to-date survey on actual menstruation, including recent changes in the amount of menstrual blood loss in women as the age of the first menstruation decreases in Japan. Also, few study has examined whether temperature in clothing reflecting with basal body temperature and other factors are related to menstruation-associated symptoms.
Purpose: The study aimed to determine the actual menstruation, the change in the number of sanitary napkins and menstrual distress during one menstrual cycle, and the predictive factors of menstrual distress.
Methods: The samples were eight university students over the age of 20. This study was conducted from the end of June to the end of September 2020. They were asked to undertake the following: menstrual cycle, length of menstruation; the amount of menstrual blood loss; changing sanitary napkins; the Japanese version of the Menstrual Distress Questionnaire (J-MDQ). The J-MDQ consists of 47 questions answered on a scale of 0 to 3, with a higher score indicating more severe menstruation-related symptoms, within a week before, during and a week after menstruation. Multiple liner regression and Friedman test were conducted as statistical analysis.
Results: The volume of menstrual blood loss increased drastically on the second day of the menstruation, and rapidly decreased from the third day. Napkin changing was also most frequent on the second day, however there is no correlation between the volume of menstrual blood and the number of times changing sanitary napkins after the second day of menstruation. The total J-MDQ during menstruation was significantly higher than pre and after menstruation ($P<0.05$). The duration of blood flow were associated with J-MDQ.
Conclusions: Appropriate changing sanitary napkins needs to be recommended to improve for vulvar hygiene. The menstrual distress was highest during menstruation.

Keywords: menstrual distress questionnaire (MDQ); menstrual blood loss; menstrual cycles; napkin changing.

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BACKGROUND

Recent research on menstruation in women in Japan has focused on the various physical and affective symptoms associated with menstruation (Kato S, Higashino T, 2020; Miyazaki & Tsukamoto, 2019; Momoko, 2018, 2020). Internationally also, there has been an increased interest in research on the premenstrual syndrome (Rad et al., 2018), menstrual difficulties (Chang et al., 2018), and their treatment (Geethanjali et al., 2020b, 2020a). For example, there is a report of menstrual symptoms being reduced by prescribing herbal medicines that are effective against the sensitivity to cold, suggesting a possible association between dysmenorrhoea and cold sensitivity (Hirabayashi, 2020).

According to the Ministry of Health, Labor and Welfare in Japan (2016), the prevalence of menstrual cycle irregularities and pain was approximately 17.0 (per 1,000 population), with women in their twenties accounting for the majority of cases. Thus, research into the symptoms and treatment of menstrual distress in women have been conducted worldwide, including in Japan. The most common causes of suffering from menstrual symptoms are, such as uterine fibroids (Hervé et al., 2018) adenomyosis (Leung & Lin, 2019) and endometriosis (Ball et al., 2016) as functional causes, such as excessive secretion of prostaglandins, which causes the uterus to contract in order to expel menstrual blood (Kulkarni, A., & Deb, 2019) or a narrow cervix (Bernardi et al., 2017)as organism causes. However, the cause of the symptoms of menstrual distress is often unclear. In Japan, while there have been a number of studies on the symptoms associated with menstruation, there have been only a few investigations into the actual condition during menstruation (Tabuchi Y, Yoshidome A, Ban N, 2014). During the past half-century, there has been an acceleration in the development of adolescent girls, with a remarkable increase in height and weight, but a younger age at first menstruation (Hinobayashi et al., 2013a). There is no up-to-date survey on actual menstruation, including recent changes in the amount of menstrual blood loss in women as the age of the first menstruation decreases. There are also no up-to-date reports on the self-care behaviours associated with menstruation, such as the frequency of changing sanitary napkins as the amount of menstrual blood changes. Therefore, in this study, we conducted a survey of actual conditions and hygiene practice behaviour during menstruation and used the resulting data to identify factors that are predictors of the suffering of menstrual symptoms.

OBJECTIVE

The study aimed to determine the actual menstruation, the change in the number of sanitary napkins and menstrual distress during one menstrual cycle, and the predictive factors of menstrual distress.

METHODS

Research Design

This study is an analytical observational and cross-sectional investigation of menstruation and the attitude of a university students during their menstrual cycle.

Sample

In this study, we focused on women in their twenties and included eight female university nursing students over the age of 20. As inclusion criteria, all subjects were required to be healthy, to have a stable menstrual cycle or to have had a menstrual period within the last three months, and to report when they took any medication, if they were using it. As an exclusion criteria, menstruation was to have not a menstrual period within the last three months.

Study period

This study was conducted from the end of June to the end of September 2020.

Data collection and procedure

The research subjects were recruited by pinning a poster onto the student notice board at a university to explain the purpose, significance, and methods of the study. The subjects were asked to complete questionnaires related to the measurement of temperature in clothing, menstrual blood loss volume, and menstruation-associated symptoms for three menstrual groups: before menstruation; during menstruation; and one week after menstruation.

The subjects who voluntarily consented to participate in the study were asked to undertake the following: ; (1) measure the amount of menstrual blood loss; (2) answer basic questions on age, age at first menstruation, cold sensitivity, Body Mass Index (BMI), regularity of the menstrual cycle, and the use of medications with menstrual pain; (3) the Japanese version of the Menstrual Distress Questionnaire (J-MDQ) (Akiyama A, 1979) . The J-MDQ was asked to be completed at each of the following time points: within one week before menstruation, during menstruation, and within one week after menstruation. It consisted of responses to each question on a 4-point Likert scale (0-3); high scores indicated severe menstruation-associated symptoms.

Each subject was handed a portable digital scale capable of measuring 0.01 g increments to measure the amount of menstrual blood loss. They were asked to weigh the sanitary napkins before using them, the weight of the sanitary napkin at the time of change, and subtract the former from the latter to calculate the amount of menstrual blood lost each time.

Ethical Considerations

This study was conducted in compliance with the ethical considerations described in the Declaration of Helsinki and the ethical guidelines for medical research involving human subjects. The subjects who voluntarily consented to participate in the study. It was approved by the Kagawa Prefectural University of Health Sciences Ethical Committee. (No. 316).

Analysis Method

Statistical analysis was performed using EZ (Kanda, 2013) and SPSS (ver. 24.0) for Windows. Descriptive statistics were calculated for all data. Spearman's rank correlation coefficients were determined for the relationship between each volume of blood lost and the frequency of changing sanitary napkins during menstruation from day 1 to day 6. The total score of the 47 items of the J-MDQ was calculated at each of the following menstrual phases: Pre-M, During-M, and After-M. The sub-disciplines of the J-MDQ were as follows: 'I. Pain', 'II. Concentration', 'III. Behavioural changes', 'IV. Autonomic ataxia', 'V. Water retention', 'VI. Negative emotions', 'VII. Mood elevation', and 'VIII. Control'. The total score was calculated for each of the eight domains. Friedman test and Bonferroni multiple comparisons were performed using the MDQ score of the three groups (Pre-M, During-M, and After-M). A multiple regression analysis was conducted at the time of the most elevated J-MDQ in the three groups. The dependent variable was the total J-MDQ score and the independent variables were menstrual blood loss, the menstrual cycle, and the duration of flow. The significance level was 5%.

RESULTS

Demographics of the subjects and basic information on menstruation

A summary of the characteristics of the subjects is presented in Table1. All the participants were in their third year of university, and there were no under- or over-weight individuals based on BMI. The mean ± standard error (SE) for age at first menstruation was 12.12 ± 0.09 years. The 95% confidence interval for age at menarche was 11.08-12.92 years. The menstrual cycle was to be regular if it fluctuated within ± 6 days in the range of 25–38 days. The usual menstrual cycle was regular in five (62.5%) and irregular

in three (32.5%) individuals. The menstrual cycles observed during the present study period ranged from 2 to 3 cycles, with an interval of 32.14 ± 0.18 (mean ± SE) days, a minimum of 30 days, and a maximum of 37 days. There were seven participants with a regular menstrual cycle and one participant with irregularity. The duration of flow was 4.64 ± 0.14 days (mean ± SE), with a minimum of two days and a maximum of seven days. The total menstrual blood loss volume was 87.40 ± 10.19 g (mean ± SE), with a maximum of 422.5 g and a minimum of 32.59 g. The volume of menstrual blood and the frequency of changing sanitary napkins during menstruation are illustrated in Figure 1. The volume of menstrual blood loss increased drastically to 44.47 ± 5.74 (mean ± SE) g on the second day of the menstruation, and rapidly decreased from the third day. The frequency of changing the sanitary napkin increased to 3.94 ± 0.16 (mean ± SE) times on the second day of menstruation, when the volume of menstrual blood loss was the highest, and gradually decreased thereafter. The correlation between the volume of menstrual blood loss and the frequency of changing sanitary napkins is presented in Table 2.

Table 1. Study subjects

Subjects	Age	Cold sensitivity	Age at first menstruation	BMI kg/m2	menstrual cycles(day)			Duration of blood flow (Day)			Total volume of menstrual blood loss (g)		
A	21	No	13	19.30	30	30	30	7	6	5	56.45	49.85	62.66
B	21	Yes	12	19.35	>79*								
C	21	No	10	19.00	32	32		5	5		337.00	422.5	
D	21	No	12	20.40	37	32	32	6	5	6	35.25	49.17	42.48
E	21	Yes	13	19.00	30	30	30	3	3	2	52.91	60.59	53.30
F	21	No	13	19.40	34	34		5	4		67.22	53.07	
G	21	No	12	21.00	31	31		6	5		58.81	32.59	
H	22	Yes	12	20.40	36	32		3	3	4	53.64	36.61	49.04
Mean	21.13		12.13	19.73	32.14			4.64			87.40		
SE	0.03		0.09	0.07	0.18			0.14			10.19		

SE: Standard Error In one case, menstruation was reported for two to three cycles.
*No menstruation was reported during the study period.
Seven participants (87.5%) had normal menstrual cycle and one (12.5%) had irregular menstrual cycle.
The 95% confidence interval for age at first menstruation was 11.08-12.92 Years.

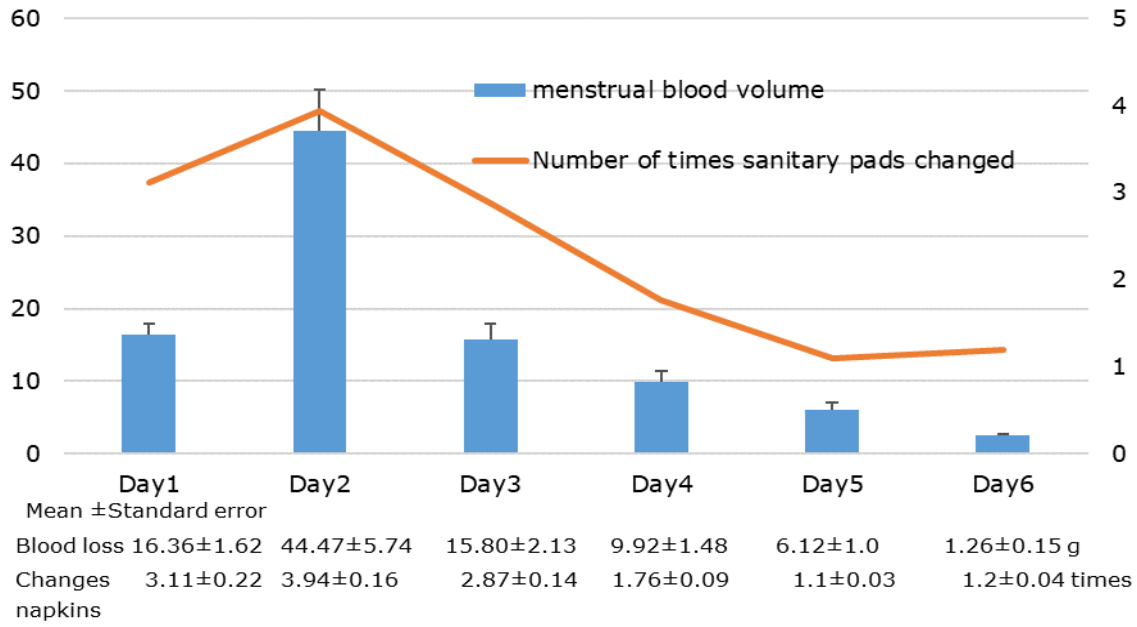

Figure 1 Changes in menstrual blood volume and the frequency of changing sanitary napkins

One case that reported the amount of menstrual blood loss on the seventh day (0.14g) was deleted. The numbers indicate the mean and standard error of the menstrual blood loss volume and the frequency of sanitary napkin changes.

Table 2. Correlation between the menstrual blood loss and the frequency of changing sanitary napkins

Menstruation day	ρ	P Value
Day1	0.69	0.00**
Day2	0.38	0.12
Day3	0.35	0.17
Day4	0.54	0.06
Day5	0.06	0.87
Day6	-0.35	0.56

One case that reported the amount of menstrual blood loss on day 7(0.14g) was deleted for the statistical analysis because it did not report the frequency of sanitary napkin changes.
Spearman's correlation coefficient was calculated for the two factors: the volume of menstrual blood loss; the frequency of changing sanitary napkins. The significance level was 5%,**P<0.01

Changes in the J-MDQ score

The total J-MDQ score was significantly different among the three menstrual groups (χ^2=19.507, P=0.000), and the sub-concepts of the J-MDQ score were significantly different, except VII (mood elevation). I (pain), III (behavioural changes), and IV (autonomic reaction) were significantly higher during menstruation than before or after (I: χ^2=18.969, P=0.000; III: χ^2=11.433, P=0.003; IV: χ^2=11. 722, P=0.000). Particularly, I (pain) and IV (autonomic reaction) were the highest during menstruation.

Table 3. Comparison of pre-menstruation, during menstruation and post-menstruation MDQ scores

MDQ sub-concepts	Menstruation			
	Pre 1 week	During	After 1 week	P Value
MDQI Pain	4.44±1.01	6.72±1.23	2.72±0.87	0.000**
MDQII Concentration	4.39±1.08	4.39±1.08	1.50±0.57	0.000**
MDQIII Behavioural Changes	5.83±1.10	6.00±1.23	2.78±0.92	0.003**
MDQIV Autonomic reaction	0.94±0.34	2.78±0.84	0.56±0.33	0.003**
MDQV Water retention	4.78±0.74	3.83±0.64	1.33±0.39	0.000**
MDQVI Negative feelings	6.11±1.54	5.56±1.61	2.44±1.10	0.000**
MDQVII Mood uplift	0.44±0.20	0.61±0.23	0.89±0.40	0.738
MDQVIII Control	1.44±0.39	1.11±0.43	0.50±0.25	0.002**
Total MDQ score	28.79±5.49	31.17±6.41	12.72±4.37	0.000**

SE: Standard Error
MDQ: the Menstrual Distress Questionnaire. The number I-VIII show sub-concepts of MDQ
The comparison of the three groups (Pre menstruation; During menstruation; After menstruation) was conducted using the Friedman test and Bonferroni test for multi-comparison.
The significance level was 5%,**P<0.01

The MDQ's II (Concentration), V (Water retention), and VI (negative feelings) significantly decreased after menstruation compared with before and during menstruation (II: χ^2=18.145, P=0.000; V: χ^2=21.294, P=0.000; VI: χ^2=19. 111, P=0.000). V (Water retention), VI (negative feelings) and VIII (Control) were the highest in the premenstrual period (Table 3).

Correlation between the temperature in clothing and the J-MDQ

A multiple regression analysis (Stepwise) was conducted using the During-M J-MDQ, which had the highest total J-MDQ, as the dependent variable, and the cold sensitivity, menstrual cycle, duration, and menstrual blood loss as independent variables. Multiple regression analysis showed that the duration (β = 1.039, P =0.041) were predictive factors for J-MDQ (Table 4).

Table 4. Predictive factors for MDQ scores during menstruation

	β	P Value
Cold sensitivity	0.812	0.107
Blood loss	0.383	0.857
Frequency of changing napkins	-0.115	0.653
Duration of blood flow	1.039	0.041*
Menstrual cycle	0.145	0.5937

Multiple R-squared: 0.603, Adjusted R-squared: 0.363 *P<0.05
β: standardized partial regression coefficients.
Multiple regression analysis was conducted with MDQ score as the dependent variable and menstrual cycle, menstrual blood loss, duration of blood flow bleeding, and cold sensitivity as independent variables.

DISCUSSION

Menstruation in Female university students

The mean age at first menstruation among the subjects of this study was 12.12 ± 0.09 years. (Mesaki NSigemitsu SInaba J, 1986) reported, more than 30 years ago, that the age at first menstruation for female university students was 12.8 ±1.1 years, which is almost the same as that found in the present study. (Hinobayashi et al., 2013b) reported that the age at first menstruation declined from 13 years and 2.6 months in 1961 to 12 years and 2.3 months in 2011, and over the last half century, the age at first menstruation has certainly been lowering in Japan.

Seven of the subjects (87.5%) had regular menstrual cycles at 32.14 ± 0.18 (mean ± SE) days. One of the subjects (12.5%) had irregular menstrual cycles, although her BMI was 19.35 and she was not underweight, both of which can potentially contribute to abnormal menstrual cycles. The mean age of the subjects was 21.12 ± 0.03 (mean ± SE) years, and nine years had passed since their first menstruation, which is the stage when the menstrual cycle stabilizes. According to recent study among female college students in Japan, irregular menstrual cycles have been reported to be 24.5% 9 and 43.6% (Kondo et al., 2019). In a study conducted 10 years ago, abnormal menstrual cycles were reported to be 12.1% (Sato, 2010), while a study conducted more than 30 years ago reported that normal menstrual cycles were only 66.9% (general students) and 54.5% (athletic students). Although various factors, such as stress, weight loss, and exercise (Ferin, 1999) , have been reported to influence the menstrual cycle, it is expected to change depending on the physical and mental condition of the subject at the time and place of the survey, rather than being influenced by lifestyle changes over time.

In this study, the duration of blood flow was 4.64 ± 0.14 days (mean ± SE), and the

total volume of menstrual blood was 87.40 ± 0.19 g (mean ± SE). Although there are a few reports on the actual measurement of menstrual blood volume in Japan, the results are almost the same as the total menstrual blood loss volume of 82.5 ± 60 g reported more than 30 years ago (Kayashima K, Maehara S, 1989). However, the duration of blood flow in this study was shorter than the 5.6 ± 1.1 days reported by (Akiyama A, 1979) indicating a decrease in the duration. In the present study, the volume of menstrual blood loss was 16.36 ± 1.62 (mean ± SE) g on day 1, highest on day 2, with 44.47 ± 5.74 (mean ± SE) g, and decreased to 15.80 ± 2.13 g on day 3. It has been reported that 92% of the total amount of blood is discharged in the first three days (Goldfeld & Hayes, 2012); in this study, approximately 90% of the total amount was discharged in the first three days.

The highest frequency of changing the sanitary napkin, 3.94 ±0.16 times, was found on the second day, when the amount of menstrual blood loss was the highest. Compared to a recent survey of junior high school girls in Manila, Philippines, in which only 0.6% of the girls (Katsuno et al., 2019) answered that they changed their sanitary napkins four or more times, the frequency of sanitary napkin changes in the present study seems to be hygienic. However, if the number of changes is approximately four in 24 h, it is only about one change every 6 h, which is not enough to maintain for vulvar hygiene. Furthermore, after the second day of menstruation, there was no correlation between the amount of menstrual blood and the number of times the sanitary napkins were changed, indicating that women did not change their sanitary napkins appropriately even when the amount of menstrual blood increased. Further investigation is needed to determine the rationale behind this low frequency. (Sato M, Kojima M, Toyoshima Y, 2006) reported that skin irritation caused by wearing sanitary napkins has remained a problem since the launch of sanitary napkins in 1961. the comfort of wearing sanitary napkins has improved and women may no longer feel the need to change their sanitary napkins as frequently, or they may be financially disadvantaged or unable to purchase sanitary products (Nito, 2019). The frequency of changing the sanitary napkin, menstrual restrictions, and dysmenorrhea have also reportedly been associated with menstrual knowledge, attitudes, and practices (Zhou et al., 2020). Regardless, it is essential for female university students to be informed about the importance of valvar hygienic sanitary napkin changing. Women who reused menstrual products were significantly associated with a high incidence of urogenital infections (Das et al., 2015; Salam et al., 2016). To prevent those infections, menstrual education needs to include specific frequency of changing sanitary napkins.

Menstrual discomfort symptoms and relevant factors

The total J-MDQ in this study was the highest during menstruation at 31.17 ± 6.41 (mean ± standard error) and decreased to 12.72 ± 4.37 after menstruation, in agreement with the results of Suzuki et al., (2018) 's study which has been suggested that the symptoms increased during menstruation and decreased promptly after menstruation. In the present study, all J-MDQ sub-concepts, except VII (mood elevation), showed significant differences among the three groups (Pre-M, During-M, and After-M). During menstruation, the J-MDQ sub-concepts I (Pain), and IV (Autonomic reaction) were significantly higher. Menstrual pain, for example, has been attributed to increased uterine activity as a result of increased production of prostaglandins and leukotrienes, although the pathological process is not completely clarified (Kulkarni, A., & Deb, 2019). Healthy and practical information for young women is needed for menstruation, because women are afraid that such suffering from menstruation could mean serious illness (Omidvar et al., 2018; Rubinsky et al., 2020). Educating women about the fact that behavioural changes are strongly associated with menstruation will make them feel more comfortable.

In addition, V (Water retention), VI (negative feelings) were higher before menstruation than after menstruation. Approximately two weeks before menstruation, a variety of physical and psychological symptoms emerge, which have the potential to negatively affect the quality of life (Durand et al., 2021). Health education for self-care

behaviour is, therefore, needed as an intervention to maintain the quality of life due to the stress of menstruation-associated symptoms (Anikwe et al., 2020).

The predictive factors for MDQ were examined: cold sensitivity, menstrual cycle, duration of menstruation, amount of menstrual blood and menstrual hygiene practices, and the duration of menstruation was associated with the MDQ. An Ethiopian study also found that the duration of menstruation was a predictor of (Gebeyehu et al., 2017). As the discomfort symptoms continue for the duration of the menstruation, it is essential to provide education on self-care strategies to manage this period. (Bernardi et al., 2017) mention that there is a need for education on effective therapeutic interventions to improve the quality of life during the menstrual period. (Asgari et al., 2020) reports that the severity of menstrual symptoms can be reduced by psycho-educational interventions. As many young women suffer from discomfort during menstruation, it is hoped that more non-drug methods will be developed to reduce the symptoms.

CONCLUSION

The study aimed to determine the actual menstruation, the change in the number of sanitary napkins and menstrual distress during one menstrual cycle, and the predictive factors of menstrual distress. The actual menstruation of young women and their hygiene behaviour during menstruation were studied: even though the female bodies were larger than 30 years ago, the amount of menstrual blood had not increased, whereas the duration of blood flow was shorter. Further studies should examine the causes of the change. Hygiene practices during menstruation did not adapt to the expected increase or decrease in the amount of menstrual blood. Future studies are required to investigate effective ways of improving awareness of the importance of reproductive health during menstruation.

As for suffering from symptoms pre, during and after-menstruation, although most of the symptoms disappeared promptly after menstruation, the severity of each symptom was different pre, during and after menstruation. For each symptom, it is necessary to investigate effective ways of coping with the symptoms, depending on the period in which their emergence becomes more intense. The duration of blood flow was a predictor of the total severity of stress during menstruation. The duration of menstruation can be controlled by using the medication. Women who suffer from a variety of menstrual symptoms should also be informed that oral contraceptives can be used for purposes apart from contraception. As many young women suffer from discomfort during menstruation, however, it is hoped that more non-drug methods will be developed to reduce the symptoms.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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