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ORIGINAL ARTICLE

Verification of the Validity of a Measurement Scale for Menstrual Abnormalities in Young Women and Consideration of Related Factors

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ABSTRACT

[Purpose] To verify a measurement scale for menstrual abnormalities in young women and identify related factors.

[Method] The concept of menstrual abnormalities was analyzed targeting 31 papers from Japan and abroad¹⁾.

A preliminary survey was carried out on 300 respondents. This survey was carried out on 600 persons and testing was carried out a week later. Valid responses were obtained from 300 persons, and a 4-factor, 25-item scale was abstracted. A survey on related factors was carried out on 400 persons, and correlation with eating habits, sleeping habits and physical discomfort were considered.

[Ethical considerations] This study was carried out after obtaining approval from the Ethical Review Committee of Tokyo Women's Medical University (Approval No: 2021-0188).

[Results] 400 women with menstrual abnormalities were targeted for analysis. A 4-factor, 25-item scale according to the analysis results of the confirmation factors could be confirmed. According to the analysis of covariance structures, a strong correlation was observed in goodness-of-fit model for 4 factors and eating habits, sleeping habits, and physical discomfort, at GFI=0.997, AGFI=0.978, CFI=0.999 and RMSEA=0.017.

[Conclusion] Construct validity, criteria and internal consistency of this scale could be confirmed, and the 4-factor, 25-item scale could be validated.

A strong correlation between the 4 factors and eating habits, sleeping habits and physical discomfort was observed.

Keywords: young women, menstrual abnormalities, knowledge, scale, related factors

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1. Introduction

The lifestyle of women in modern Japan has greatly changed over the past 30 years, with the tendency to marry and have children later in life. Consequently, maintaining fertility for a longer length of time after menarche until childbirth is required.

According to Enatsu, frequency of childbirth in modern women who have menarche early is lower, and the risk of endometriosis is significantly higher. Among patients diagnosed with endometriosis, 26.1% had dysmenorrhea in their teenage years. However, most women with dysmenorrhea do not visit a medical facility. Since many symptomatic women do not visit a medical facility at the right time, treatment often begins when the disease is in the advanced stage²⁾.

In Egypt, most respondents (84.01%) reported feeling pain in the abdomen and back. Most students (91.2%) did not seek medical consultation for dysmenorrhea³⁾. This cross-sectional examination of a young multiethnic population of Canadian women shows that 99% of women experience some type of premenstrual symptom⁴⁾. In Hong Kong, the prevalence of dysmenorrhea was 80% (95% confidence interval, 75-85%)⁵⁾.

Furthermore, according to Miyazaki, the most frequent responses regarding matters not taught in menstruation education were "lifestyle during menstruation," "menstruation record" and "menstrual disorder"⁶⁾.

According to the above, insufficient education regarding menstrual disorders is considered to be related to the frequency of visits to a medical facility.

According to the results of the multilinear regression analysis of the previous survey, when a self-care scale for young women with menstrual pain was prepared, young women with stronger menstrual pain were found to not properly care for themselves and their symptoms did not improve by self-care⁷⁾.

If there is a scale that can check the knowledge of menstrual abnormalities, it will lead to early detection of menstrual abnormalities. Therefore, we developed a scale to measure knowledge about menstrual abnormalities among young women.

Messick, et al. determined that validity is a comprehensive judgment on the degree to which the empirical and theoretical evidence support the appropriateness and adequacy of the reasoning and action based on the other evaluation methods such as tests or interviews⁸⁾. According to Landy, et al. stated that the concept of validity consists of content validity, criterion-related validity, and construct validity. In addition, for assessment of scale validity, the reliability of the reasonings of the subject, on which the scores of the scale are based, is important⁹⁾. Content validity must consist of items that are a good representation of behavior, and their contents are determined by experts, representatives of subjects, etc. Criterion-related validity includes both concurrent validity and prediction validity. Concurrent validity simultaneously employs new and existing criteria for the subjects in order to identify any correlations. Prediction validity predicts and considers the future. Regarding construct validity, Cronbach, et al. states that I. all the theories which are assumed to be related to the constitutive concepts are clearly documented, and correlations between theories are identified, II. criteria to measure those theories is developed, and III. measurements are carried out using such criteria to verify whether the theory (hypothesis) is valid or not¹⁰⁾.

Thirty one articles published in Japan and internationally were targeted and repeated consideration of the conceptual analysis of menstrual disorders was carried out by the author and two maternity nursing professors. Next, content validity was considered at a meeting of experts (two maternity nursing professors, a medical school instructor and a statistics expert).

Preliminary survey on 300 young women (18–29-year-old) with menstrual disorders, were carried out. Scale items were then adjusted and 5 factors and 47 item draft scale was prepared.

This survey was carried out on 600 young women with menstrual disorders (18–29-years-old). For criterion-related validity, 41 items based on the Menstrual Distress Questionnaire (hereinafter referred to as MDQ, consisting of 47 items in 8 areas)¹¹⁾, were used as a modified MDQ, excluding item 6, “feeling exhilarated” because it did not apply to menstrual disorders. Correlation according to Spearman's rank correlation coefficient was considered, and a positive correlation was observed overall. To determine discriminant validity, 600 patients were divided into one group of 203 persons who experience strong menstrual pain and always use analgesics, and another group of 367 persons who do not always need analgesics. From the results of the unpaired t-test, the analgesic had significantly higher average value and standard deviation for each subscale, compared to the non-analgesic group. Young women with strong menstrual disorders were found to have higher knowledge of menstrual disorders.

For construct validity, 4 factors and 25 items were abstracted as a result of exploratory factor analysis and confirmation factor analysis .

Therefore, construct validity will not be verified unless further survey is conducted with a different population, and 4-factor, 25-item scale was abstracted using the developed scale.

Consequently, the purpose of this study is to verify the validity of the construct validity of a knowledge measurement scale for menstrual abnormalities in young women and consider related factors.

2. Definition of terms

Young women: Women from the average age of menarche (11-12 years) to approx. 7 years of anovulatory cycles, and from the age of 18, when the ovulatory cycle begins, to 29 years of age, before the average age of childbearing.

3. Method

3.1. Survey subjects

Women 18-29 years old with menstrual disorders and persons who do not meet any of the exclusion criteria (pregnant, taking birth control pills, visiting the hospital for gynecological disease).

3.2. Survey method

An online survey was carried out on a different population, consigned to a different research company than the one that carried out the preliminary survey and main survey. First, confirmation whether the person had a menstrual disorder or if she met any of the exclusion criteria was carried out by a screening survey, and the related factors questionnaire was sent to eligible persons.

3.3. Survey period

October 2022.

3.4. Composition of questions

In order to determine any correlation between the 25 items of this survey result and the revised MDQ 41 items, 22 items of related factors such as age at menarche, menstrual cycle, degree of menstrual pain, BMI, eating habits, sleeping habits, physical discomfort were surveyed.

3.5. Item analysis

The ceiling/floor effect was calculated from the mean and standard deviation, and IT correlation analysis and GP analysis were carried out.

3.6. Confirmation of validity

Regarding construct validity, confirmation factor analysis was carried out to confirm whether the 4 factors and 25 items were the same as those of the main survey. Regarding criteria-related relevance, correlation with the modified MDQ was considered by Spearman's rank correlation coefficient.

3.7. Confirmation of Reliability

Oshio stated that if the alpha coefficient is above a certain number (e.g., .80), the internal consistency of the scale is considered high¹². Therefore, for the internal consistency of the scale, Cronbach's coefficient alpha of entire scale and subscales was calculated, with the standard set at 0.8 or higher.

3.8. Multiple linear regression analysis

Correlation between the First-Fourth Factors of knowledge measurement scale for menstrual abnormalities in young women and eating habits, sleeping habits, physical discomfort was considered.

3.9. Covariance structure analysis

Covariance structure analysis was carried out to consider the degree of correlation between the First to Fourth Factors and eating habits, sleeping habits, physical discomfort. In addition, standardized residual variance was carried out.

According to Oshio, the closer the fit index is to the Good of Fit Index (hereinafter referred to as GFI):1 the better. Adjusted Goodness of Fit Index (AGFI): closer to 1 the better, GFI and AGFI are also considered good-fitting models if they are greater than 0.90, $GFI \geq AGFI$.

Normal Fit Index (NFI), Comparative Fit Index (CFI): The closer to 1, the more favorable the model, and greater than 0.90 is considered a good model.

Root Mean Square Error of Approximation (RMSEA): good correspondence is less than 0.05, greater than 0.1 is determined as poor correspondence¹².

SPSS Statistics 27 and Amos 27 were used for data statistical analysis.

4. Ethical consideration

For the online survey, an explanation screen and a consent screen were prepared, and only persons who gave consent were able to go to the question screen. All data was set to be anonymous. An agreement was concluded so that all data, including data held by the research company would be promptly deleted after completion of the study. This study was carried out after obtaining approval from the Ethical Review Committee of Tokyo Women's Medical University (Approval No: 2021-0188).

5.Results

5.1. Selection of Subjects

The screening survey was sent to 17,091 persons, and 1406 persons replied. Among these, 662 persons with a menstrual disorder were targeted. Of these, 510 persons who did not meet the exclusion criteria (pregnant, taking birth control pills, regularly visiting the hospital for a gynecological disease) responded, of which valid responses could be obtained from 400 persons.

5.2. Subject Summary (Refer to Table 1)


Regarding age the 400 subjects, 23 persons were 18-19 years old (5.8%), 126 were 20-24 years old (31.5%), and 251 were 25-29 years old (62.7%).

Occupations in descending order were, 140 company employees (35.0%), 81 students (20.3%), 64 part-time workers (16.0%), 46 unemployed (11.5%), and 39 housewives (9.7%).

Regarding BMI, BMI of 138 persons (34.5%) was 18.5 or less, 225 persons more than 18.5 but less than 25 (56.3%), and 37 persons 25 or more (9.3%). 251 persons had a BMI of 19 or less (62.8%). 36 persons had an appropriate BMI of 22 (9.0%).

Table 1. Overview of subjects

Item	Result
Age	
18~19years old	23(5.8%)
20~24years old	126(31.5%)
25~29years old	251(62.7%)
Profession	
Office worker	140(35.0%)
Student	81(20.2%)
Part-time job	64(16.0%)
Unemployed	46(11.5%)
Housewife	39(9.7%)
Civil servant	17(4.2%)
Company manager	6(1.5%)
Self-employed	6(1.5%)
Others	4(1.0%)
Body Mass Index (BMI)	
18.5 or less	138(35.0%)
18.5 to less than 25	225(56.3%)
25 or more	37(9.3%)



BMI
19 or less
251 (62.8%)

n=400

5.3. Item analysis

Of the 25 items, no item was excluded by the floor/ceiling effect.

In addition, no item was excluded due IT correlation analysis or GP analysis.

5.4. Confirmation of Validity

Regarding construct validity, the goodness-of-fit model was GFI=.794, AGFI=.745, NFI=.856, CFI=.887, and RMSEA=.087.

The 4 factors and 25 items could be confirmed by factor analysis.

Regarding criterion-related validity, a significant positive correlation was observed in the modified version MDQ and for all items.

In particular, for the Second Factor (Relationship between menstrual pain and analgesics), a clear correlation was observed with the modified MDQ First Factor “menstrual pain,” $r=.47$ ($p<.001$), and modified MDQ Fourth Factor “Autonomic Dysregulation Symptoms,” $r=.49$ ($p<.001$) (refer to Table 2).

Table 2. Screening scale for menstrual abnormalities in young females and correlation with the modified MDQ

	Modified MDQ Factor 1	Modified MDQ Factor 2	Modified MDQ Factor 3	Modified MDQ Factor 4	Modified MDQ Factor 5	Modified MDQ Factor 6	Modified MDQ Factor 7
First factor	.277**	.308**	.170**	.280**	.236**	.180**	.360**
Second Factor	.477**	.403**	.299**	.490**	.320**	.378**	.387**
Third factor	.354**	.362**	.320**	.297**	.283**	.258**	.352**
Fourth Factor	.317**	.258**	.311**	.227**	.283**	.318**	.223**

** Correlations are significant (two-tailed) at the 1% level.

n=400

5.5. Confirmation of Reliability

Cronbach's alpha for the entire scale was .924.

Regarding the subscale of Cronbach's alpha, First Factor was $\alpha=.927$, Second Factor $\alpha=.846$, Third Factor $\alpha=.902$, and Fourth Factor $\alpha=.891$.

All factors exceeded the standard deviation of .8, confirming internal consistency.

5.6. Linear regression analysis in First-Fourth Factors with eating habits, sleeping habits, physical discomfort (refer to Table 3)

First Factor (Risk of menstrual disorder) correlated with sleeping habits ($B=.382$, $SE=.105$, $p<.01$) and physical discomfort ($B=.121$, $SE=.055$, $p<.05$). Adjusted R2 was 0.076.

Second Factor (Related to menstrual disorder) correlated with eating habits ($B=.261$, $SE=.077$, $p<.01$) and physical discomfort ($B=.284$, $SE=.052$, $p<.01$). Adjusted R2 was 0.161.

Third Factor (QOL in the peri-menstrual period) correlated with sleeping habits ($B=.393$, $SE=.113$, $p<.01$) and physical discomfort ($B=.161$, $SE=.060$, $p<.01$). Adjusted R2 was 0.079.

Fourth Factor (Benefit of birth control pills) correlated with sleeping habits ($B=.354$, $SE=.122$, $p<.01$) and physical

discomfort (B=.205, SE=.064, p<.01). Adjusted R2 was 0.063.

Table 3. Regression analysis between Factors 1-4 and eating habits, sleeping habits, and physical discomfort
(multiple regression analysis: stepwise) n=400

Dependent variable	Independent variable	B	SE	p-value
First factor	Sleeping habits	0.382	0.105	0.000
	Physical condition	0.121	0.055	0.030
	AR ²		0.076	
Second factor	Eating habit	0.261	0.077	0.001
	Physical condition	0.284	0.052	0.000
	AR ²		0.161	
Third factor	Sleeping habits	0.393	0.113	0.001
	Physical condition	0.161	0.060	0.007
	AR ²		0.079	
Fourth factor	Sleeping habits	0.354	0.122	0.004
	Physical condition	0.205	0.064	0.001
	AR ²		0.063	

B,Regression coefficients; SE,Standard error;

AR²,Adjusted R-squared;

5.7. Covariance structure analysis between First-Fourth Factors and eating habits, sleeping habits and physical discomfort (refer to Figure 1)

From the covariance structure analysis results, eating habits correlated with the Second Factor, sleeping habits with the First, Third, and Fourth Factors, and physical discomfort with the First-Fourth Factors. In the goodness-of-fit model, an extremely strong correlation was observed at GFI=.997, AGFI=.978, CFI=.999 and RMSEA=.017.

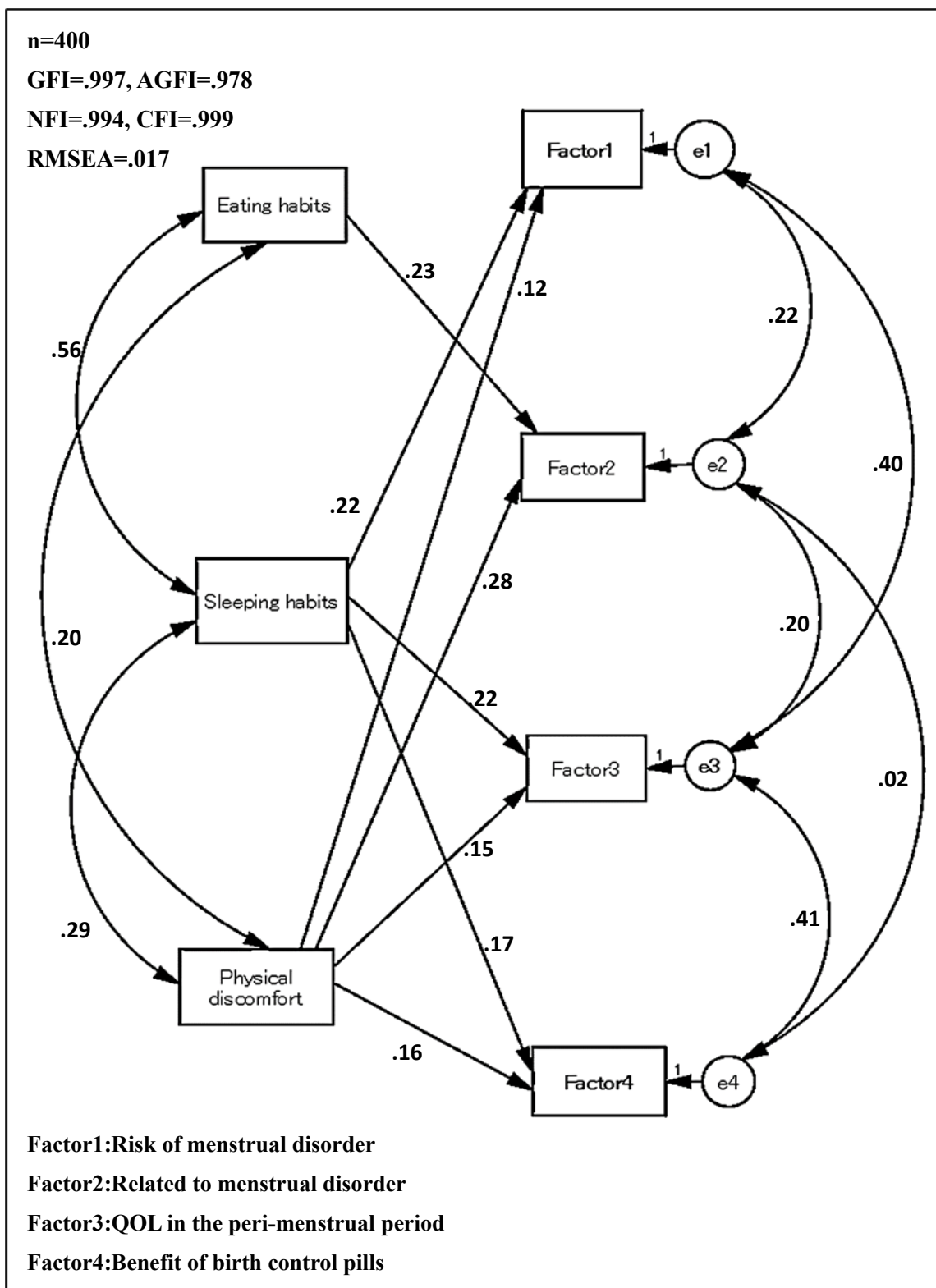


Figure1. Covariance structure analysis between Factor1-4 and eating habits, sleeping habits, and physical discomfort

6. Discussion

6.1. Consideration of Scale Validity

For content validity, a conceptual analysis of 31 articles on menstrual disorders in Japan and overseas was carried out using the Rogers method. Furthermore, two maternity nursing professors, a medical school instructor and a statistics expert considered validity, and understanding menstrual disorders from a more objective viewpoint was possible.

For criterion-related validity, 41 items related to menstrual disorder were used as a revised MDQ, based on the most frequently used a scale of menstruation in the world. Positive correlation was observed for all items. Second Factor (Relationship between menstrual pain and analgesics) is considered to show moderate correlation because MDQ measures symptoms during menstruation, and symptoms of menstrual pain overlapped.

On the other hand, First Factor (Risk of menstrual disorder), Third Factor (QOL in the perimenstrual period), and Fourth Factor (Benefits of birth control pills) showed weak correlation since characteristics of this scale specialized in menstrual disorder.

Regarding construct validity, the 4-factor structure could be confirmed by two surveys, namely this survey and the related factor survey. Since 4 factors and 25 items were obtained from the results both times, construct concept validity is considered confirmed.

6.2. Consideration of Scale Reliability

Cronbach's alpha for the entire scale of the related factor survey was .924. Subscales were, starting from the First Factor, .927, .846, .902, and .891, respectively. All were .85 and above; and internal consistency of this scale is considered high.

6.3. Results of the multiple linear regression analysis and covariance structure analysis

From the results of the multiple linear regression analysis and covariance structure analysis, a strong correlation with eating habits, sleeping habits, and physical discomfort was observed. According to Yuasas, et al, the symptomatic group with menstruation complaints had a lower BMI and significantly less sleep than the non-symptomatic group¹³).

In addition, the symptomatic group had significantly higher awareness of physical symptoms such as cold hands and feet, lethargy and tiredness. Similarly, sleep and physical discomfort are significantly connected to symptoms during menstruation. Yuasas, et al also stated that headache symptoms were significantly observed in the group with menstrual pain, and the group with irregular menstruation had significantly less intake of eggs, meat, fish, vegetables, and milk¹³). In addition, a correlation with five potential factors, namely vitamins and minerals, protein, weight, and sleep, was observed in students with issues regarding menstrual pain and irregular menstruation.

Among 400 persons targeted from the related factor survey (all subjects had menstrual disorder), 138 persons (34.5%) were thin with a BMI of 18.5 or less, and 251 persons (62.8%) who were somewhat thin with a BMI of 19 or less. From these results, menstrual disorder more easily occurred in cases where BMI was 18.5 or less or a value close to that. According to Nodas, et al, a significant correlation between skipping breakfast or dinner, or restricting staple foods and the occurrence of irregular menstruation was observed¹⁴). As expected, eating habits and BMI were closely related with menstrual disorder. According to Nodas, et al, the recent increase in the number of "thin type" young women is related to an awareness that "being thin is healthy and beautiful" -omitted- and within this background, the lack of education regarding

which body shapes are at risk and to what degree is one cause¹⁴⁾.

There is a lack of widespread knowledge about the risks of thinness and menstrual abnormalities.

A strong correlation with all the items of the screening scale for menstrual disorder for young women was observed in persons experiencing physical discomfort. Occurrence of menstrual disorders lead to hormonal imbalance. As a result bodily discomfort more easily occurs. In fact, according to the results of Yuasa's study as well, a significant difference was observed in the items of cold hands and feet, headache, lethargy and easily tired in persons with menstrual pain.

For items in this study related to physical discomfort, a significant difference in cold hands and feet, lethargy, easily tired, and headache was also observed. Along with the results of the Yuasa study, the possibility that menstrual disorder leads to physical discomfort is considered high.

In other words, modern young women stay up late at night, do not get enough sleep, lose weight due to missing meals and a carbohydrate diet. BMI decreases below the standard, and menstrual disorders occur. As this continues, menstrual disorders can be predicted to become the norm, and physical discomfort can be expected.

The fact that young women need to be educated regarding disruptive lifestyle habits such as irregular eating and sleeping, and the connection between severe dieting and menstrual disorders/physical discomfort.

6.4. Possibility of practical use of the scale

This scale was developed to confirm knowledge of young women regarding menstrual disorders, and promote visits to a gynecologist.

Young women who have menstrual disorders can review their own menstruation condition, consider the risk of menstrual disorders, and evaluate their own menstrual pain and how to use analgesics by confirming this scale. Furthermore, this is an opportunity to review QOL before and after menstruation, and learn about the effects of birth control pills. In other words, this scale can be used as an indication for young women to understand menstrual disorders. From this, young women with menstrual disorders will be motivated to visit a gynecologist. If more young women can detect a menstrual disorder on their own and visit a gynecologist at an early stage, progression to more serious gynecological disorders may be prevented. Even if a patient is suffering from an abnormality, visiting a gynecologist can prevent the disease from worsening and treatment can be administered earlier. Consequently, fertility can be maintained for a longer period of time after menarche until first childbirth, which may lead to the prevention of future infertility.

Subjects targeted for this scale are 18- to 29-years-old women, and this scale can be utilized at a health checkup interview at a university or company. First, a screening survey on all persons to consider if they have a menstrual abnormality (menstrual cycle more than 39 days or less than 24 days, menstrual period more than 8 days or less than 2 days, excessive or too little menstrual bleeding, no menstruation for 3 months, first menstruation does not come after turning 18, menstrual pain that interferes with life, premenstrual discomfort, bleeding other than during menstrual period) is carried out, and young women who are 18 to 29 years old who have menstrual disorder are requested to answer questionnaire for this scale. From this, young women can determine whether they have a menstrual abnormality, leading to a visit to a gynecologist.

7. Study limitations and issues

In the process of developing a scale to measure knowledge regarding menstrual disorders by young women, items with bias in the item analysis or factor analysis phase and items with low factor loadings were deleted. Some of these items, were deleted due to poor discrimination, even though they were important. Consequently, it should be emphasized that the 25 items of knowledge measurement scale of menstrual abnormalities in young females should be used while recognizing that all the knowledge regarding menstrual disorder may not be included, but rather that the scale is a tool to measure the knowledge of young women on menstrual disorders.

Regarding future tasks, consideration on how this scale can be effectively utilized, and how to encourage young women with menstrual disorders to visit a gynecologist, are needed.

8. Conclusion

1. According to the result of the confirmation factor analysis of this survey and related factor analysis, a screening scale for menstrual abnormalities in young women with 4 factors and 25 items could be confirmed, and construct validity could be verified.
2. In most cases of young women with menstrual abnormalities have BMI of 19 or less, or a tendency to be somewhat thin.
3. Young women tend to have menstrual abnormalities due to a lack of sleep and worsened eating habit. This connects to physical discomfort such as cold hands and feet, headache, lethargy and tiredness.
4. Reviewing lifestyle habits such as meals and sleep, and maintaining the appropriate body weight are important to prevent menstrual disorders.

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