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Stress and psychological changes during the menstrual cycle among medical and health science students

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ABSTRACT

Psychological factors such as depression, anxiety and stress during menstruation are disrupted things in the higher education level. This study mainly focused on analyzing the relationship between psychological factors and their changes during the menstrual cycle among students of UniKL RCMP. The data collection was done by giving the questionnaire to the female students of UniKL RCMP Ipoh, Perak, Malaysia. They were needed to answer the questionnaire which was self-administered by the respondents. Results showed that the younger age group were more prone to a higher level of depression and a higher level of anxiety. There was a significant correlation between anxiety level and courses among female students of UniKL RCMP. These three psychometric assessments presented in a variety of levels in relation to age, study courses and body mass index.

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INTRODUCTION

The neuroendocrine system plays a major role in maintaining homeostasis as a result of stress and thereby influences endocrine and reproductive system. As a result of hormonal changes such as activation of the corticotrophin-releasing hormone, the normal menstrual cycle can be affected (Eva *et al.,* 2015). Psychological factors that occur before and during menstruation can cause amenorrhea, cycle irregularity and increased menstrual cycle length which are important health-related problems in women (Allsworth *et al.,* 2007). As a result of daily stress, women may experience high levels of anxiety and irregular menstrual cycle. Diabetes, cardiovascular disease, osteoporosis and infertility are serious health outcomes when there is a continuous irregularity in menstruation (Yamamoto, Okazaki, Sakamoto, & Funatsu, 2009). Abnormal menstrual cycles, with irregular and heavy bleeding, may have a deleterious impact on women's education (Adams Hillard & Deitch, 2005). Previous researches on the effect of stress in menstruation were not well defined (Sood *et al.,* 2012). Stress is not always bad as it can be the enhancer for an individual to achieve certain life goals. However, due to high academic demands, competitions, family expectations and responsibilities, students always experience pressuring stress. Studies have shown that medical students may experience high levels of stress that may give rise to fear, anxiety and depression. Stress was associated with medical training whereas depression and anxiety were associated with workload, fear during exams and no time for other activities (Moffat, McConnachie, Ross, & Morrison, 2004). Female medical students are most affected when compared to male medical students (Dahlin, Joneborg, & Runeson, 2005).

Previous results hypothesized that psychosocial stress was independently associated with premenstrual symptoms, menstrual pain, and the experience of irregular menstrual cycles after controlling for the effects of likely confounding variables. The menstrual function is deemed to be one of the

Table 1: Details of study variables used in this study

Variables	Concept	Operational Definition	Measurement/ Classification
Socio-demographic Age	Birth until current age	Asking through questionnaire	Age in years (continuous data)
Study Course	Present education	Asking through questionnaire	MBBS, Degree of Pharmacy, Degree in Pharmaceutical Technology, Diploma in Pharmacy, Diploma in Radiography, Diploma in Physiotherapy, Diploma in Nursing (categorical data-nominal)
Length of time in current program	Total of year or semester of current study course	Asking through questionnaire	Years (categorical data-nominal)
Marital status	Present marital status	Asking through questionnaire	Married, Single, Divorced, Others (categorical data-nominal)
Screening of stress, anxiety and depression level based on Depression, Anxiety and Stress Scale (DASS 21)	Classification of respondents according to Depression, Anxiety and Stress Scale (DASS 21)	Based on the score that the respondent gets after answering the questionnaire	The normal, mild, moderate, severe, extremely severe level of anxiety, depression and stress (Categorical data-nominal)
BMI	Body Mass Index using calculation weight in kg divided by square of height in m	Based on the given height and weight answered in the questionnaire	Underweight, normal, overweight, obese (Categorical data-nominal)
Age of menarche	Age when attaining first menstruation	Asking through questionnaire	Year (categorical data- nominal)
Regularity of cycle	Interval of the cycle about 21 to 35 days	Asking through questionnaire	Regular, Irregular, (categorical data-nominal)
Missed Cycle	The absence of a period for 3 months or longer in a usually regular cycle, 6 months or longer in a usually irregular cycle	Asking through questionnaire	Present, absent (categorical data-nominal)
Menstrual Cycle Length	Number of days from the first day of bleeding at one cycle to the first day of the next cycle	Asking through questionnaire	Days (continuous data)
Presence of clot	Blood clotting in menstruation and its occurrence	Asking through questionnaire	Yes, No All the time, most of the time, sometimes (categorical data-nominal)
Spotting	Bleeding occur between cycle and not associated with normal menstruation	Asking through questionnaire	Just before periods, In between periods, Never (categorical data-nominal)
Dysmenorrhea	Pain during menstruation	Asking through questionnaire	Pain score 0 to 10 (no pain to severe pain) (continuous data)
Menstrual Flow	The flow of menstruation for each day	Asking through questionnaire	Heavy, not heavy (categorical data-nominal)
Premenstrual Symptoms	Experience of premenstrual symptoms within study years	Asking through questionnaire	In usual condition, in a stressful condition (categorical data)

factors are reflecting the functional potentiality of women that may be affected by stress (Behere, Yadav, & Behere, 2011). Pre-Menstrual Syndrome (PMS) is a common stress-related problem affecting menstruation with troublesome symptoms like backache, fatigue and irritability that develops even before few days of menstruation and calms when menstruation begins (Kudielka & Kirschbaum, 2005). With respect to all the above aspects, the present study was designed to determine the relationship between stress among female students of RCMP from various study courses, different ethnics and body mass index and the changes in their menstrual cycle.

MATERIALS AND METHODS

Study Design and population

This was a cross-sectional study which is conducted among female students of University Kuala Lumpur Royal College of Medicine Perak for about four weeks and the target population for this study includes all female students of University Kuala Lumpur Royal College of Medicine Perak from all study courses, which were total of 1225 students.

Sampling method and sample size

From 1225 female RCMP students of 7 study courses, a proportion of the population from each study courses were calculated. Then, a random sample in the proportion of year/semester from respective study courses was taken. The minimum sample size was calculated by assuming that 50% of college students who are having stress will be having changes in menstruation with a precision of 5% for a 95% confidence level, as 300 samples using Open Epi software.

Study variables

Numerous variables such as socio-demographic status, depression, Anxiety and Stress Scale (DASS 21), BMI, regularity of menstrual cycle, missed menses, the presence of a clot, spotting, dysmenorrhea, daily menstrual flow, the age of menarche, pre-menstrual symptoms were studied and was shown in Table 1.

Data Collection and Data Analysis

Data was collected by distributing the questionnaire to the female students of UniKL RCMP Ipoh, Perak. They were requested to answer the questionnaire on their own. Their identity was kept anonymous and personal data was kept confidential. All the data were tabulated and analyzed using Microsoft Excel and the Statistical Package for Social Sciences SPSS 17 for Windows. The frequency and the percentage of each demographic data including age, race, marital status, study course, length of study years, and age of menarche were evaluated using descriptive statistics. The degree of stress was assessed using the standard Perceived Stress Test Questionnaire (developed in 1983), Depression, Anxiety and Stress Scale (DASS 21) and the changes in the menstrual cycle were assessed using the questionnaire extracted from the Menstrual Disorder of Teenagers Questionnaire, The Parker Sneddon MDOT and Pictorial Blood Assessment Chart and Scoring System for Assessment of Menstrual Blood Loss. The association between dependent and independent variables was tested using the chi-square test with P-value < 0.05.

RESULTS AND DISCUSSION

The relationship between depression, anxiety and stress and changes in the menstrual cycle among students of UniKL RCMP were studied to know that these factors brought some effects towards their menstruation, either physiologically or psychologically. Percentage of depression, anxiety and stress level in relation to age were shown in Table 2, 3 and 4 respectively.

It was found that for depression and anxiety, students in the age of 18 to 20 years old, are more vulnerable to be at the higher level of depression which is mild and moderate, and a higher level of anxiety which are mild, moderate, severe and extremely severe. On the other hand, 18 to 20 years old are more prone to mild and moderate stress, followed by 24-26 years old. Chi-Square test shows no significant correlation between depression, anxiety and stress with age.

When analyzing factors such as depression, anxiety and stress in relation to study course, nursing students were found to be moderately depressed with the highest number of frequency and percentage while students of Bachelor in Medicine and Surgery were found to be mildly depressed. Level of moderate anxiety was denoted in Diploma of Pharmacy students while Bachelor in Medicine and Surgery students were significant in mild and severe anxiety. Stress score portrayed that students in Bachelor of Medicine and Surgery had the sententious finding in both mild and moderate stress. There was a significant correlation between anxiety level and courses.

When analyzing factors such as depression, anxiety and stress in relation to BMI, 60% of the students who suffer mild and moderate depression were students with normal BMI. Meanwhile, for extremely severe anxiety and severe anxiety, 100% and 54.5% had normal BMI. A student with normal BMI also dominated in mild and moderate anxiety with 58.9% and 62.0% respectively. For stress, the pattern was the same with normal BMI students

Table 2: Percentage of depression level in relation to age

Depression Percentage		Age 18-20	Age 24-26
Normal	% within Depression	48.8%	6.4%
	% within Age	83.0%	80.0%
Mild	% within Depression	50.0%	10.0%
	% within Age	10.2%	15.0%
Moderate	% within Depression	50.0%	5.0%
	% within Age	6.8%	5.0%
Total	Count	147	20
	% within Depression	49.0%	6.7%
	% within Age	100.0%	100.0%
	% of Total	49.0%	6.7%

Table 3: Percentage of anxiety level in relation to age

Anxiety Percentage		Age 18-20	Age 24-26
Normal	% within Anxiety	44.8%	7.7%
	% within Age	55.1%	70.0%
Mild	% within Anxiety	57.1%	3.6%
	% within Age	21.8%	10.0%
Moderate	% within Anxiety	52.0%	8.0%
	% within Age	17.7%	20.0%
Severe	% within Anxiety	54.5%	0.0%
	% within Age	4.1%	0.0%
Extremely severe	% within Anxiety	100.0%	0.0%
	% within Age	1.4%	0.0%
Total	Count	147	20
	% within Anxiety	49.0%	6.7%
	% within Age	100.0%	100.0%
	% of Total	49.0%	6.7%

Table 4: Percentage of stress level in relation to age

Stress percentage		Age 18-20	Age 24-26
Normal	% within Anxiety	44.8%	7.7%
	% within Age	55.1%	70.0%
Mild	% within Anxiety	57.1%	3.6%
	% within Age	21.8%	10.0%
Moderate	% within Anxiety	52.0%	8.0%
	% within Age	17.7%	20.0%
Severe	% within Anxiety	54.5%	0.0%
	% within Age	4.1%	0.0%
Extremely severe	% within Anxiety	100.0%	0.0%
	% within Age	1.4%	0.0%
Total	Count	147	20
	% within Anxiety	49.0%	6.7%
	% within Age	100.0%	100.0%
	% of Total	49.0%	6.7%

counted in 80% and 64.7% of those who suffer moderate and mild stress as shown in Table 5, 6 and 7.

On observing the premenstrual symptoms, among the highest percentage of occurrence of premenstrual symptoms were a change in appetite and low back pain. In case of appetite, 24% had changes in appetite just before the period, 7.3% at any time of the month and 9.3% at all the times. While 42.3% had low back pain at the time of period and 7.3% experienced at any time of the month. For the least likely premenstrual symptoms, 93.3 % of female students never experienced bleeding from the anus as a premenstrual symptom as shown in Table 8.

For distribution of age in relation to depression, anxiety and stress, the results showed was in line with a previous study which said that younger adults were more vulnerable than older adults in

Table 5: Percentage of depression level in relation to BMI

Depression		BMI			
		Underweight	Normal	Overweight	Obese
Normal	% within Depression	4.8%	61.6%	14.8%	18.8%
	% within BMI	70.6%	83.7%	86.0%	83.9%
Mild	% within Depression	10.0%	60.0%	6.7%	23.3%
	% within BMI	17.6%	9.8%	4.7%	12.5%
Moderate	% within Depression	10.0%	60.0%	20.0%	10.0%
	% within BMI	11.8%	6.5%	9.3%	3.6%
	Count	17	184	43	56
	% within Depression	5.7%	61.3%	14.3%	18.7%
	% within BMI	100.0%	100.0%	100.0%	100.0%

Table 6: Percentage of anxiety level in relation to BMI

Anxiety		BMI			
	Count	10	112	23	36
Normal	% within Anxiety	5.5%	61.9%	12.7%	19.9%
	% within BMI	58.8%	60.9%	53.5%	64.3%
	Count	3	33	12	8
Mild	% within Anxiety	5.4%	58.9%	21.4%	14.3%
	% within BMI	17.6%	17.9%	27.9%	14.3%
	Count	3	31	7	9
Moderate	% within Anxiety	6.0%	62.0%	14.0%	18.0%
	% within BMI	17.6%	16.8%	16.3%	16.1%
	Count	1	6	1	3
Severe	% within Anxiety	9.1%	54.5%	9.1%	27.3%
	% within BMI	5.9%	3.3%	2.3%	5.4%
Extremely Severe	Count	0	2	0	0
	% within Anxiety	0.0%	100.0%	0.0%	0.0%
	% within BMI	0.0%	1.1%	0.0%	0.0%
	Count	17	184	43	56
	% within Anxiety	5.7%	61.3%	14.3%	18.7%
	% within BMI	100.0%	100.0%	100.0%	100.0%

terms of having anxiety or depression. There was considerable age-dependent variation with regard to anxiety and depressive disorders in adults with a cancer history (Simning, Conwell, Mohile, & van Wijngaarden, 2014). This shows the risk of having depression, anxiety or stress in younger age. Apart from that, another study mentioned that depression was less prevalent among older adults than among younger adults but can bring important impacts. Over half of cases represent the first onset in later life. Depression was not common in later life compared to midlife. However, the effects can be dangerous (Fiske, Wetherell, & Gatz, 2009).

The nursing student was found to be moderately depressed due to the demands as this professional education is full of rigours. The previous study found that these three factors can interrupt students' learning, disturb their academic performance and impair clinical practice. There is also an overall rise in severity and extent of mental health problems among students of higher education (Chernomas & Shapiro, 2013). As part of the health professionals, pharmacy students are exposed to the stressful environment as they have to deal with time management and tremendous study syllabus. Apart from that, they are also burdened with entrepreneurial obligation. This was seen when the level of moderate anxiety was noted in Diploma of pharmacy students. Stress which correlated to work had given strong impact on community pharmacies. Emotional status of medical students has been taken as a serious matter reported as early as 1956. It may affect the overall performance of students and results in a cascade of consequences at both personal and professional levels (Balayssac *et al.,* 2017). However, the most extremely severe anxiety was found among Diploma in Radiography students. This might be due to time constraint as they have to memorize many types of radiographic terms and skills.

The result of our study did not portray any association between level of depression, anxiety, and stress with body mass index. There were some other studies pointed out the occurrence of some correlation between obesity and depression which can be assumed that these factors are influenced by

Table 7: Percentage of stress level in relation to BMI

Stress		BMI			
		Underweight	Normal	Overweight	Obese
Normal	Count	16	169	41	52
	% within Stress	5.8%	60.8%	14.7%	18.7%
	% within BMI	94.1%	91.8%	95.3%	92.9%
Mild	Count	0	11	2	4
	% within Stress	0.0%	64.7%	11.8%	23.5%
	% within BMI	0.0%	6.0%	4.7%	7.1%
Moderate	Count	1	4	0	0
	% within Stress	20.0%	80.0%	0.0%	0.0%
	% within BMI	5.9%	2.2%	0.0%	0.0%
	Count	17	184	43	56
	% within Stress	5.7%	61.3%	14.3%	18.7%
	% within BMI	100.0%	100.0%	100.0%	100.0%

Table 8: Premenstrual symptoms occurrence percentage

Premenstrual symptoms	No or Never (%)	Sometimes (%)	Just before a Period (%)	At the time of a period (%)	Any time of the month (%)	All the time (%)
Nausea (feel like vomiting)	66.3	12.0	8.0	9.7	3.0	1.0
Vomiting	79.7	10.7	4.7	3.0	1.7	0.3
Bloating (swollen tummy)	40.0	14.3	14.0	23.0	4.0	4.7
Diarrhoea/constipation or both	51.3	10.0	12.7	17.7	5.7	2.7
Indigestion, reflux, heartburn	58.0	14.0	11.0	11.0	5.0	1.0
Changes in appetite	16.0	12.3	24.0	31.0	7.3	9.3
Aching outside vagina	38.0	13.7	12.7	30.7	3.0	2.0
Aching down the legs	48.7	13.0	9.0	25.3	2.0	2.0
Pelvic pain aching	35.0	10.0	16.0	34.3	2.3	2.3
Pelvic pain cramping	27.0	12.3	16.3	38.7	2.0	3.7
Pelvic pain stabbing	52.3	10.3	9.0	25.0	1.3	2.0
Lower back pain	15.7	14.3	16.0	42.3	7.3	4.3
Pain during or after passing urine	75.3	12.3	3.7	7.7	0.3	0.7
Pain when the bladder is full	76.0	12.3	2.3	5.0	1.7	2.7
Pain before or when passing wind	86.3	7.0	1.3	4.3	0.0	1.0
Pain when emptying bowels	74.7	12.3	3.7	7.7	0.3	1.3
Feeling an urgent need to empty bowels	61.3	19.3	6.3	9.3	2.0	1.7
Bleeding from the bottom (anus)	93.3	4.0	0.7	1.3	0.3	0.3

sociodemographic, psychosocial and cultural factors. In this regard, psychosocial and cultural factors are possible to have moderate importance, so it seems that in more traditional communities in which individualism, sense of superiority and competitiveness are not highly valued, obesity will not dispose of people of social benefits. Moreover, in such societies, physical appearance is not at the headmost in term of importance due to religious and moral beliefs. Hence, obesity did not bring any psychological pressure which leads to depression (Askari *et al.,* 2013). Meanwhile, for anxiety, a non-linear correlation showed an inverted U-shaped association, with lower anxiety scores both for lower and very high body mass index, and higher anxiety scores for medium to high body mass index. From our current research, it showed that there was no significant relationship between the overall stress score with body mass index. This was in agreement with other studies among college students in UKM where there was no relationship between stress and body mass index (Saat *et al.,* 2010).

There was no significant relationship between

depression and regularity of menstrual cycle, even though from our research, it was found that there were students who were mild and moderately depressed. This might be because, in this research, depression was only tested in the context of symptoms and not with the regards of its duration. Early decline in ovarian function was related to a lifetime depression (Harlow, Wise, Otto, Soares, & Cohen, 2003). For anxiety, our research has come out with the results of students having all normal, mild, moderate, severe and extremely severe anxiety. In terms of the regularity of the menstrual cycle, students tend to become more anxious when there was any urgency or certain demands in their study period. The association between estrogen and anxiety in premenstrual dysphoric disorder (PMDD), supporting the claim that women with PMDD differ in their responses to normal estrogen levels (Yen *et al.,* 2018). For stress, there was also no significant finding that correlates to the regularity of menstrual cycle. From our research, it was found that the students were normal and some of them were mild and moderately stressed.

We did not classify our menstrual cycle length data in this method, as well as most of the respondents have a normal level of depression, anxiety and stress. A subtle comparison was unable to be achieved and so more structured and focused study is greatly improved to better indulge into this issue. Surprisingly, from our research, there was a denoted correlation between anxiety and stress with menstrual flow. However, the previous study by Mohamedirizi *et al*., had no significant correlation between depression, anxiety and stress with a pattern of menstrual bleeding which included the amount of bleeding (Mohamadirizi & Kordi, 2013). There was a significant correlation between stress and blood clotting in menstruation. An obvious association of increased stress scores with the passage of clots was observed in a previous study conducted. Studies have shown that stress increases not only the level of cortisol but also progesterone and its metabolites (Eva *et al.,* 2015). The causes of thickening of the endometrial wall of the uterus, which lead to heavier blood flow and formation of the clot are the imbalance of hormone progesterone and estrogen. Formation of clotting is also resulting from the failure of the anticoagulants. However, there was no previous study done on the correlation of depression and menstrual clot in order to support our finding. Hormonal imbalance is believed to be related to depression, which also affects the menstruation.

From our study, we also found a significant correlation between anxiety and spotting of blood between the period. From the available scientific research, there was a comparison of bleeding in between menstruation and consumption of hormonal contraceptive, but not focusing on the psychological factor. It was assumed that the correlation found as a result of the development of anxiety due to their abnormal pattern of bleeding. At the same time, dysfunctional uterine bleeding due to anovulatory or less commonly ovulatory occurs during the childbearing years. It is exclusively diagnosed after pregnancy, iatrogenic causes, systemic conditions, and obvious genital tract pathology have been ruled out. There are a few anxiety symptoms which imitate systemic conditions that causing abnormal uterine bleeding like hyperthyroidism which include heart palpitations, shortness of breath, chest pain, hand tremors, irritability and/or oversensitivity, fatigue, weight fluctuation, muscle weakness and sleeplessness, which are almost similar to those of anxiety (Albers, Hull, & Wesley, 2004). There was significance between depression, anxiety and stress, with almost all of the premenstrual symptoms, except for pelvic cramping, pain when the bladder was full, and pain before passing wind. Due to the belief of having premenstrual syndromes as an abnormality in their daily lives, people tend to develop depression, anxiety and stress. The feeling of discomfort had affected their daily routine but not occurring on a daily basis.

CONCLUSION

The study shows that there are a variety of levels of depression, anxiety and stress. There is also the relationship between depression, anxiety and stress on changes in menstrual cycle. These three psychometric assessments presented in a variety of levels in relation to age, study courses and body mass index which bring some correlations. However, there was no relationship showed with regards to ethnicity.

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