



Impact of Body Mass Index on Menstrual Health: A study among Tripura's Tribal Communities

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ABSTRACT:

The menstrual cycle is one important metric for assessing the quality of life and reproductive health of women. A high or low body mass index (BMI) might put a woman at risk for menstrual abnormalities, which can include painful periods, irregular cycles, and lack of menstruation. This investigation seeks to ascertain the relationship between menstrual cycle issues and body mass index in tribal students of Tripura. This study used an observational analytic study design and a cross-sectional approach. Samples are selected using a purposive sampling technique. The samples were a total of **100** individuals of undergraduate students belongs to 'Scheduled Tribes' community within the age range of **19-22** years old. Based on the chi-square statistical test, the results obtained with **p-value = 0,000 (p-value *** P<0.001)** which indicates menstrual cycle abnormalities and Body Mass Index (BMI) are significantly correlated in students.

Key Words: Body Mass Index (BMI), Menstrual Cycle, Menstrual Disorders, Correlation.

1. INTRODUCTION:

Menstruation is a woman's monthly bleeding brought on by the hormones *progesterone* and *estrogen* being reduced after the monthly ovarian cycle.[1,2]The menstrual cycle is the term used to describe the recurring occurrence of menstruation.[3] The menstrual cycle is a crucial component of female reproduction because it helps the female body get ready for conception and pregnancy.[2,3] A regular menstrual cycle can show that a woman's reproductive organs are functioning at their best, whereas irregular periods can signify changes in ovarian function and may indicate a higher risk of developing diseases like *ovarian cancer, fractures, diabetes, breast cancer, and cardiovascular disease*. [4] monthly problems that frequently affect women include irregular monthly cycles, disruption of *menstrual pain* or *dysmenorrhea*, disruption of menstrual volume, length, and flow, abnormal bleeding, and *premenstrual syndrome*. [5] Menstrual problems may be brought on by both biological and psychological anomalies. Stress-related conditions and emotional disturbances are examples of psychological illnesses, while reproductive system malfunction is an example of a biological ailment. Body weight, exercise frequency, physical activity, stress, food, environmental exposure, working circumstances, synchronization of menstrual processes, and endocrine problems all have an impact on menstrual disorders.[6] Body weight, and more specifically the percentage of body fat, is one of the major variables that affect menstruation problems. There are other elements, which may be further separated into internal and external factors; external elements include *smoking, drinking alcohol* and *caffeine*, being stressed out at work, having a low socioeconomic level, etc. [1,3] The body's fat level is one of the internal variables, along with illnesses of hormonal imbalance including thyroid issues and polycystic ovarian syndrome.[7] *Androgen hormones* may rise as a result of persistently rising estrogen levels. Follicular development can be hampered by an increase in androgen hormone levels, preventing follicular maturation.[8] A small amount of body fat can also reduce the amount of *androgen hormone* converted into estrogen, leading to irregular menstrual periods. In certain societies, young women get married at an average age of **16** in developing nations like Indonesia. As previously indicated, it is critical to evaluate the menstrual cycle in young women since it is significant for conception and pregnancy. In addition to this issue, *Althea Medical Journal. 2015;2(4) 556 AMJ December 2015* - As the world's population grows, the number of malnourished teenagers is rising.

2. METHOD:

This study's strategy combined a cross-sectional method with observational analysis. Different colleges of Tripura served as the site of this investigation. Total **100** students were selected for this study. Purposive sampling was used to do the sampling, which involved identifying samples that satisfied the researcher's inclusion and exclusion standards up until the necessary number of samples were obtained. Women between the ages of **19** and **25** who were not participating in a weight-increasing or weight-loss program, who did not engage in vigorous exercise, and who were not under extreme stress met the inclusion criteria for this study. If the sample is unwilling to complete an informed consent form and a questionnaire, they will be excluded from the research. As a condition of participating in the study, the research participants signed an informed permission form. Next, their height and weight were recorded, and their BMI was calculated. They also completed a questionnaire about menstrual cycle disorders. In this work, univariate descriptive tests and chi-square statistical tests were utilized in the data analysis.

3. RESULT:

Table 01: Characteristics of Research Participants

Variables	Frequency (n)	Percentage (%)
Age		
19	20	20
20	30	30
21	24	24
22	26	26
BMI		
Underweight	11	11
Overweight	13	13
Normal	68	68
Obesities	8	8
Menstrual Cycle		
Disorder	37	27
Normal	63	73
Type of Disorder(n=37)		
Oligomenore	23	23 (n=100)/62.16 (n=37)
Polimenore	13	13 (n=100)/35.14 (n=37)
Amenore	1	1 (n=100)/2.70 (n=37)

The age range of the research participants is 19–22 years, and 30 (30%) of them are in the 20-year age group. Of the 100 subjects researched, it is known from the distribution depending on class. According to the BMI distribution, the majority of research participants fall into the 68 (68%) BMI group, which is considered to be normal. Only 37 (37%) of the individuals had menstrual cycle difficulties, according to the distribution of these conditions. The majority of the students don't seem to have menstrual cycle issues. With a total of 23 (62.16%) participants, oligomenorrhea, or interruption of menstrual cycle extension for more than 35 days, was the most prevalent kind of menstrual cycle disorder among the research subjects, according to the distribution of menstrual cycle disorder types. A kind of Polimenore, when the menstrual cycle lasts fewer than 21 days, is the second most common menstrual cycle disruption after oligomenorrhea. 13 (35.14%) persons have reported having Polimenore.

Table 02: Characteristics of Research Participants

Variables	Menstrual Cycle Disorders			
	Oligomenore	Polimenore	Amenore	Without Disorder
Age				
19	2	0	0	17
20	15	9	1	5
21	5	3	0	16
22	1	1	0	24
BMI				
Underweight	2	9	0	0
Overweight	9	2	1	1
Normal	3	0	0	65
Obesities	5	1	0	2

All these data demonstrates that the majority of study participants with Polimenore type menstrual cycle problems fall into the underweight BMI group, which can include up to 9 individuals. One patient had an amenorrhea-type condition, while nine other participants in the overweight BMI category had oligomenorrhea-type menstrual cycle problems. As many as 65 participants in the normal BMI category dominated the group of subjects who did not have menstrual cycle abnormalities.

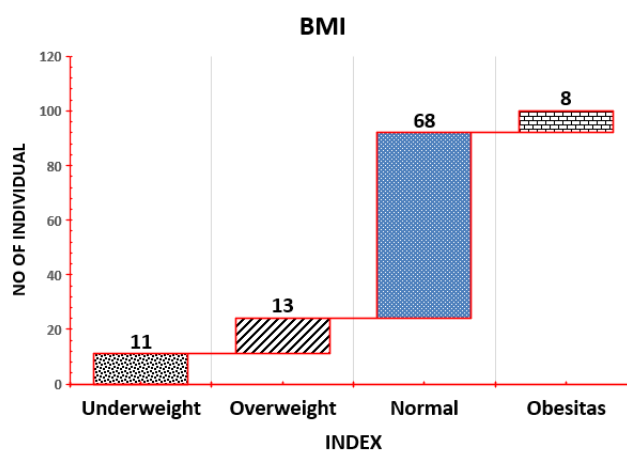
Table 3: Statistical Analysis of BMI and Menstrual Cycle

BMI	No Of Individual Having Disorder	% Of Individual Having Disorder	No Of Individuals Without Any Disorder	% Of individuals without Any Disorder	Total No of Individual	% of Total Individual	P Value
Under Weight	11	100	0	0	11	100	0.000
Over Weight	12	92.30	1	7.70	13	100	
Normal	3	4.41	65	95.59	68	100	
Obesity	6	75	2	25	8	100	

All of these numbers show that **95.59%** of research participants with normal BMI did not have menstrual cycle abnormalities. Subjects with underweight body mass index made up the majority of those with menstrual cycle abnormalities and were closely followed by those with overweight body mass index of **92.30%**. Based on the findings of the chi-square test at the **95%** level of confidence (**0.05**), the analysis obtained ***p-value* = 0.000**, where the findings of ***p-value* < 0.001**, so that **H_0** has been disregarded and **H_a** is approved, which indicates there is a correlation between the body mass index and menstrual cycle.

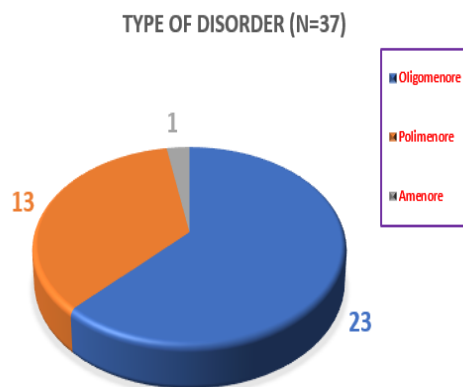
4. DISCUSSION:

Twenty-year-old participants make up the majority of study subjects. From the ages of **20** to **40**, the reproductive stage begins. The menstrual cycle will often run consistently and just slightly alter during the reproductive phase.[9] According to the BMI-based features of the research individuals, most of them fall into a normal BMI group. A normal BMI will indicate that the body is getting all the nutrition it needs. The development of the sexual organs can be aided by good nutrition, whereas poor nutrition inhibits the maturity and expansion of the sexual organs.[10]



Most study participants have regular menstrual cycles. The findings of the present research are close to those of a **2016** study conducted in Pebrina, where **69.4%** of the participant population had normal menstrual cycles while merely **30.6%** of the participants had menstrual cycle problems.[11] Women who have difficulties that impair metabolic processes, sexuality, sleeping, fertility, and ability to reproduce, and other factors may find that irregular menstrual periods have a major negative effect on their health, either immediately or over time.[12]

The majority of participants who fell into the underweight BMI group experienced polimenore, a sort of menstrual cycle irregularity. This is consistent with the **2016 Astuti research**, which found that the type of menstrual cycle polimenore was disrupted in **60%** of Muhammadiyah one Junior High School Yogyakarta students who had an underweight BMI.[5] Adolescents with a BMI of less than **17.5 kg/m²** had a risk of **2.06** having menstrual cycles that were irregular.[13] This is similar to the **2018 Kumalasari study** in Surabaya, which demonstrated that there is a correlation between BMI and regular menstrual cycles, where subjects with a normal category BMI tend to experience regular menstrual cycles. The majority of research subjects with a normal BMI category experience regular menstrual cycle.[14] The majority of the participants who fell into the group of overweight and obese BMI had menstrual cycle problems called oligomenorrhea. This is in line with **Rakhmawati's 2013 study**, which discovered that obese women's nutritional state increased their risk of menstrual cycle abnormalities by **1.89** times more than those with appropriate nutritional status.[8] In this present study with a proportion of **95.59%**, responders with normal BMI fall into the group of regular menstrual periods. Underweight BMI subjects made up the majority of those with menstrual cycle abnormalities, accounting for **100%** of the total, followed by overweight BMI subjects **92.30%**. According to statistics, there is a connection between menstrual cycle abnormalities and BMI among students, with a ***p-value* of 0.000 (*p* < *value* 0.001)**. This finding is relevant to **Jena's 2017 study** in Bhubaneswar, Odisha, India, which found that there was a significant relationship between BMI and menstrual cycle length in high school teenage girls. The results of the cross-sectional study of menstrual patterns and BMI showed significant results with ***p-value* = 0.001 (*p-value* 0.05)**, rejecting hypothesis **H_0** and accepting hypothesis **H_a** . [15]



Basically, all these facts are due to the involvement of estrogen hormones generated in the placenta, ovaries, adrenal glands, and adipose tissue is known to affect BMI and the menstrual cycle.[16] Estrogen levels will drop as a result of low body fat, and low estrogen levels are linked to infertility. The menstrual period will lengthen as a result of excess body fat levels increasing estrogen levels.[17]

5. CONCLUSION:

Basically, a small amount of body fat can lead to irregular menstruation periods in women whose weight is below normal because there is insufficient hormone production and body fat stores. Reduced testosterone levels brought on by a small amount of body fat will aromatize into estrogen, which might lead to irregular menstrual periods. Losing weight can result in a drop in the hormone gonadotropin, which is necessary for the release of the **luteinizing hormone (LH)** and **follicle-stimulating hormone (FSH)**, which lowers **estrogen** levels and disrupts the menstrual cycle. The **luteal phase** may be shortened as a result of impaired **LH** production brought on by weight reduction. Because a woman's bodily condition weakens and lowers her ability to withstand discomfort, women with a BMI category underweight are also at risk of developing dysmenorrhea. An **androgen** known as **androstenedione**, which serves as a precursor to reproductive hormones, is responsible for the increased production of menstrual cycles in women who have higher-than-average body fat. With the aid of the enzyme **aromatase**, androgen is a hormone that will be transformed into estrogen through the process of aromatization of granulosa cells and fat tissue. In the hypothalamus, elevated levels have a negative feedback effect on **GnRH** secretion. Due to excessive **estrogen** levels, follicular growth will halt and **FSH** levels will not reach their optimum, preventing ovulation. Due to this circumstance, oligomenorrhea or amenorrhea may develop. **Leptin**, a hormone involved in controlling hunger, energy intake, and the sympathetic nervous system, is also known to be linked to body fat. **Leptin** levels cannot regulate adipose tissue in the body in overweight people because of leptin resistance. **Estrogen** levels will increase unless obesity is not fixed. According to the research, there is a direct correlation between BMI and menstrual cycle abnormalities among students. Menstrual cycle issues are more frequently encountered by research participants in the categories of underweight BMI **100%** and overweight **92.30%**, whereas respondents in the group with normal BMI **95.59%** report having regular menstrual cycles more frequently.

6. REFERENCES:

- Ganesh, R., Ilona, L., & Fadil, R. (2015). Relationship between body mass index with menstrual cycle in senior high school students. *Althea Medical Journal*, 2(4), 555-560.
- AC, G. (1991). Female physiology before pregnancy and the female hormones. *Textbook of Medical Physiology*, 899-914.
- Nelson, L. (2009). Menstruation and the menstrual cycle fact sheet. *Office on Women's Health, US Department of Health and Human Services*.
- Tombokan, K. C., Pangemanan, D. H., & Engka, J. N. (2017). Hubungan antara stres dan pola siklus menstruasi pada mahasiswa Kepaniteraan Klinik Madya (co-assistant) di RSUP Prof. Dr. RD Kandou Manado. *eBiomedik*, 5(1).
- Astuti, E. P., & Noranita, L. (2016). Prevalensi kejadian gangguan menstruasi berdasarkan indeks masa tubuh (IMT) pada siswa kelas VII SMP. *Jurnal Ilmu Kebidanan*, 3(1), 58-64.
- Mahitala, A. (2017). Hubungan Aktivitas Fisik Dengan Gangguan Menstruasi Wanita Pasangan Usia Subur Di Desa Temanggung Kecamatan Kaliangkrik Kabupaten Magelang Tahun 2015. *Jurnal Kesehatan Masyarakat*, 3(3), 74-80.
- Panay, N., Dutta, R., Ryan, A., & Broadbent, J. A. M. (2004). Abnormal Bleeding. *Obstetrics and Gynaecology*.
- Hidayati L, S., Kusumawati, E., Lusiana, N., & Mustika, I. (2019). Anemia defisiensi besi dan indeks massa tubuh terhadap siklus menstruasi remaja putri. *Jurnal Kesehatan*, 12(1), 30-40
- Yudita, N. A., Yanis, A., & Iryani, D. (2017). Hubungan antara Stres dengan Pola Siklus Menstruasi Mahasiswa Fakultas Kedokteran Universitas Andalas. *Jurnal Kesehatan Andalas*, 6(2), 299-304.

10. Putra, R. N. Y., Ermawati, E., & Amir, A. (2016). Hubungan indeks massa tubuh (IMT) dengan usia menarche pada siswi SMP Negeri 1 Padang. *Jurnal Kesehatan Andalas*, 5(3).
11. Pebrina, M. Hubungan Status Gizi Dengan Keteraturan Siklus Menstruasi Pada Siswi Remaja Di SMA N 12 Padang Tahun 2015. *Jurnal Kesehatan Medika Sainika*. 2016;7(2).
12. Ganesan, DK., Krishnan, GK., Chitharaj, RR., Boopathirajan, R. A cross-sectional study on relationship between body mass index and menstrual irregularity among rural women in Tamil Nadu. *International Journal of Community Medicine and Public Health*. 2019;6(11), 4635.
13. Sitoayu, L., Pertiwi, DA., Mulyani, EY. Kecukupan zat gizi makro, status gizi, stres, dan siklus menstruasi pada remaja. *Jurnal Gizi Klinik Indonesia*. 2017;13(3), 121-128.
14. Kumalasari, MLF., Hadi, MI., Munir, M. 2019. Hubungan antara Tingkat Stres dengan Siklus Menstruasi pada Remaja. *Jurnal Kesehatan*. 2019;12(2).
15. Jena, P., Panda, J., Mishra, A., Agasti, N. 2017. Menstrual pattern and body mass index in adolescent school girls; a cross-sectional study. *Global Journal for Research and Analysis*. 2017;VI (6), 29-31.
16. Simbolon, P., Sukohar, A., Ariwibowo, C., Susianti, S. Hubungan Indeks Massa Tubuh dengan Lama Siklus Menstruasi pada Mahasiswi Angkatan 2016 Fakultas Kedokteran Universitas Lampung. *Jurnal Majority* 2018;7(2), 164-170.
17. Alasi, ZYU., Hamdani, I. 2017. Hubungan indeks Massa Tubuh (IMT) terhadap Keteraturan Siklus Menstruasi pada Siswi Madrasah Aliyah Negeri Dolok Masihul di Kecamatan Dolok Masihul. *Jurnal Ibnu Sina Biomedika*. 2017;1(1), 40-48.

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