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Research Article

Influence of Body Mass Index [BMI] on the Menstrual Cycle of Adolescent Girls at a Selected Urban High School in West Bengal, India: A Cross-Sectional Study

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Abstract

Adolescence marks the pubertal maturation stage and shapes the reproductive health of women. The WHO recognizes menstruation as a health issue and recommends a life-course approach to address it. Narrowing down the factors affecting menstrual as well as reproductive health, the role of a balanced diet and nutrition among adolescent girls holds the utmost importance. Given India's extensive demographic dividend, comprising 118.9 million adolescent girls as per the 2011 Census, studying diet and its impact on menstrual health becomes essential. This study aims to ascertain- the existence of menstrual issues among teenage girls, their eating habits, and the association of BMI with menstrual disorders. A cross-sectional survey was conducted among 231 adolescent girls (aged 10-19 years) from Urban High School in West Midnapore, West Bengal, India. A modified Women's Health Questionnaire (WHQ) and a daily diary were used to collect data and analyze the association between dietary habits and menstrual issues among adolescent girls using Excel. Out of 231 participants, 190 (82.3%) girls reported menstrual problems associated with their periods. Eating junk food was reported by 84.4% (n = 195) of the girls more than 4 days per week. The impact of BMI (obesity, overweight, and underweight) on mental disorders was found to be statistically significant ($p < 0.05$). The study concludes that diet plays a significant role in influencing the menstrual health of adolescent girls. Consumption of junk food, tea/coffee, and weight influences menstrual issues like lower abdominal pain, body aches, and anorexia. Thus, for adolescent girls to lead a quality life and be well, cultivating healthy eating habits is essential. Eating a nutritious and balanced diet before an anticipated period results in less pain felt during the subsequent cycle.

Keywords: menarche, schoolgirls, Diet, BMI, menstrual disorder, adolescent girl

Introduction

Menstruation is a biological process experienced by half of the world's population at some stage in their life. As a physiological condition, it affects health and well-being and is linked to dignity and equality. The WHO recognizes menstruation as a significant issue and recommends actions to address it under the three SDG goals: 3 (health), 5 (gender equality), and 6 (water and sanitation) (World Health Organization, 2022).

According to gynecologists, menstruation is one of the physiological indicators of teenage girls' health. (Mohamadirizi & Kordi, 2015). Adolescence is an age of physical growth and development, and menstrual issues affect the quality of life of girls.

During adolescence, the hypothalamic-pituitary-ovarian axis is still developing, which can result in irregular menstruation. Almost 90% of teenage girls experience menstrual cycles with lengths of 21 and 45 days or brief cycles every 20 days or so. By the age of three years, the menstrual cycle length ranges from 21 to 34 days and becomes normal by the age of 19-20 years (ACOG Committee, 2006).

Menstrual issues impact women's psychology, reproduction physiology, quality of life, family income, and community has been reported by various studies. (Mohamadirizi & Kordi, 2015). Menstruation abnormalities can be attributed to eating disorders reported in a study that poor eating habits adversely affect menstrual cycles (Amagin& Neupane, 2019). Eating disorders lead to weight loss, decreased body fat, hyperleptinemia, inappropriate eating attitudes, behaviors, exercise, and psychological stressors (Kotecha et al., 2014), which may be linked to menstrual disorders. During adolescence, girls have the opportunity to shape their health and prepare for motherhood. Considering the growth spurt during adolescence, the nutritional, medical, and educational requirements are high and should be met at the right time. Adolescence is a critical phase for developing daily routines and behaviors that last a lifetime; cultivating healthy eating habits becomes essential for physical growth (Fujiwara et al., 2007).

In India, 118.9 million adolescent girls (aged 10–19 years) constitute 20.2% of the total population (National Commission on Population, 2020). It is essential to investigate the menstrual health issues that affect the growth, health, and education of adolescents in the Indian context. Additionally, in West Medinipur, 56% of women aged 20-24 were found to be married before the age of 18 (Ashok et al., 2022). Given that nutritional status, influenced by diet, plays a significant role in lifestyle and quality of life and is crucial for growth and development (Viswanathan et al., 2017), it warrants study in adolescent girls in West Medinipur. Researchers are investigating the potential connection between menstrual irregularities and dietary habits. To date, few Studies have been conducted to assess this relationship.

This study was conducted with objectives: 1) to evaluate the menstrual disorders among teenage girls, 2) to determine the eating patterns of teenage girls, and 3) to determine whether BMI/ eating habits and menstruation disorders are related in adolescent girls.

Methods

A cross-sectional study was conducted among 231 adolescent girls from an urban high school in West Midnapur, West Bengal, India, to analyze the association between dietary habits and menstrual disorders among adolescent girls. According to the WHO definition, the adolescent age range is 10-19 years; however, in this study, the age group of 10-12 years was excluded due to the high school setting, as sample selection was conducted using a non-probability purposive sampling technique. The data collection period spanned from October 2018 to November 2019. A modified women's health questionnaire and daily diary entries were used to collect the data. A pre-tested questionnaire was used to conduct interview schedules for data collection, preventing misunderstandings and ensuring truthful answers. Data analysis was performed using Excel, and descriptive statistics were recorded for socio-demographic information, menarcheal age, menstrual cycle pattern, premenstrual symptoms, dysmenorrhea, dietary habits, and related symptoms. BMI was estimated by dividing the weight (in kilograms) by the height (in meters squared). Individuals were considered malnourished if their BMI was less than 18.5, regular from 18.5 to 24.9, and overweight if ≥ 25. The association between dietary habits, BMI, and menstrual disorders was determined using a Chi-square test, with significance at $p < 0.05$. Statistical analysis was performed using Excel. P-values were calculated using *the X2 test, and $p < 0.05$ was considered* significant.

Results

Two hundred thirty-one girls participated in this study. Menarche marks the beginning of puberty's biological changes. Girls have both veg and non-vegetarian. When stratified by age groups, 98 (42%) girls were aged 14–15 years, 84 (36.4%) were> 16 years of age, and 50 (21.6%) were 12–13 years of age. The mean ± SD age of the 14 participants was 1.58. Distribution according to the age of menarche reveals that 71 (30.7%) girls reported menarche at the age of 12–13 years, 120 (51.9%) girls between 14 and 15 years, and 40 (17.3%) girls by the age of 16 years. The mean ± SD age at menarche reported by the participants is 14 ± 1.58 (Table 1).

Age groups	Frequency (n=231)	Percentage (%)
12-13	50	21.6
14-15	97	42.0
16	84	36.4
Age at Menarche		
12-13	71	30.7
14-15	120	51.9
16	40	17.3

Table 1: Distribution of Adolescent Girls as per Age and Menarche

The study reported the prevalence of menstrual disorders during the menstrual cycle among 82.3% (n=190) of adolescent girls. Among these 190 girls, 41.1% (n=95) reported lower abdominal pain as the main problem, followed by body aches (16.5%) and anorexia (11.7%). Other participants (30.7%) reported backache, headache, malaise, mood swings, and nausea with vomiting as less common menstrual problems experienced during their menstrual cycle. The details are given in (Table 2).

Menstrual Disorder	Frequency (n=231)	Percentage (%)
Present	190	82.3

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Absent	42	18.2
Lower Abdominal Pain	95	41.1
Backache	25	10.8
Headache	05	2.2
Body Ache	38	16.5
Anorexia (loss of appetite)	27	11.7
Mood Swings	20	8.7
Nausea + vomiting	21	9.1

Table 2: Distribution of Menstrual Disorders among the Adolescent Girls

The findings on the dietary habits of the 231 adolescent girls indicated that only 55.4% (n = 128) of the girls were following a healthy diet. Among the participants, 91.8% (n = 212) of adolescent girls preferred a non-vegetarian diet. Out of the 231participants, the habit of taking tea/ coffee was found in 85.7% (n=198) participants, 84.4% (n=195) girls were eating junk food more than 4 days per week, and 77.9 % (n=180) of total adolescent girls reported intake of food according to regular mealtimes (Table 3).

Dietary Patterns of Adolescence	Frequency (n=231)	Percentage (%)
Healthy Diet		
Yes	128	55.4
No	103	44.6
Type of food		
Vegetarian	19	8.2
Non-vegetarian	212	91.8
Tea/Coffee		
Yes	198	85.7
No	33	14.3
Eating junk food(days)		
1-4	195	84.4
>4	36	15.6
Follows Mealtime		
Regular	180	77.9
Irregular	51	22.1

Table 3: Distribution of Adolescent Girls as per Dietary Pattern

The hypothesis testing to ascertain the association of BMI/dietary habits with mental disorders among girls was ascertained by X^2test. A statistically significant association (p<0.0001) was reported by this study. This study revealed that the occurrence of menstrual disorders was found to be higher in obese adolescent girls, followed by overweight, underweight, obesity, normal weight, respectively and (Table 4).

Body mass index (BMI)	Menstrual Disorder		X^2	p-value
	Present(f)	Absent(f)		
Underweight	43	05	46.23	<0.0001*
Normal weight	17	28		
Overweight	55	10		
Obesity	68	05		

*p value < 0.05 indicates a statistically significant association

Table 4: Association of Body Mass Index with Menstrual Disorders in Adolescence Girls

Discussions

Adolescent girls' menstrual health is crucial in preparing them for motherhood in the future. The key element that affects the experience during menstruation is diet (Yadav &Masand, 2018). In this study, 82.3% of teenage girls experienced menstrual problems during their menstrual cycle out of a total of 231 participants. Similarly, out of all the menstrual illnesses, over 41.1% of teenage girls reported lower abdominal pain as the most common issue. The ensuing less frequent menstruation issues that occurred during their menstrual cycle were back pain, headache, body pain, anorexia, malaise, mood swings, and nausea and vomiting.

The study's findings are consistent with those of many other studies. This study also shows a positive association of BMI/eating habits with menstrual issues. A previous study by Amagin and Neupane (2019) reported that menstrual issues were substantially correlated with non-vegetarian diets and more prevalent in non-vegetarian diets than in vegetarian diets (p < 0.001). The menstrual

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issues experienced by 87.9% of the participants, with 80.7% reporting lower abdomen pain, 65.7% headaches, and 20.7% mood fluctuations, similar to this study. (Amagin& Neupane, 2019)

According to a similar study by P.V. Kotecha et al., 35% of the females had a fast-food eating habit, and half of them consumed chocolate, soft drinks, and fast food (Kotecha et al., 2014). However, in this study, 84.4% of girls consumed fast food, and 22% had irregular food habits.

A comparable cross-sectional study conducted in Gwalior City reported irregular cycles (28.72%), premenstrual syndrome (PMS) (40.42%), and dysmenorrhea (62.75%) as the most prevalent issues among teenage girls. The results demonstrated a direct correlation between dietary practices, physical activity, and monthly abnormalities, including PMS and dysmenorrhea. Eating junk food was associated with dysmenorrhea (66.10%), while not exercising was associated with PMS (78.94%) (Fujiwara, 2018).

Different diets also have an impact on an individual's quality of life. According to their research, skipping breakfast may have an impact on ovarian function and increase the risk of gynecological diseases that cause young teenagers to experience monthly pain. The study also showed that people who had previously experienced diets during youth had higher levels of menstruation pain (Negi et al., 2018).

There have been reports of Bulgarian students regularly consuming fast food, including cakes and various fried snacks such as chips. Healthy foods, including fruits and vegetables, were reported to be consumed less frequently by Polish pupils (El Ansari et al., 2012). The study on irregular menstruation in obese teenage girls was conducted by Atrian KM et al. According to this study, obesity is a common factor that contributes to irregular menstrual cycles. It was suggested that girls modify their lifestyles to include regular exercise and a healthy diet in order to maintain a body weight in proportion to their height and reduce irregular menstrual cycles (Atrian et al., 2014).

According to the findings of Dars, Sayed, and Yousufzai (2014), 75.51% of the girls in the study group with a BMI between 14 and 24.9 reported having a regular menstrual cycle. A BMI of 25–29.9 kg/m2 is associated with irregular menstrual cycles, as reported by 16 girls. According to this study, a statistically significant correlation exists between menstrual periods and body mass index (BMI). ($P < 0.001$, $df = 6$, $x3 = 116.5$) (Darset al., 2014).

Every woman's quality of life is impacted by unhealthy and unsuitable eating habits, both now and in the future. Most participants in this study skipped breakfast, which was associated with higher consumption of junk food. Girls who frequently ate fast food were most likely to experience dysmenorrhea. Fast food contains a high amount of saturated fats, which can impact how the body utilizes progesterone during the menstrual cycle (Samreen et al., 2016).

The results of our investigation were consistent with those of earlier research studies. Girls with lower BMIs were substantially more likely to experience irregular menstruation. This study focuses on adolescent females who benefit from proper nutrition, which can impact their body mass index (BMI). Alma Ata (1978) identified eight essential components, including appropriate food products and a nutritious diet, that are necessary for a person's normal health (International Conference on Primary Health Care, 1978). To alleviate nutritional deficiencies, the Indian government has implemented various programs; however, achieving the targets requires improvement. Further, strategies may be devised considering the association of diet and menstruation problems in teenage girls to address the problem.

The purpose of this study was to determine the relationship between various lifestyle characteristics, such as consuming nutritious and junk food, and the menstruation issues that teenage females suffer. Comparatively, several observational-based studies have found that individuals complain of drinking more tea or coffee; however, it remains unknown what role caffeine plays in menstrual issues. Further research is needed to determine whether coffee consumption is a contributing factor to these symptoms or if women are using self-therapy as a response to typical fatigue symptoms to mitigate their focus on menstrual distress signals (Hibina et al., 2020).

This study provides a snapshot of the current situation, utilizing daily diary entries to record food consumption and menstrual distress among participants, thereby addressing recall bias. The study area and sample size were limited to an urban setting, which may limit the generalizability of the findings to rural settings. It is recommended to conduct similar studies, if possible longitudinal studies with a large sample size, to determine the impact of food patterns on menstrual abnormalities and the associated risk factors.

Conclusion

Menstrual problems are prevalent among teenage girls attending high school. Intake of recommended daily doses of protein, CHO, fat, vitamins, and minerals by adolescent girls may reduce issues related to menstruation. Menstrual health plays a crucial role in shaping the life of a teenage girl as a whole, and food is essential for life's development, sustenance, reproduction, and overall well-being. Adolescence, an age of physical, cognitive, and psychosocial growth, is a crucial period for developing eating habits that promote well-being and meet the body's nutritional needs, thereby laying the foundation for a quality and healthy life. Eating a balanced and healthy meal before the anticipated period can help reduce pain during the subsequent cycle.

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