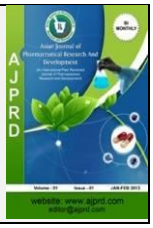
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Review Article

A Review: Impact of Menstrual Health on Academic Perfomance and Educational Outcomes

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ABSTRACT

Menstrual health is a critical component of women's physical, mental, social, and reproductive health. However, menstrual problems, inadequate menstrual hygiene management, limited access to sanitary products and facilities, stigma, and insufficient menstrual health education can all have a negative impact on girls' educational participation. This review investigates the link between menstrual health and academic performance, focusing on menstrual cycle phases, hygiene management, psychological and lifestyle factors, and school attendance. Menstrual symptoms such as dysmenorrhea, heavy bleeding, fatigue, mood swings, and discomfort can impair concentration, classroom participation, and attendance. Inadequate water, sanitation, and hygiene facilities, a lack of privacy, limited access to menstrual products, and social stigma can all contribute to increased menstruation related absenteeism.The review also discusses psychological and lifestyle factors such as stress, dietary habits, obesity, physical inactivity, and skipping breakfast, all of which can have an impact on menstrual health and well-being. Evidence suggests that improving menstrual hygiene facilities, providing accurate menstrual health education, ensuring access to safe and affordable menstrual products, and promoting supportive school environments can all help to reduce barriers to education. The review emphasizes the importance of long-term, high quality research, standardized menstrual-health measures, digital self-monitoring tools, and collaboration across healthcare, education, WASH, and policy sectors. A case study from rural Pune, Maharashtra demonstrates the association between menstrual problems, sanitation barriers, and school absenteeism among adolescent girls.

Keywords: Menstrual Health, Hygine Management, Menstrual symptoms, menstruation absenteeism

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INTRODUCTION

Menstrual health is critical for sexual and reproductive health, and it is associated with human rights, gender equality, and sustainable development. Despite being a natural process, menstruation is frequently stigmatized, particularly in low- and middle-income countries (LMICs)[1-3].The lack of comprehensive policy direction to address Menstrual health needs are concerning, although some countries like India, the Philippines, Kenya, South Africa and Zambia have initiated efforts to address this issue. Menstruation significantly affects a woman's physical Mental and social well-being. Menstrual health is defined as "a A state of complete physical, mental, and social well-being Not just the absence of disease or infirmity, in relation to "The Menstrual Cycle". Between menarche and menopause. Menstrual health is important because most women have periods essential to the general health of women[4-6]. Cyclic discharge of between menarche and menopause, blood from the uterine corpus is usually how mensuration is defined. The bleeding lasts from 2 and 7 days, on average, in each cycle of 21–31 days 28 days. Nearly 70–80% of women do not have any interference with their regular daily activities in the days preceding or during menstruation, while still Premenstrual syndrome (PMS) affects 20–30% of people. Adolescence in girls has been recognized as a unique Period in their life cycle that necessitates special attention. This Menarche is the onset of the menstrual cycle. Menstruation is unique to females and is

part of the female reproduction cycle. The ductive cycle begins at puberty. Scientific interest in cycle-sensitive training prescription has significantly increased in recent years, as hormonal variations throughout the menstrual cycle are considered relevant modulators of physical performance recovery. The hypothalamus, pituitary gland, and the ovaries interact to regulate the menstrual cycle and typically lasts 26 to 32 days. Using the framework proposed by McNultyetal .The cycle is divided into the early follicular (EF) and late follicular (LF) phases, ovulation (OV), and the early (EL), Mid (ML) and late luteal (LL) phases. At the beginning of the cycle (EF), circulating estrogen and progesterone levels are low. Estrogen levels rise toward ovulation, while progesterone predominates during the luteal phase, before both hormones decline. Near the end of the cycle. These hormonal fluctuations have been shown to influence the energy metabolism thermoregulation, neuromuscular activation, and psychological well-being[7-10].

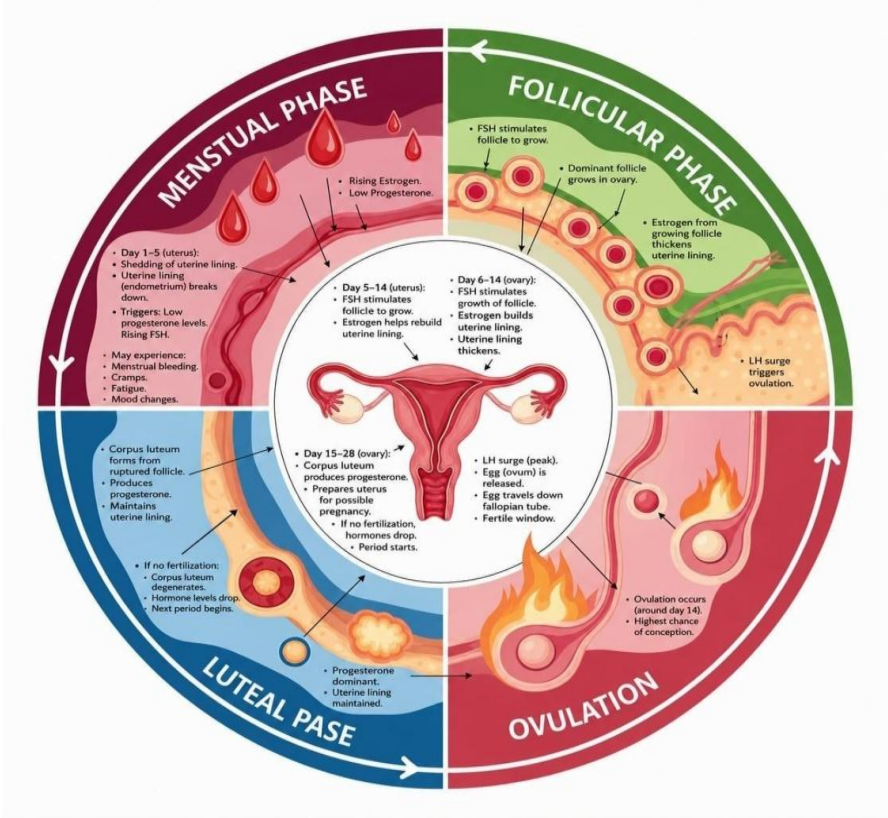


Figure 1: Menstrual Phase's Cycle

Mensturation Cycles

Phase 1: Follicular and Proliferative Phases:

Follicular Phase Events

The menstrual cycle begins with the follicular and proliferative phases, which correspond to ovarian follicle maturation and endometrial proliferation, respectively. The follicular phase, which varies in length, always begins on the first day of the menstrual cycle (when menstrual bleeding occurs) and ends with ovulation[11-13]. In a typical 28-day cycle, this phase lasts from days 1 through 14. Concurrently, the proliferative phase in the uterus begins after menstrual bleeding ends and lasts until ovulation. Follicular Phase Event: follicular phase, FSH stimulates the maturation of primordial follicles into Graafian follicles and increases the production of 17-β estradiol and inhibin B in the ovary. According to studies, the dominant follicle produces the majority of the hormone estrogen[14-16].

Proliferative Phase Events

17-β estradiol and inhibit B reduce FSH levels; no dominant follicles begin to degenerate. FSH stimulates **th**e production of new FSH receptors within the dominant Graafian follicle, increasing its sensitivity to FSH even as overall FSH levels decrease. The dominant follicle continues to mature, growing approximately 2 mm per day until it reaches a diameter of 18 to 29 mm (average 23.6 mm)().FSH also stimulates the development of LH receptors within the dominant follicle, preparing it for the next step, ovulation. Growing follicles produce 17-β estradiol, which stimulates the development of the endometrial stroma and glands from the decidualbasalis (basal layer of the endometrium) and increases the depth of the spiral arteries that supply the endometrium. By the end of the proliferative phase, the endometrium has reached its peak development, measuring between 8 and 12 mm, though this can vary. These changes prepare the endometrium for a possible pregnancy after ovulation, which occurs near the end of the proliferative phase. Furthermore, 17-β estradiol alters the elasticity and protein content of cervical mucus, creating channels for sperm entry into the uterine cavity[17-20].

OVULATION

Ovulation usually occurs 14 days before the onset of menstruation, so in an average 28-day cycle, ovulation happens on day 14. Estradiol levels increase during the follicular phase, and at the end, 17-β estradiol switches from negative to positive feedback at the anterior pituitary gland.

This transition from negative to positive feedback is not fully understood and is likely influenced by a number of factors; however, it usually occurs when a critical level of estradiol is reached[21-24]. Elevated estradiol levels stimulate gonadotrophic cells in the pituitary to produce more GnRH receptors, increasing their sensitivity to GnRH. Estradiol may also inhibit the breakdown of GnRH within pituitary cells, lowering the GnRH threshold required to trigger LH release. Additionally, a nonsteroidal ovarian product known as gonadotropin surge-attenuating factor (GnSAF) is thought to counteract the sensitizing effects of estradiol during the majority of the follicular phase. As estradiol levels rise during the follicular phase, GnSAF is suppressed, allowing estradiol's sensitizing effects to take effect at the end of the phase, leading to ovulation[25].

Phase 2: The Luteal and Secretory Phases

The luteal and secretory phases of the menstrual cycle follow, reflecting the roles of the corpus luteum in the ovary and the mature endometrium in the uterus, respectively. This phase starts with ovulation and ends when menstrual bleeding begins. Unlike the variable length of the follicular or proliferative phase, the luteal or secretory phase is relatively consistent within an individual, lasting approximately 14 days. During this phase, progesterone is the dominant hormone, and LH stimulates it[26-29].

Progesterone stimulates endometrial maturation in preparation for the implantation of a fertilized ovum. Progesterone stimulates the growth of complex glands, increases glycogen storage for energy, and expands the surface area of the spiral arteries. Furthermore, progesterone thickens and reduces the elasticity of cervical mucus, making it more difficult for sperm to penetrate. It also slightly raises the basal body temperature.The fertilized ovum secretes human chorionic gonadotropin (HCG), which stimulates the corpus luteum to continue producing progesterone. However, without a fertilized ovum, the natural rise in progesterone inhibits LH release via negative feedback at the pituitary gland, resulting in a rapid drop in progesterone and estradiol levels at the end of the phase. As these hormone levels decline, hypothalamic GnRH is released from feedback inhibition, resulting in an increase in secretion in preparation for the following cycle[30].

Menstrual Health Factors Affecting Academic Perfomance 31-34

Table 1: Menstrual Health Factors Affecting Academic Performance

FACTOR	POSSIBLE EDUCATIONAL EFFECT
Dysmenorrhea or menstrual pain	Reduced concentration, participation, and attendance may disrupt daily activities.
Heavy menstrual bleeding	Fatigue/discomfort, increased need to change absorbents, and possibly missed classes.
Limited access to products	May result in missed school days or restricted participation.
Stigma and teasing	Result in embarrassment, anxiety, and a decreased willingness to participate or seek help
Lack of menstrual education	Poor Preparation And Misconceptions Can Lead To Increased Anxiety And In Effective Management.
Premenstrual symptoms	mood swings, fatigue, or discomfort can all have an impact on academic performance
Poor MHM facilities	Difficulty changing products, insufficient water/privacy, and a fear of staining can all contribute to absence.

Menstrual Health and Academic Attendance

Chronic absenteeism is defined as missing 10% or more of school. The burden is not distributed evenly. Emerging evidence from China implies that school refusal and chronic absenteeism are meaningful. Concerns among adolescents, but the evidence from China remains. limited and only a small number of studies investigate these attendance. Due to menstruation-related problems, 43%-50.7% of Students were absent from school for one or more days to four days .Approximately 90% of students reported Their school did not have a separate sanitary facility. For females, approximately 43% of informants were required to have missed school during their menstrual period[35-38]. The absence of separate facilities was also associated with a high Oromia has a 65% female school dropout rate Amhara (33%) regional states of Ethiopia. Students reported difficulty attending class due to menstrual related issues like pain. And fear of unexpected menstrual blood leakage, as they did. Not using proper sanitary napkins approximately 39% of respondents reported that menstruation affected them academic performance or rank negatively when compared.to their position before menarche. They also experienced discomfort and shame sitting next to male students in class[39-41].

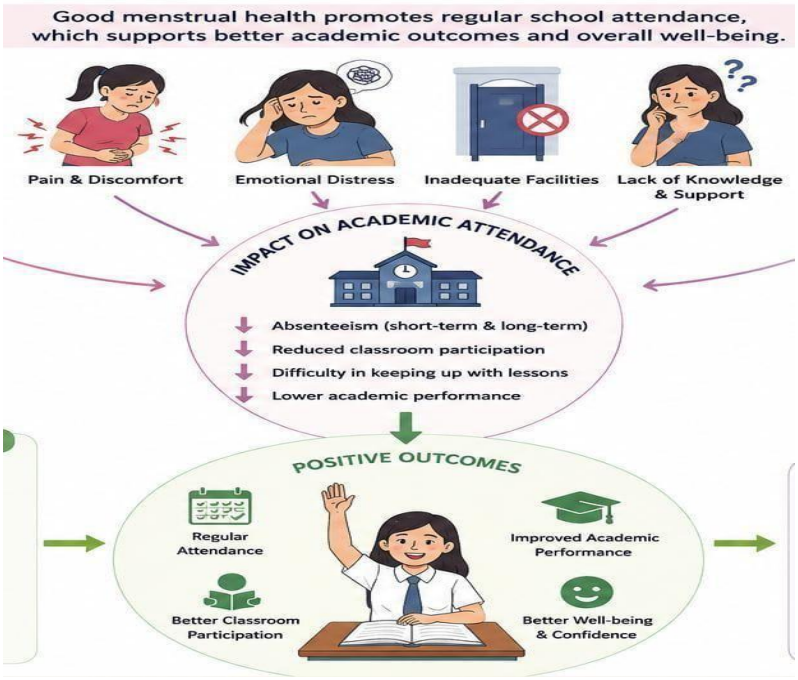


Figure 2: Menstrual Health and Academic Attendance and Interconnected Relationship

Menstrual Hygience Management

Menstrual health and hygiene (MHH) refers to the overall mental, physical, and social wellbeing associated with the menstrual cycle, rather than simply the absence of disease. Previous Studies have shown that adolescent girls face barriers in Providing safe, sanitary, and dignified menstrual experiences Within educational settings challenges include limited access to clean and efficient absorbent materials; water, sanitation, and WASH facilities, limited pre-menstrual information, and inadequate health education about menstruation. Puberty and a lack of social support from teachers, families, and peers to manage menstruation at school and at home[42-45].These challenges may be associated with adverse health outcomes such as urinary or reproductive tract infections (RTIs).Anxiety, shame, fear, and other negative mental health outcomes Depression and with girls' educational outcomes including difficulty in participating and engaging in class, missed hours or days of school, and potentially contribution to school dropouts. Recognizing the magnitude of morbidity and poor quality of life that a woman would face in the absence of proper MHM perception and practices in the country, the Government of India has incorporated MHM into national policies and programs as part of initiatives to improve the health, well-being, and nutritional status of adolescent girls and women, as well as to reduce adolescent girls' school absenteeism. UNICEF has also been instrumental in providing technical guidance and support for raising awareness, addressing behaviour change, building the capacity of frontline community cadre, sensitizing key stakeholders, and establishing WASH facilities with safe disposal options. The "Swatch Bharat: Swatch Vidyalaya" campaign has been launched to ensure that every school in India has a set of functional and well-maintained WASH facilities, including soap, private space for changing, adequate water for washing, and disposal facilities for used menstrual absorbents[46].



Figure 3: Menstrual Hygiene Management

Menstrual Health and Psycological Factors

1. STRESS

Stress can disrupt menstrual function due to dysregulation of the hormones. The hypothalamic-pituitary-adrenal axis primarily regulates the body's stress response. The hypothalamus regulates The gonadotropin-releasing hormone regulates the menstrual cycle by stimulating the pituitary gland to secrete follicle stimulating hormone (FSH) and luteinizing hormone (LH) on a regular basis. FSH It is crucial for follicular maturation, while LH Regulates estradiol secretion by maturing. The follicle is necessary for ovulation and helps maintain the corpus luteum after it is formed. When the cycle is disrupted, regular menstrual function may stop for a period of time, depending on the nature and the duration of menstrual pause is determined by the continuation[47].

2. INTAKE OF JUNK FOOD

Most Indian foods are deep-fried in fats, particularly Tran's fats. Fast food consumption contributes to a higher proportion of calories coming from total and saturated fats. Additionally, the micronutrient content of the food also plays a role. Fast food is also inexpensive.Junk foods are high in Saturated fatty acids should interfere with the Progesterone metabolism occurs during the luteal phase. Regular menstrual cycles can lead to premenstrual symptoms. Symptoms. Junk foods deficient in micronutrients such as vitamin B6, calcium, magnesium, and potassium may cause premenstrual symptoms[48].

3. OBSEITY

There are several mechanisms that link adipose tissue to ovulation and the menstrual cycle

- Adipose/fat tissue converts androgens into Aromatization of estrogen occur in the breast, abdomen, omen, and fatty marrow of long bones.
- Body weight this affects the direction of estrogen metabolism. Thin women produce less potent and inactivated product Obesity and the 2-hydroxylated form of estrogen Women produce stronger forms of estrogen due to activated estrogenic activity (16-hydroxylated form)
- Obese women have decreased estrogen binding capacity with SHBG, which inactivating estrogen leads to increased levels. The percentage of free serum estradiol.
- Adipose Obese women's tissues store steroid hormones. Also, central effects on the hypothalamic-pituitary axis. Additionally, it has the potential to regulate ovarian function[49].

1. LACK OF PHYSCIAL ACTIVITY

Daily physical activity Maintaining an ideal body weight, increasing insulin sensitivity, increasing BMR, and stimulating endorphins can help regulate the menstrual cycle, improve PCOD and hypothyroidism, reduce PMS, and improve overall well-being. Low physical activity has the strongest effects. Women who have irregular periods. Obese and sedentary individuals have higher rates of Irregular periods compared to normal weight Women who exercise moderately. Excess adipose tissue may affect androgen and estrogen levels. Multiple paths may lead to a reservoir. Lipid-soluble steroids may affect hormone-hormone interactions and sex hormone binding.

2. SKIPPING BREAKFAST

Breakfast habits are associated with physical, psychological, and social health Several studies found associations between Skipping breakfast leads to fatigue at noon, which worsens Memory loss, increased BMI, obesity prevalence, chronic illnesses, energy, vitamin, and mineral deficiencies, and rise in Risk factors for central obesity and insulin resistance This includes cardio-metabolic disorders. The reasons behind Skipping breakfast was attributed to time constraints, inability to cook, lack of appetite, late-night eating, and other reasons. Skipping breakfast has been linked to weight control, habit formation, and more. Has a greater impact on both waist circumference and Skipping breakfast has been linked to higher BMI, obesity, and overweight worldwide. In Skipping meals among adults may lead to an increase in Changes in body weight, insulin resistance, and fasting lipid levels. Breakfast has direct influence. Blood glucose levels are also affected has a direct impact on cognitive function[50].

CHALLENGES OF MENSTRUAL HEALTH

1. Menstrual Hygiene Management Awareness: Minimizing Barriers

Access to accurate and practical information is essential Prerequisite for sanitary menstrual practices. Studies from Different areas of the country have revealed that awareness Menstruation is recognized as a normal biological process the phenomenon is abysmally poor in different parts of the society.

2. Improving Access to Hygienic Menstrual Hygience Management Products

Hygienic menstrual absorbents are available at an affordable price Cost is an important determinant of healthy menstrual cycles Management Practice. Throughout the years, numerous initiatives have taken in this direction, and the recent National Family. According to data from the National Family Health Survey 4 (NFHS 4), 57.6% Women use hygienic methods for menstrual protection.

3. Disposal Infrastructure: Limited Capacity

Used napkins should be disposed of in an environmentally friendly manner. However, discarding used napkins has become an India is experiencing an increase in this problem. It is not yet decided if soiled the absorbents will be classified as hazardous solid waste the presence of plastic in disposable napkins, or as biomedical Waste is contaminated with blood and bodily fluids. The decision will have implications for planning and implementation. Menstrual waste should be managed appropriately in the country. Currently, approximately 42% of Indian women aged 15 to 24 years are the use of sanitary napkins (NFHS 4) is obvious. Commercial sanitary products will continue to grow with time. Approximately 121 million girls and women in India Currently, the average person uses eight disposable sanitary pads in a month, generation of waste load is

expected to be 1.021 billion pads per month, which are safely disposed of nation[51].

4. Exemption from the Goods and Services Tax: The Need

Sanitary napkins cannot be considered luxury items this is for women. However, the unfair classification of sanitary napkins for tax purposes restricts access to this essential commodity to a large proportion of needy women.

Future Perspectives in Menstrual Health

Future research should prioritize high-quality, long-term studies to better understand menstrual health, pain, disorders, hormonal changes, and their effects on physical, academic, and athletic performance. Menstrual health education and awareness should be prioritized in order to reduce stigma and misconceptions while also ensuring access to safe, affordable, acceptable, and sustainable menstrual products. Future healthcare services should promote early detection and management of menstrual problems, as well as providing appropriate care throughout one's life. Personalized approaches to nutrition, exercise, symptom management, and menstrual cycle awareness may improve individual well-being and performance.Digital tools, such as menstrual tracking apps, may aid in self-monitoring and self management. Furthermore, future research should prioritize the needs of underserved and vulnerable populations, improve standardized methods for measuring menstrual health, strengthen collaboration among healthcare, education, WASH, and policy sectors, and develop supportive policies and interventions that can be effectively implemented and scaled up. These efforts can contribute to better menstrual health, well-being, participation, productivity, and overall quality of life.

CASE STUDY

Case Study: Menstrual Health and Performance of Adolescent Girls in Rural Pune, Maharashtra

A cross-sectional study of 740 adolescent schoolgirls in a rural field-practice area of Pune, Maharashtra, looked into the impact of menstruation on school attendance and the factors that influence menstrual management. Of the 740 participants, 622 (84.05%) had achieved menarche. Among these girls, 269 (43.2%) reported being absent from school due to menstruation, with an average absence of 1.2 days. Menstrual disorders, abdominal pain, socioeconomic status, and the type of menstrual material used all had a significant association with school absenteeism. Girls with menstrual disorders, in particular, had significantly higher absenteeism rates than those without.The studies also demonstrated the importance of school sanitation and menstrual management facilities in promoting school attendance. Among the girls who had reached menarche, 339 (54.5%) reported bringing pads or cloth to school, while 283 (45.5%) did not, owing to insufficient sanitation facilities. Common toilet entrances for boys and girls, insufficient water availability, dirty toilets, a lack of privacy, and the absence of appropriate facilities for changing menstrual materials were among the issues reported. These barriers may complicate menstrual management and contribute to menstrual-related school absenteeism.This Maharashtra case study is important for menstrual health and performance because menstrual disorders, abdominal pain, poor sanitation, and difficulties managing menstrual materials can all interfere with girls' regular school attendance. Although the study focused on school attendance rather than exam scores or academic achievement, repeated absenteeism can limit classroom participation and learning opportunities[52].

CONCLUSION

Menstrual health is an important part of women's physical, mental, social, and reproductive well-being, and it can have a big impact on their daily lives, education, and performance. This review emphasizes how hormonal changes, menstrual symptoms, nutrition, physical activity, stress, body weight, menstrual hygiene practices, and access to appropriate menstrual products and sanitation facilities all have an impact on menstrual health.Pain, heavy menstrual bleeding, premenstrual symptoms, anxiety, and poor menstrual hygiene management can all lead to decreased concentration, discomfort, absenteeism, and participation in educational and other activities.The review emphasizes the importance of menstrual hygiene management, which includes access to affordable and appropriate menstrual products, clean water, sanitation, privacy, safe disposal facilities, accurate menstrual health education, and social support. Stigma, a lack of awareness, inadequate facilities, and difficulty accessing menstrual products continue to be significant challenges, particularly for adolescent girls. The rural Pune case study shows that menstrual disorders, abdominal pain, socioeconomic factors, and insufficient sanitation facilities can all contribute to menstruation-related school absenteeism, emphasizing the importance of supportive school environments and improved menstrual management facilities. Improving menstrual health necessitates a comprehensive and supportive approach that includes education, healthcare services, families, schools, communities, and policymakers. Raising awareness, lowering stigma, ensuring access to safe and affordable menstrual products, improving WASH facilities, encouraging healthy nutrition and physical activity, and providing timely menstrual management can all help to improve participation, productivity, well-being, and quality of life. Future research should concentrate on highquality long-term studies and personalized approaches to nutrition, exercise, symptom management, and menstrual cycle awareness.

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