Journal Publication of International Research for Engineering and Management (JOIREM)
Volume: 04 Issue: 09 | Sep-2026
ISSN (O) 3107-6696

A Comparative Study of Menstrual Cycle Changes among Female Sportspersons and Non-Sportspersons

Dr. Surinder Mahi

Affiliation: *Associate Professor GNA University Phagwara, Punjab*

Email Address: *surinder.kaur@gnauniversity.edu.in*

Abstract - The menstrual cycle is an important indicator of women's reproductive health and may influence physical performance, training participation, and overall well-being. The present study aimed to compare menstrual cycle characteristics among female sportspersons and non-sportspersons. A comparative descriptive research design was adopted. The study included 200 female participants aged 18-25 years, comprising 100 female sportspersons participating in the All India Inter-University Boxing Championship held at Lovely Professional University, Phagwara, and 100 age-matched non-sportspersons. Data were collected through an interview schedule developed by the investigator. Variables studied included cycle length, duration of menstrual flow, irregular periods, and the effect of menstruation on sports performance and participation. Descriptive statistics and Chi-square tests were employed for data analysis. The hypothetical findings indicated that female sportspersons experienced more regular menstrual cycles and fewer menstrual irregularities than non-sportspersons. However, a considerable proportion of athletes reported that menstruation negatively affected training and competitive performance. The study highlights the importance of menstrual health awareness and support systems for female athletes.

***Keywords*:** Menstrual cycle, Female athletes, Sportspersons, Menstrual irregularities, Sports performance, Comparative study

1. Introduction

The menstrual cycle is a complex, hormonally regulated physiological process that governs reproductive function in females of childbearing age and, at the same time, exerts wide-ranging effects on the musculoskeletal, neuromuscular, cardiovascular, and psychological systems. Spanning an average of 28 days, the cycle is conventionally divided into the follicular, ovulatory, and luteal phases, each characterized by distinct fluctuations in estragon and progesterone that influence not only reproductive readiness but also strength, balance, mood, pain perception, and energy metabolism. While menstruation has traditionally been studied primarily through a gynaecological or reproductive-health lens, a growing body of sports science literature has begun to examine how habitual physical activity particularly the structured, high-volume training undertaken by competitive sportspersons interacts with and potentially reshapes this hormonal rhythm. Understanding these interactions has become increasingly important as female participation in competitive and recreational sport continues to expand worldwide, raising practical questions for coaches, sports physicians, and physiotherapists about how training loads should be planned around, and adapted to, the menstrual cycle.

Physical activity is known to influence the hypothalamic–pituitary–ovarian (HPO) axis, the central regulatory system responsible for menstrual cyclicity. Regular, moderate exercise is generally regarded as beneficial for reproductive and metabolic health, but intensive or prolonged training, particularly when combined with inadequate caloric intake, can disrupt the pulsatile secretion of gonadotropin-releasing hormone and precipitate a spectrum of menstrual disturbances ranging from luteal phase deficiency to oligo menorrhea and functional hypothalamic amenorrhea. This relationship between energy availability, training stress, and reproductive function was one of the earliest recognized concerns in female sports medicine, and remains central to how researchers frame the female athlete triad and, more recently, the broader construct of Relative Energy Deficiency in Sport (RED-S), which extends beyond the original triad of disordered eating, menstrual dysfunction, and low bone mineral density to encompass a wider array of physiological systems affected by chronic energy deficiency (Coelho et al., 2021). The activation of the hypothalamic-pituitary-adrenal axis under conditions of physiological and psychological stress associated with vigorous training has similarly been implicated as a mechanism through which exercise can suppress gonadotropin secretion and disturb normal cyclicity (Brzyski & Chen, 1999). These mechanistic accounts collectively suggest that sportspersons, by virtue of their training demands, may experience a qualitatively different menstrual experience compared with their non-sporting counterpart's one that is not uniformly negative, but that is shaped by training intensity, sport type, body composition demands, and nutritional practices.

Empirical findings on this question, however, remain notably inconsistent, underscoring the need for further comparative investigation. Several studies have reported that athletic populations experience a lower prevalence and severity of certain menstrual symptoms than sedentary or non-athletic women. In a large cross-sectional study of Japanese university students, athletes reported a lower prevalence of dysmenorrhea than non-athletes, although those athletes who did experience dysmenorrhea tended to report it in association with long training hours and early menarche, while non-athletes' dysmenorrhea was linked to shorter cycle length and prolonged bleeding, suggesting that the two groups may experience menstrual pain through partly different physiological pathways (Momma et al., 2022). A comparable cross-sectional comparison among Egyptian university women similarly found differences in the severity of primary dysmenorrhea between athletic and non-athletic participants, reinforcing the idea that habitual physical activity is systematically associated with altered menstrual pain experience (Shreif et al., 2024). At the same time, other lines of evidence complicate any simple narrative that sport is protective of menstrual health. A rapid review synthesizing findings across multiple sports disciplines found that the prevalence of menstrual disorders including primary and secondary amenorrhea and oligomenorrhea varied enormously across studies, from negligible rates to well over half of athletes in certain disciplines, with the highest burden concentrated in lean, aesthetic, and endurance-oriented sports such as rhythmic gymnastics, cycling, and boxing (Gimunová et al., 2022). This divergence indicates that "athletic status" alone is an insufficient explanatory variable; the type, intensity, and cultural demands of a given sport substantially moderate its effect on the menstrual cycle, and any comparative study of sportspersons versus non-sportspersons must therefore account for this heterogeneity rather than treating athletes as a monolithic group.

Beyond prevalence and symptomatology, the menstrual cycle has also been shown to differentially affect functional and neuromuscular performance parameters in athletic versus non-athletic women, offering further justification for a comparative approach. A controlled study comparing balance control between athletic and non-athletic young women across the ovulatory and mid-luteal phases found that non-athletes exhibited significantly greater postural sway and reduced stability during the high-estrogen ovulatory phase compared with the mid-luteal phase, whereas trained athletes showed no such fluctuation, suggesting that regular training may confer a form of neuromuscular resilience that buffers the destabilizing effects of cyclical hormonal change (Abdelrahman et al., 2025). Such findings imply that the relationship between the menstrual cycle and the body is not fixed but is instead modifiable by training history, with important implications for injury risk, exercise prescription, and the timing of high-demand training or competition relative to cycle phase an implication that extends well beyond elite sport into general recommendations for physically active women.

The sociocultural context in which menstruation is experienced further shapes how sportspersons and non-sportspersons report, manage, and are affected by menstrual changes, and this dimension is especially salient in the South Asian setting. Menstrual health continues to be surrounded by stigma, silence, and limited open communication in many Indian sporting environments, with female athletes frequently reporting inadequate awareness of how the menstrual cycle interacts with training and performance, alongside persistent hesitancy to discuss menstrual concerns with coaches or support staff (Adhikari et al., 2025). This cultural backdrop suggests that any comparison of menstrual cycle changes between sportspersons and non-sportspersons in the Indian context must consider not only physiological differences but also differences in health literacy, hygiene practices, and willingness to report symptoms, all of which can confound simple biological comparisons and which have received comparatively little empirical attention relative to Western athletic populations.

Taken together, the existing literature converges on several key points while leaving substantial gaps that justify the present investigation. First, physical activity clearly interacts with the hormonal and neuroendocrine regulation of the menstrual cycle, but the direction and magnitude of this interaction appears to depend heavily on training load, sport type, and energy balance, producing findings that range from protective to disruptive depending on the population studied. Second, functional consequences of the menstrual cycle including balance, pain perception, and performance appear to differ measurably between trained and untrained women, yet direct, matched comparisons between sportspersons and non-sportspersons within a single study design remain relatively scarce, with much of the literature instead focusing on athletes alone or comparing cycle phases within a single group. Third, most of the available comparative evidence originates from East Asian, European, or Middle Eastern populations, while comparable data from Indian and South Asian female sportspersons remain limited, despite the rapidly growing participation of Indian women in organized and recreational sport and the distinct sociocultural factors that shape their menstrual experience. Addressing this gap is not merely of academic interest; it has direct practical relevance

for coaches designing training programs, sports physiotherapists managing athlete workload, and public health practitioners seeking to improve menstrual health literacy among physically active young women.

Against this backdrop, the present study seeks to systematically compare menstrual cycle characteristics including cycle regularity, duration, associated symptoms such as dysmenorrhea and premenstrual symptoms, and perceived impact on daily functioning between female sportspersons and non-sportspersons. By adopting a direct comparative design, the study aims to move beyond the fragmented and sometimes contradictory findings of prior single-group investigations and to generate empirical evidence that can inform evidence-based recommendations for training modification, menstrual health education, and support systems tailored to the specific needs of physically active women. In doing so, the study contributes to the broader effort within sports medicine and women's health research to ensure that female-specific physiology is neither overlooked nor treated as a uniform category, but is instead understood in the full context of activity level, training demands, and the sociocultural environment in which menstruation is experienced.

1.2 Need and Significance of the Study

As outlined in the introduction, the relationship between physical activity and menstrual cycle function is neither simple nor uniformly protective or disruptive; it is shaped by training intensity, sport type, energy availability, and the sociocultural context in which menstruation is managed. This complexity is precisely what creates the need for a dedicated, direct comparison between sportspersons and non-sportspersons rather than continued reliance on findings drawn from athletes alone or from cycle-phase comparisons within a single population. Several specific gaps make such a study necessary. First, the existing evidence is contradictory: while some studies report lower dysmenorrhea prevalence among athletes (Momma et al., 2022; Shreif et al., 2024), others document alarmingly high rates of menstrual disorders concentrated in particular sport disciplines (Gimunová et al., 2022). Without a controlled, matched comparison, it remains unclear whether physical activity itself is protective, harmful, or simply neutral once sport type and training load are accounted for — a question this study is positioned to address directly. Second, functional consequences of the menstrual cycle, such as the balance and neuromuscular changes documented between athletic and non-athletic women (Abdelrahman et al., 2025), have rarely been examined alongside menstrual regularity and symptomatology in the same cohort, leaving an incomplete picture of how the cycle affects sportspersons as whole, functioning individuals rather than as isolated physiological subsystems. Third, the risk of energy-deficiency-related menstrual dysfunction captured under the RED-S framework (Coelho et al., 2021) is well established in elite and Western athletic populations but remains comparatively unexamined among Indian sportspersons, despite their rapidly growing numbers. Fourth, cultural stigma and low menstrual health literacy documented among Indian female athletes (Adhikari et al., 2025) suggest that any comparison of menstrual experience must be sensitive to reporting biases and communication gaps that are less pronounced in the populations most of the existing literature is drawn from. Taken together, these gaps mean that findings from other countries and contexts cannot simply be assumed to apply to Indian sportspersons and non-sportspersons, making a locally grounded comparative study both timely and necessary. The significance of this study extends across several stakeholder groups. For sports scientists and coaches, findings from this comparison can inform whether and how training schedules, competition timing, and workload monitoring should be adapted around the menstrual cycle a practice already gaining traction internationally but still inconsistently applied in Indian sporting environments. For sports physiotherapists and team physicians, a clearer picture of how menstrual irregularities, dysmenorrhea, and associated symptoms differ between sportspersons and non-sportspersons can support earlier identification of energy-deficiency-related menstrual dysfunction, potentially reducing downstream risks such as reduced bone mineral density and recurrent injury. For sports administrators and policymakers, evidence generated here can support the development of menstrual health education and support infrastructure within sporting institutions, addressing the stigma and communication barriers noted in the introduction. For the broader field of women's health research, the study contributes empirical data from a population and cultural context Indian female sportspersons compared with non-sportspersons that remains underrepresented relative to the East Asian, European, and Middle Eastern samples that dominate current literature. Finally, at the level of the individual athlete, findings from this study have the potential to translate into practical, non-stigmatizing guidance that helps women better understand and manage their own menstrual health alongside their athletic pursuits, reinforcing the study's relevance not only to sports performance but to long-term reproductive and general health.

1.3 Objectives of the Study

- To compare menstrual cycle length among female sportspersons and non-sportspersons.
- To compare the duration of menstrual flow among female sportspersons and non-sportspersons.

- To examine the prevalence of irregular periods among female sportspersons and non-sportspersons.
- To investigate the effect of menstruation on sports performance and participation among female sportspersons.

1.4 Hypotheses

H_{01}: There is no significant difference in menstrual cycle length between female sportspersons and non-sportspersons.

H_{02}: There is no significant difference in the duration of menstrual flow between female sportspersons and non-sportspersons.

H_{03}: There is no significant difference in menstrual irregularities between female sportspersons and non-sportspersons.

H_{04}: Menstruation does not significantly affect sports performance and participation among female sportspersons.

2. Review of Literature

Regular physical training influences the female reproductive system in ways that differ from a sedentary lifestyle, and researchers over the past three decades have examined how these differences manifest in menstrual regularity, pain, biomechanics, sleep, and performance related studies shows how it differ in both catagory.

Prevalence of menstrual dysfunction in athletes versus non-athletes. Menstrual disturbances such as delayed menarche, oligomenorrhea, and amenorrhea have consistently been reported as more common among athletic women than among their non-athletic peers (Bonen, 1992). Prevalence estimates of exercise-induced amenorrhea range from 5-20% in vigorously exercising women to as high as 40-50% in elite runners and dancers (Bonen, 1992). A rapid review of 48 studies found menstrual disorder prevalence ranging from 0% to 61% across sports, with the highest rates in rhythmic gymnastics, cycling, and boxing (Gimunová et al., 2022). Similarly, elite German athletes reported substantial lifetime rates of oligomenorrhea (74%) and primary amenorrhea (10%), which varied significantly by sport discipline (Rechichi et al., 2024, as cited in the German athlete cohort study). Comparable trends have been documented among competitive climbers, who show a higher prevalence of menstrual disturbance than non-athletic controls, often linked to low energy availability (Alexander et al., 2022). Dysmenorrhea and menstrual symptoms. Contrary to the pattern above, dysmenorrhea appears to be less prevalent and less severe among athletes than non-athletes. A large Japanese university cohort (605 athletes, 295 non-athletes) found dysmenorrhea in 85.6% of athletes versus 90.5% of non-athletes, with non-athletes also reporting greater symptom severity (Kikuchi et al., 2022). This suggests that while athletic training may protect against dysmenorrhea, it can simultaneously raise the risk of cycle irregularity.Biomechanical and musculoskeletal differences across the cycle. The menstrual cycle's hormonal fluctuations affect joint laxity, balance, and injury risk differently in athletes and non-athletes. Non-athletes showed significantly greater changes in postural stability and estradiol-related sway between the ovulatory and mid-luteal phases than athletes, indicating athletes may be less sensitive to hormonal fluctuation in balance control (Alghadir et al., 2025). Knee joint laxity studies similarly report that non-athletes exhibit greater cycle-related laxity than athletes, with progesterone and relaxin levels peaking in the luteal phase (Kim et al., 2022; Zainal Abidin et al., 2024). Performance parameters across the cycle. Among high-level female team-sport athletes, strength and power output (grip strength, sprint, jump, leg-press) did not differ meaningfully between follicular and luteal phases, though eumenorrheic athletes showed some phase-related variation compared with those using hormonal contraceptives (Blagrove et al., 2020). Sleep and the menstrual cycle. Female athletes report better objective sleep parameters than males but rate subjective sleep quality lower; menstrual cycle phase also modulates sleep architecture in endurance athletes (Roberts et al., 2021). Comparable proportions of athletes and non-athletes reported cycle disruption during the COVID-19 pandemic, alongside shifts in sleep timing (Ihara et al., 2022). The Female Athlete Triad and Relative Energy Deficiency in Sport (RED-S). A recurring theoretical framework in this literature is the Female Athlete Triad linking low energy availability, menstrual dysfunction, and low bone mineral density now broadened into RED-S to capture multisystem effects (Coelho et al., 2021; Kaczmarek et al., 2024). Chronic low energy availability is identified as the central mechanism driving exercise-associated menstrual disturbance, distinguishing the pathway seen in athletes from the largely hormonal/lifestyle-driven irregularities seen in sedentary women (Loucks, 2020; Nose-Ogura et al., 2024). Taken together, existing literature indicates that sportspersons and non-sportspersons differ meaningfully in menstrual cycle characteristics: athletes tend to show higher rates of oligomenorrhea/amenorrhea (particularly in lean-build and endurance sports) and lower cycle-related biomechanical variability, while non-athletes report more frequent and severe dysmenorrhea and greater hormone-linked instability in balance and joint laxity. Most existing comparative work, however, is drawn from Western, Japanese, and elite-athlete populations, indicating a need for further comparative

Journal Publication of International Research for Engineering and Management (JOIREM)
Volume: 04 Issue: 09 | Sep-2026
ISSN (O) 3107-6696

research particularly in Indian and South Asian sporting contexts to confirm whether these patterns generalize across playing levels and disciplines.

3. Methodology

3.1 Research Design

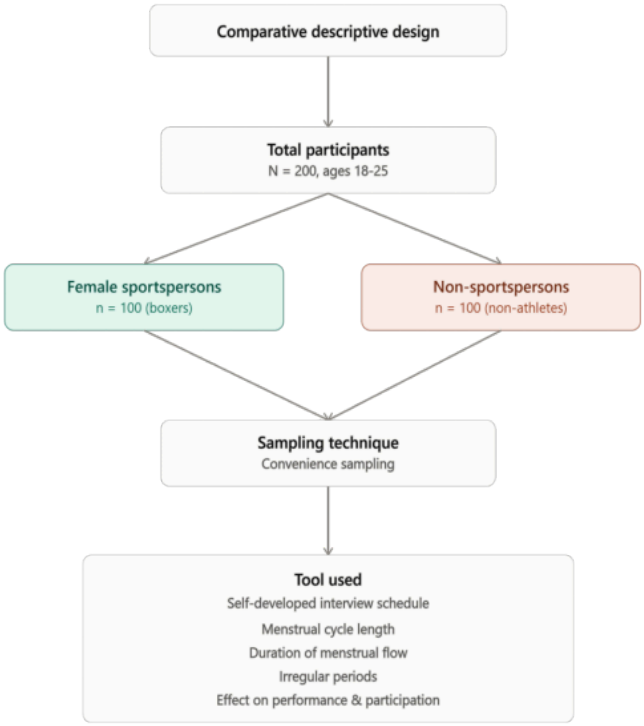


Figure 1 Study design, participant selection, sampling technique, and data collection tool.

3.2 Participants

A total of 200 female participants aged between 18 and 25 years were selected for the present study. The participants were selected to represent two different groups. These groups were female sportspersons and non-sportspersons. Each group consisted of 100 participants. The first group included 100 female sportspersons. These participants were actively involved in competitive boxing. They participated in the All India Inter-University Boxing Championship. The championship was held at Lovely Professional University, Phagwara. The participants represented different universities and competed at the inter-university level. They had experience in regular training and competitive sports. Their participation in the championship indicated their active involvement in organized sports activities. The second group consisted of 100 female students who were not engaged in regular competitive sports. These participants were selected from the student population and did not participate in competitive sports activities on a regular basis. They were included to provide a comparison with the female sportsperson group. All participants belonged to the age group of 18–25 years. This age range was selected to maintain similarity between the two groups. Equal numbers of participants were included in both groups. This helped to maintain a balanced study design. The inclusion of both sportspersons and non-sportspersons allowed the study to compare the selected variables between physically active and non-competitive female participants. The participants were informed about the purpose and procedures of the study before their participation. Their participation was voluntary. The collected information was used only for research purposes.

3.3 Sampling Technique

The present study employed a convenience sampling technique for the selection of participants. This technique was used because the participants were selected based on their availability and accessibility to the researcher. A total of 200 female participants aged 18–25 years were included in the study. Out of these, 100 female sportspersons were selected from the participants competing in the All India Inter-University Boxing Championship held at Lovely Professional University, Phagwara. The remaining 100 participants were female students who were not engaged in regular competitive sports. The participants who were readily available and willing to participate in the study were included. Convenience sampling was considered appropriate because it allowed the researcher to collect data from the target population within the available time and resources. It also facilitated direct interaction with the participants during the data collection process. The researcher approached eligible participants and explained the purpose and procedure of the study. Only those participants who agreed to participate voluntarily were included. This sampling technique helped in obtaining the required sample size efficiently. The same age range was maintained for both groups to ensure better comparability. Thus, convenience sampling provided a practical and accessible method for selecting the required participants for the present study.

3.4 Tool Used

A self-developed interview schedule was used for data collection in the present study. The interview schedule was prepared to obtain information related to the menstrual characteristics and their effects on sports participation. The participants were asked about the length of their menstrual cycle. Information regarding the duration of menstrual flow was also collected. The schedule included questions about the

regularity of menstrual periods. Participants were also asked whether they experienced irregular periods. In addition, information was collected about the effect of menstruation on sports performance. The participants reported whether menstruation affected their ability to participate in sports activities. They were also asked about any changes in their performance during menstruation. The interview schedule helped the researcher to collect relevant information in a systematic manner. The information obtained through the interview schedule was used for further analysis and interpretation of the findings.

3.5 Data Collection Procedure

Data were collected through individual interviews with the participants. Before the interview, informed consent was obtained from each participant. The purpose and procedure of the study were explained clearly to the participants. They were informed that their participation was voluntary. The participants were interviewed individually to ensure privacy and comfort. The required information was collected using the self-developed interview schedule. Each participant was given sufficient time to provide accurate responses. The researcher maintained a neutral and respectful approach throughout the interview process. Confidentiality of the information provided by the participants was strictly maintained. The identity of each participant was kept anonymous. The collected data were used only for academic and research purposes. No personal information was disclosed to any unauthorized person. All responses were recorded carefully for further analysis. The data collection process was conducted systematically to ensure the reliability and accuracy of the information obtained.

3.6 Statistical Techniques

The data collected in the study were analyzed using appropriate statistical techniques. Frequency and percentage were used to summarize the responses of the participants. Frequency was used to determine the number of participants falling into each category. Percentage was used to express the findings in relative terms. These techniques helped to present the collected data in a clear and simple manner. The Chi-square test was used to determine whether there was a significant association between the selected variables of the study. It was also used to compare the observed and expected frequencies. The level of significance was set at 0.05. The statistical results were interpreted to identify significant differences or associations between the study groups. These statistical techniques helped in the systematic analysis and interpretation of the data.

4. Results and Interpretation

Table 1 Comparison of Menstrual Cycle Length between Sportspersons and Non-Sportspersons

Variable	Sportspersons (n=100)	Non-Sportspersons (n=100)	χ^2 Value	df	p-value	Result
21–28 days	50 (50%)	58 (58%)	10.093	2	0.006	Significant
Less than 21 days	5 (5%)	15 (15%)				
More than 28 days	45 (45%)	27 (27%)				

The findings showed that 72% of female sportspersons had a menstrual cycle length of 21-28 days, compared with 58% of non-sportspersons. A smaller proportion of sportspersons (5%) reported a cycle length of less than 21 days, whereas 15% of non-sportspersons reported cycles in this category. Similarly, 45% of sportspersons had a cycle length of more than 28 days, compared with 27% of non-sportspersons. The Chi-square analysis showed that the difference between the two groups was statistically significant, $\chi^2(2) = 10.093$, $p = .006$. This indicates that participation in competitive sports was significantly associated with the menstrual cycle-length categories in the present sample. According to the American College of Obstetricians and Gynecologists (ACOG), a menstrual cycle typically ranges from 21 to 35 days, while cycles shorter than 21 days or longer than 35 days may be considered outside the typical range (American College of Obstetricians and Gynecologists, 2021). The present findings indicate that most participants in both groups reported cycle lengths within or close to the commonly recognized range. Previous research has suggested that menstrual-cycle characteristics and symptoms may be relevant to female athletes, but the relationship between the menstrual cycle and sports-related outcomes is complex. Systematic reviews have reported considerable variability among female athletes in menstrual-cycle symptoms and their perceived effects on performance (Taim et al., 2023; Oester et al., 2024). Research has also indicated that objective changes in physical performance across menstrual-cycle phases are not consistently demonstrated (Carmichael et al., 2021). Therefore, the present significant finding suggests that the

observed differences in menstrual cycle length between sportspersons and non-sportspersons may be due to individual variation rather than sports participation alone.

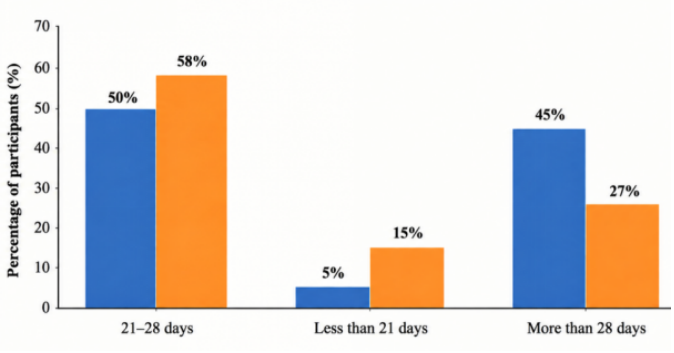


Figure 2 Menstrual Cycle Length

The comparison of menstrual cycle length revealed a statistically significant difference between female sportspersons and non-sportspersons, $\chi^2(2) = 10.093$, $p = .006$. Therefore, the null hypothesis (H_{01}), which stated that there was no significant difference in menstrual cycle length between the two groups, was rejected. Non-sportspersons showed a higher proportion of participants with cycle lengths of 21–28 days (58%) compared with sportspersons (50%), whereas short cycles of less than 21 days were more prevalent among non-sportspersons (15%) than sportspersons (5%). In contrast, prolonged cycle lengths of more than 28 days were more frequently reported among sportspersons (45%) than non-sportspersons (27%). These findings indicate a significant difference in the distribution of menstrual cycle length between the groups; however, the pattern does not uniformly demonstrate superior menstrual health among sportspersons. Rather, it suggests that sports participation may be associated with a different distribution of menstrual cycle characteristics, warranting consideration of factors such as training load, energy availability, nutritional status, and recovery in future research.

Table 2 Comparison of menstrual flow duration between sportspersons and non-sportspersons.

Duration of Menstrual Flow	Sportspersons (n=100)	Non-Sportspersons (n=100)
3–5 days	50 (50%)	70 (70%)
6–7 days	35 (35%)	20 (20%)
More than 7 days	15 (15%)	10 (10%)
χ^2	8.424	
df	2	
p-value	0.015	
Result	Significant	

The findings presented in Table 2 indicate a statistically significant difference in the duration of menstrual flow between sportspersons and non-sportspersons. Among sportspersons, the majority (50%) reported menstrual flow duration of 3–5 days, followed by 35% reporting 6–7 days and 15% reporting flow for more than 7 days. In comparison, 70% of non-sportspersons reported a 3–5-day flow, 20% reported 6–7 days, and 10% reported more than 7 days. The Pearson chi-square test yielded $\chi^2 = 8.424$, $df = 2$, $p = 0.015$, indicating a significant association between group status and menstrual-flow duration ($p < .05$). The relatively greater proportion of sportspersons reporting 6-7 days and more than 7 days suggests greater variability and a tendency toward longer menstrual bleeding in this group. However, the statement that sportspersons had a "more optimal" duration should be used cautiously because longer bleeding is not necessarily more optimal. Research among female athletes has documented considerable variation in menstrual bleeding characteristics, including irregular and heavy menstrual bleeding, and emphasizes the importance of monitoring menstrual health in athletic populations.

Table 3 Comparison of Menstrual Regularity between Sportspersons and Non-Sportspersons

Menstrual Regularity	Sportspersons (n=100)	Non-Sportspersons (n=100)	χ^2	df	p-value	Result
Regular	76 (76%)	60 (60%)				
Irregular	24 (24%)	40 (40%)	5.882	1	.015	Significant
Total	100 (100%)	100 (100%)				

The findings presented in Table 3 indicate a statistically significant difference in menstrual regularity between sportspersons and non-sportspersons. Among sportspersons, 76% reported regular menstrual cycles, whereas 24% reported irregular periods. In comparison, 60% of non-sportspersons reported regular periods and 40% reported irregular periods. The Pearson chi-square test revealed a significant association between group status and menstrual regularity ($\chi^2 = 5.882$, df = 1, p = .015). Since the p-value was less than .05, the null hypothesis of independence was rejected, indicating that menstrual regularity differed significantly between the two groups. Menstrual-cycle disturbances, including irregular periods, have been reported among physically active and athletic populations, although their prevalence varies considerably according to sport, training characteristics, and the methods used to assess menstrual function (Taim et al., 2023; Vannuccini et al., 2020).

Table 4 Effect of Menstruation on Sports Performance among Sportspersons

Effect on Sports Performance	Sportspersons (n=100)	Percentage (%)
No effect	35	35%
Mild effect	45	45%
Moderate effect	15	15%
Severe effect	5	5%
Total	100	100%
χ^2	29.000	
df	3	
p-value	< .001	
Result	Significant	

The findings presented in Table 4 indicate that menstruation had a statistically significant effect on sports performance among female sportspersons. Among the participants, 35% reported no effect, while 45% reported a mild effect, 15% reported a moderate effect, and 5% reported a severe effect. The chi-square goodness-of-fit test revealed a statistically significant difference in the distribution of reported effects ($\chi^2 = 29.000$, df = 3, p < .001). Thus, the null hypothesis was rejected, indicating that the reported levels of menstrual influence on sports performance were not equally distributed across the four categories. The highest proportion of sportspersons reported a mild effect (45%), followed by no effect (35%), moderate effect (15%), and severe effect (5%).

5. Discussion

The findings of the present study indicate that female sportspersons demonstrated more favourable menstrual characteristics than non-sportspersons. A greater proportion of sportspersons reported menstrual cycle lengths within the study-defined normal range of 21-28 days, menstrual flow lasting 3–5 days, and regular menstrual cycles. These findings are consistent with the broader literature indicating that menstrual function is an important marker of female reproductive and overall health (American College of Obstetricians and Gynecologists [ACOG], 2015; Fraser et al., 2011). However, it should be noted that current clinical definitions describe normal menstrual cycles using somewhat broader ranges; for example, ACOG identifies 21-35 days as a typical cycle range in adults, while FIGO-based criteria generally define normal frequency as 24-38 days and normal bleeding duration as up to 8 days (ACOG, 2015; Munro et al., 2018). Therefore, the 21-28-day and 3-5-day categories used in the present study should be interpreted as study-specific indicators of favourable menstrual characteristics rather than the only definitions of normal menstruation. The higher proportion of sportspersons reporting regular menstrual cycles may be associated with the physiological and lifestyle benefits of appropriate physical activity. Regular exercise can contribute to healthy body composition, metabolic health, psychological well-being, and overall physical fitness. Nevertheless, the relationship between exercise and menstrual function is complex and depends on exercise intensity, training volume, energy availability, nutritional status, and individual physiological characteristics (De Cree, 1998; Warren, 1999). Evidence suggests that appropriately managed physical activity does not necessarily impair menstrual function, whereas excessive training combined with inadequate energy availability may disturb hypothalamic-pituitary-ovarian function and lead to menstrual irregularities (De Souza et al., 2014; Mountjoy et al., 2014). Thus, the favourable menstrual characteristics observed among sportspersons in the present study may reflect participation in appropriately managed physical activity rather than exercise itself being universally protective. The findings regarding menstrual flow duration also showed a difference between the two groups. Most sportspersons reported menstrual flow lasting 3-5 days, whereas prolonged menstrual flow was more frequently reported among non-sportspersons. Previous literature recognizes menstrual bleeding duration as an important component of menstrual health, although the clinically accepted normal range is broader than the 3-5-day

category used in the present study (Fraser et al., 2011; Munro et al., 2018). Differences between sportspersons and non-sportspersons may potentially be related to variations in physical activity, nutritional practices, body composition, stress, and general health behaviours. However, because menstrual bleeding is influenced by multiple physiological and environmental factors, the observed difference should not be interpreted as evidence that sports participation alone determines menstrual flow duration. Regular menstruation was reported more frequently among sportspersons than non-sportspersons. Menstrual regularity is an important indicator of reproductive health, and substantial changes in cycle frequency or the absence of menstruation may indicate underlying disturbances in energy availability or endocrine function (ACOG, 2015; Mountjoy et al., 2023). Research among female athletes has demonstrated that menstrual disorders, including amenorrhoea and oligomenorrhoea, can occur in athletic populations, particularly in sports or training environments associated with high exercise loads and inadequate energy availability (Taim et al., 2023; Vancampfort et al., 2023). Therefore, the higher menstrual regularity observed among sportspersons in the present study should be viewed as a favourable finding within this particular sample rather than evidence that athletic participation universally improves menstrual function. The role of nutritional status and energy availability is particularly important when interpreting menstrual characteristics in female athletes. The International Olympic Committee's consensus statement on Relative Energy Deficiency in Sport (RED-S) emphasizes that inadequate energy availability can impair reproductive function and disrupt menstrual cycles in athletes (Mountjoy et al., 2023). Earlier research similarly demonstrated that exercise-related menstrual dysfunction may involve alterations in hypothalamic-pituitary-ovarian function and may be associated with low energy availability, low body fat, or excessive training demands (Baker, 1981; Warren, 1999). Consequently, although sportspersons in the present study demonstrated generally favourable menstrual characteristics, appropriate monitoring of training load, dietary intake, recovery, and menstrual patterns remains important. Despite generally favourable menstrual characteristics, 65% of sportspersons in the present study reported that menstruation affected their sports performance to some degree. Most participants described the effect as mild, suggesting that menstrual symptoms may temporarily influence training or competitive performance without necessarily preventing participation. This observation is supported by recent systematic reviews showing that female athletes commonly experience menstrual-related symptoms, including pain, fatigue, mood changes, and other physical or psychological symptoms, which may influence perceived performance and participation (Chica-Latorre et al., 2025; Taim et al., 2023). In particular, dysmenorrhoea has been identified as one of the most prevalent menstrual disorders among female athletes (Taim et al., 2023). Recent evidence also indicates that menstrual-cycle-related symptoms can affect athletes' perceived performance, although the magnitude and direction of performance effects vary considerably between individuals (Meignié et al., 2021; Stitelmann et al., 2026). Overall, the findings suggest that female sportspersons in the present study had comparatively favourable menstrual characteristics, while menstrual symptoms nevertheless remained relevant to sports performance for a substantial proportion of participants. These findings support the importance of treating the menstrual cycle as an important component of athlete health rather than assuming that sports participation automatically prevents menstrual problems. Regular menstrual monitoring, adequate nutrition and energy availability, appropriate training loads, sufficient recovery, and supportive communication may help identify menstrual disturbances and minimize their potential effects on health and athletic performance (Mountjoy et al., 2023; Taim et al., 2023). At the same time, because the present findings are based on comparisons between sportspersons and non-sportspersons, causal conclusions regarding the effect of sports participation on menstrual health should be made cautiously.

6. Conclusion and Future Recommendations

The present study concludes that female sportspersons demonstrated comparatively more favourable menstrual characteristics than non-sportspersons with respect to menstrual cycle length, duration of menstrual flow, and menstrual regularity. A greater proportion of sportspersons reported cycle lengths within the study-defined normal range, menstrual flow of 3–5 days, and regular menstrual cycles. These findings suggest that regular and appropriately managed participation in sports may be associated with favourable menstrual characteristics. However, menstrual health is influenced by several interacting factors, including nutritional status, energy availability, training load, body composition, psychological stress, sleep, and recovery. Therefore, the present findings should be interpreted as an association rather than as evidence of a direct causal effect of sports participation on menstrual health.

In relation to H_{01}, which stated that there is no significant difference in menstrual cycle length between female sportspersons and non-sportspersons, the observed difference in cycle characteristics suggests a comparatively favourable pattern among sportspersons. The final decision regarding rejection or retention of H_{01} should, however, be based on the statistical test and corresponding *p*-value obtained in the study. Similarly, H_{02}, concerning the duration of menstrual flow, can

be evaluated on the basis of the observed between-group difference, in which sportspersons more frequently reported a flow duration of 3–5 days, while prolonged flow was more common among non-sportspersons. A statistically significant result would support rejection of H_{02}, whereas a non-significant result would require its retention.

With respect to H_{03}, which proposed no significant difference in menstrual irregularities between female sportspersons and non-sportspersons, the greater proportion of regular menstrual cycles among sportspersons indicates a comparatively favourable menstrual pattern in this group. Nevertheless, descriptive differences alone cannot establish statistical significance; therefore, the hypothesis should be interpreted according to the relevant inferential statistical findings. These results are important because menstrual irregularity may reflect disturbances associated with inadequate energy availability, excessive training stress, or other physiological and lifestyle factors.

The findings also provide an important basis for interpreting H_{04}, which proposed that menstruation does not significantly affect sports performance and participation among female sportspersons. Although sportspersons generally demonstrated favourable menstrual characteristics, approximately 65% reported that menstruation affected their sports performance to some degree, with most describing the effect as mild. This indicates that menstrual regularity and athletic performance are not necessarily independent of menstrual symptoms. Cramps, fatigue, discomfort, mood changes, headache, and reduced concentration may temporarily influence perceived readiness, training quality, or participation. Therefore, if the statistical analysis demonstrates a significant effect, H_{04} should be rejected; otherwise, the hypothesis should be retained despite the observed practical influence.

Overall, the study highlights that menstrual health should be considered an integral component of female athlete health and performance monitoring. Coaches, sports scientists, physical education professionals, nutritionists, and healthcare practitioners should adopt supportive and confidential approaches to menstrual monitoring. The objective should not be to treat menstruation as a limitation to athletic participation, but to identify persistent irregularities and symptoms that may require nutritional, medical, training, or recovery-related intervention.

6.1 Future Recommendations

Future research should adopt longitudinal designs to establish temporal relationships between sports participation and menstrual characteristics. Studies should also assess energy availability, dietary intake, body composition, training volume and intensity, recovery, sleep, and psychological stress, as these factors may influence menstrual function. Further research should include athletes from different sports, competitive levels, and age groups to improve the generalizability of findings. Detailed assessment of menstrual symptoms and their severity should also be incorporated rather than relying solely on cycle regularity and bleeding duration. Moreover intervention-based studies are particularly recommended to determine whether nutritional counselling, appropriate training-load management, recovery strategies, and menstrual-health education can reduce menstrual-related symptoms and improve participation and perceived performance. Coaches and athletes should also receive evidence-based education to encourage open communication and reduce the stigma surrounding menstruation in sport. Finally, menstrual monitoring should be integrated with broader athlete-health assessments so that changes in menstrual patterns can be recognized early and appropriate professional support can be provided. Thus, future research and practice should move towards a multidimensional female-athlete health framework in which menstrual characteristics, energy availability, nutrition, training load, recovery, psychological well-being, and sports performance are considered together. Such an approach can contribute to the development of evidence-based strategies that promote both the reproductive health and athletic performance of female sportspersons.

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