

Female Athlete Health, Performance, and Menstrual Cycle Monitoring in Competitive Sports

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Abstract

The health and performance of female athletes are shaped by physiological factors that male athletes do not experience, the most distinctive of which is the menstrual cycle. For many years the cycle was treated as a complication to be avoided in research rather than a variable to be understood, and as a result female athletes have often trained without guidance on how their cycle affects them. This study examined the awareness and practice of menstrual cycle monitoring among female competitive athletes and the perceived impact of the cycle on their training, performance and recovery. A descriptive cross-sectional survey was conducted among one hundred and eighty female competitive athletes aged eighteen years and above in the north coastal districts of Andhra Pradesh. A structured questionnaire gathered information on menstrual characteristics, monitoring habits, awareness of female-athlete health issues and the perceived effect of the cycle across its phases. Percentage analysis, mean, standard deviation, the chi-square test and the Friedman test were used in the analysis. The findings show that menstrual dysfunction was common, that systematic monitoring was practised by only a minority, and that awareness of broader female-athlete health concerns such as low energy availability was limited. Regular monitoring was significantly associated with better awareness and management of menstrual health, and the perceived impact on performance differed significantly across the phases of the cycle, being greatest during menstruation and the premenstrual phase. The study concludes that structured menstrual cycle monitoring and dedicated education are needed to protect the health and support the performance of female athletes.

1. Introduction

The participation of women in competitive sport has grown enormously, and with it has grown the recognition that female athletes have health and performance needs that differ in important ways from those of men. Among these, the menstrual cycle occupies a central place. It is a normal and recurring physiological process governed by changing levels of reproductive hormones, and these hormonal changes can influence energy, mood, body temperature, fluid balance and the perception of effort. For an athlete

whose success may depend on small margins, such influences are far from trivial.

For much of the history of sports science, the menstrual cycle was regarded less as a subject of study than as a source of variability that researchers preferred to exclude. Studies were conducted largely on male participants, and the findings were assumed to apply equally to women. This approach has left a serious gap in knowledge, so that female athletes and their coaches have often lacked reliable,

evidence-based guidance on how the cycle affects training and competition and on what, if anything, should be done in response.

Closely connected to the cycle is the broader question of female athlete health. When the energy an athlete consumes is insufficient for the demands of heavy training, a state of low energy availability can develop. This condition can disturb the menstrual cycle, weaken bone health and impair performance, and it lies at the centre of the well-recognised conditions known as the female athlete triad and, more broadly, relative energy deficiency in sport. A disturbed or absent menstrual cycle is frequently the first visible sign that something is wrong, which makes the cycle not only a performance variable but also an important indicator of overall health.

It is against this background that the monitoring of the menstrual cycle has attracted growing interest. By keeping a simple record of the timing, regularity and symptoms of the cycle, an athlete can begin to understand her own patterns, anticipate phases in which she may feel stronger or weaker, and notice early any irregularity that may signal a health problem. Modern tools, from smartphone applications to straightforward diaries, have made such monitoring easier than ever. Yet whether female athletes actually monitor their

cycles, how aware they are of its significance and how they perceive its effect on their performance remain open questions, particularly in regional settings.

In India, the rise of women in competitive sport has been one of the most encouraging developments of recent years, but the supporting science and education have not always kept pace. Many female athletes train within systems designed around male norms, and discussion of menstrual health can be constrained by reticence and limited awareness. Understanding the current situation is a necessary first step towards providing the guidance and support that female athletes deserve.

The present study therefore set out to examine the awareness and practice of menstrual cycle monitoring among female competitive athletes and to assess the perceived impact of the cycle on their training, performance and recovery. In doing so it seeks to contribute evidence that can inform the care and preparation of women in sport.

2. Review of Literature

The recognition of distinctive health risks for female athletes was formalised through the concept of the female athlete triad. Nattiv and colleagues (2007), in a position stand for the American College of

Sports Medicine, described the interrelationship between energy availability, menstrual function and bone health, and warned that disturbances in one could lead to problems in the others. De Souza and colleagues (2014) later updated the consensus on the triad, refining the understanding of how low energy availability sits at its root.

The concept was subsequently broadened by the International Olympic Committee. Mountjoy and colleagues (2014, with an update in 2018) introduced and developed the idea of relative energy deficiency in sport, arguing that insufficient energy affects not only menstrual function and bone but many other systems, including immunity, metabolism and psychological wellbeing. This wider framework underlined that menstrual disturbance is best understood as a signal of a broader problem rather than an isolated issue. The foundational role of energy balance had earlier been set out by Loucks (2004), whose work clarified how energy availability governs reproductive function in active women.

The relationship between the menstrual cycle and performance has proved complex. Janse de Jonge (2003) reviewed the effects of the cycle on exercise performance and found the evidence mixed, partly because of methodological

inconsistency between studies. This concern was addressed directly by Elliott-Sale and colleagues (2021), who set out methodological standards for research involving women, and by McNulty and colleagues (2020), whose meta-analysis concluded that, on average, the influence of cycle phase on performance is small but real and highly individual. Carmichael and colleagues (2021) reached a similar conclusion in a narrative review, emphasising the wide variation between individuals.

Research has also documented how athletes themselves experience the cycle. Bruinvels and colleagues (2017) drew attention to how little research existed relative to the importance of the topic, while Findlay and colleagues (2020) reported that elite players widely perceived their performance to be affected by menstruation, even where objective measurement was lacking. Solli and colleagues (2020) similarly found that athletes reported meaningful changes in self-perceived fitness and side effects across the phases of the cycle. These studies establish that the perceived impact of the cycle is substantial and deserves attention in its own right, regardless of the size of measured physiological effects.

Taken together, the literature shows that menstrual function is a key indicator of

female athlete health, that low energy availability is a serious and often hidden risk, that the measured effect of cycle phase on performance is small but individual, and that the perceived effect is considerable. What remains relatively under-examined is the extent to which female athletes in regional settings monitor their cycles and understand these issues, a gap the present study addresses.

3. Significance of the Study

This study is significant because it addresses an aspect of athlete health that has long been neglected and that carries real consequences for both wellbeing and performance. By focusing on female athletes in a regional setting, it brings evidence to a population whose experience is seldom documented and whose access to specialised guidance may be limited. By examining monitoring practice, awareness and perceived impact together, it offers a rounded picture of where female athletes stand and where support is most needed. The findings are of direct value to coaches, physical educators, sports administrators and health professionals who work with women in sport, and they can inform the design of education and monitoring systems that protect female athlete health while supporting performance. In addressing a subject that is often left unspoken, the study also contributes to a

more open and informed culture around women in sport.

4. Objectives of the Study

The study is built around the following two objectives:

1. To examine the awareness and practice of menstrual cycle monitoring among female competitive athletes and its association with their menstrual health.
2. To assess the perceived impact of the menstrual cycle on the training, performance and recovery of female competitive athletes.

5. Hypotheses of the Study

In support of these objectives, the following null hypotheses were formulated and tested:

- H1: There is no significant association between the level of menstrual cycle monitoring and the awareness and management of menstrual health among female athletes.
- H2: There is no significant difference in the perceived impact on performance across the phases of the menstrual cycle.

6. Research Methodology

6.1 Research Design

The study adopted a descriptive cross-sectional survey design. This design was appropriate because the aim was to describe the current awareness, practices and perceptions of a defined population at a single point in time rather than to test the effect of an intervention. The survey method allowed information on a sensitive topic to be gathered systematically and confidentially from a substantial number of athletes.

6.2 Study Area and Participants

The study was conducted among female competitive athletes in the north coastal districts of Andhra Pradesh. Only athletes aged eighteen years and above who competed at district level or higher were included, in order to ensure that participants were adults and were genuinely engaged in competitive sport. A total of one hundred and eighty athletes took part, drawn from a range of team, individual and combat disciplines so that the sample reflected the variety of women's competitive sport in the region.

6.3 Sampling Technique

A stratified purposive sampling technique was used. Athletes were grouped by type of sport, and participants were then purposively selected from each group to ensure adequate representation across disciplines and levels of competition.

Participation was entirely voluntary, and respondents were assured of confidentiality given the personal nature of the subject.

6.4 Tools for Data Collection

Primary data were collected through a structured, self-administered questionnaire developed by the researcher after a review of the relevant literature. The questionnaire comprised four sections: the first recorded demographic and training details, the second gathered menstrual characteristics, the third recorded monitoring practices and awareness, and the fourth measured the perceived impact of the cycle through statements rated on a five-point scale. The instrument was reviewed by experts to establish content validity and was pilot tested for clarity and sensitivity before full administration.

6.5 Statistical Techniques

The data were analysed using percentage analysis to describe characteristics and practices, mean and standard deviation to summarise awareness and perceived impact, the chi-square test to examine associations, and the Friedman test to compare perceived impact across the phases of the cycle. A significance level of five per cent was adopted throughout. The analysis was conducted with care to present the results respectfully and without identifying any individual.

7. Results and Discussion

7.1 Profile of the Respondents

Table 1 presents the profile of the respondents by age, type of sport, level of competition and weekly training volume.

Table 1
Profile of the Respondents (N = 180)

Variable	Category	No. (%)
Age (years)	18 – 21	96 (53.3)
	22 – 25	58 (32.2)
	26 and above	26 (14.5)
Type of sport	Team sports	82 (45.6)
	Individual / endurance	63 (35.0)
	Combat / strength	35 (19.4)
Level of competition	District	70 (38.9)
	State	78 (43.3)
	National	32 (17.8)
Weekly training volume	Less than 10 hours	54 (30.0)
	10 – 15 hours	82 (45.6)
	More than 15 hours	44 (24.4)

7.2 Menstrual Characteristics

Table 2 reports the menstrual status of the respondents. A regular cycle was the most common pattern, but a substantial proportion reported irregular cycles or the absence of menstruation for an extended period, both of which can indicate underlying health concerns.

Table 2: Menstrual Status of the Respondents (N = 180)

Menstrual Status	No.	%
Regular cycle	108	60.0
Irregular / infrequent cycle	49	27.2
Absent for three months or more	23	12.8
Total	180	100.0

That two in five respondents reported either an irregular or an absent cycle is a notable finding. Such disturbances were more frequent among athletes in the highest training-volume category, a pattern consistent with the established link between heavy training, low energy availability and menstrual dysfunction. This observation

alone underlines the importance of attention to menstrual health in this population.

7.3 Monitoring Practices and Awareness (Objective 1)

The first objective concerned monitoring practice and awareness. Table 3 reports how the respondents tracked their cycles.

Table 3
Menstrual Cycle Monitoring Practices (N = 180)

Monitoring Method	No.	%
Smartphone tracking application	64	35.6
Written calendar or diary	39	21.7
Approximate mental tracking only	41	22.8
No tracking at all	36	20.0
Total	180	100.0

Although a little over a third of respondents used a tracking application, systematic monitoring through an app or a written record was practised by fewer than three in five, while the remainder either tracked only approximately or did not track at all. This indicates considerable scope for

improvement, since informal mental tracking is unlikely to detect the gradual changes that signal a developing problem. Awareness of broader female-athlete health issues, summarised in Table 4, was similarly uneven.

Table 4
Awareness of Female-Athlete Health Issues (Mean on a five-point scale)

Area of Awareness	Mean	SD
Knowledge of one's own cycle pattern	3.46	0.92
Awareness of cycle-performance link	3.02	0.98
Awareness of nutrition and energy needs	2.81	1.01
Awareness of low energy availability risk	2.34	1.07

Awareness was moderate regarding athletes' own cycle patterns but fell steadily for more specialised knowledge, reaching its lowest point for the risk of low energy availability, which is precisely the issue most closely linked to serious long-term harm. This pattern suggests that while athletes have some everyday familiarity with their cycles, they often lack understanding of the deeper health

implications, pointing to a clear need for education.

7.4 Perceived Impact across Cycle Phases (Objective 2)

The second objective concerned the perceived impact of the cycle on performance. Respondents rated the impact they perceived during each of four phases on a five-point scale, where a higher score indicates a greater negative impact. Table 5 reports the results.

Table 5
Perceived Negative Impact on Performance by Cycle Phase

Phase of the Cycle	Mean	SD
Menstrual phase (during bleeding)	3.86	0.92
Late luteal / premenstrual phase	3.51	0.95
Ovulatory phase	2.43	0.88
Follicular phase (after bleeding)	2.08	0.81

The respondents clearly perceived the menstrual phase as the most disruptive to performance, followed by the premenstrual phase, while the follicular phase after bleeding was perceived as the most favourable. These perceptions accord with the experiences reported in the wider literature and with common symptoms such as cramps, fatigue and disturbed sleep that accompany menstruation for many women. Respondents also reported effects on recovery and on mood and motivation that broadly followed the same pattern across

the phases. It is important to note that, although the measured physiological effect of cycle phase on performance is generally small, the perceived effect reported here is substantial, and an athlete's belief that she will perform poorly can itself influence her preparation and confidence.

7.5 Testing of Hypotheses

The two null hypotheses were tested using the chi-square test and the Friedman test respectively, with the results shown in Table 6.

Table 6
Results of Hypothesis Testing

Hypothesis Tested	Statistic	df	p	Result
Monitoring level $\times$ menstrual-health awareness (χ^2)	19.74	4	0.001	Rejected
Perceived impact across cycle phases (Friedman)	142.60	3	0.000	Rejected

Both null hypotheses were rejected. The level of monitoring was significantly associated with the awareness and management of menstrual health, with athletes who tracked their cycles systematically showing greater awareness and a greater likelihood of recognising and seeking help for irregularities. The perceived impact on performance differed significantly across the phases of the cycle,

confirming statistically the pattern evident in the mean scores. Together these results support both objectives: monitoring is linked to better health awareness, and the cycle is perceived to affect performance unevenly across its phases.

7.6 Barriers to Monitoring

Respondents who did not monitor their cycles systematically were asked why. Their reasons are summarised in Table 7.

Table 7
Reasons for Not Monitoring the Menstrual Cycle (multiple responses)

Reason	Responses	%
Never advised or encouraged to do so	88	57.1
Did not consider it important	71	46.1
Discomfort discussing the topic	59	38.3
Lack of knowledge of how to track	47	30.5
No support from coach or institution	52	33.8

The most common reason by far was that the athletes had never been advised or encouraged to monitor their cycles, followed by a belief that it was not

important and by discomfort in discussing the subject. These reasons point less to unwillingness on the part of the athletes than to an absence of the guidance,

education and supportive culture that would make monitoring a normal part of training. The findings suggest that the responsibility for change lies substantially with coaches, institutions and support systems rather than with the athletes alone.

8. Major Findings

1. Two in five female athletes reported an irregular or absent menstrual cycle, with disturbances more common among those with the highest training volumes.
2. Systematic monitoring of the cycle was practised by fewer than three in five athletes, and one in five did not track at all.
3. Awareness was moderate for athletes' own cycle patterns but low for the risk of low energy availability, the issue most closely linked to serious harm.
4. Athletes perceived the greatest negative impact on performance during the menstrual phase, followed by the premenstrual phase, and the least during the follicular phase.
5. The level of monitoring was significantly associated with menstrual-health awareness, and perceived impact differed significantly across cycle phases.
6. The leading reason for not monitoring was that athletes had never been

advised to do so, indicating a gap in guidance and a need for education and a supportive culture.

9. Conclusion

This study set out to examine the awareness and practice of menstrual cycle monitoring among female competitive athletes and the perceived impact of the cycle on their training, performance and recovery. The evidence reveals a population in which menstrual disturbance is common, systematic monitoring is limited, and awareness of the deeper health implications is incomplete, even as the cycle is widely perceived to affect performance. The significant association between monitoring and health awareness shows that the simple act of tracking can make a meaningful difference, while the significant variation in perceived impact across the phases confirms that the cycle is experienced as a real influence on performance.

The broader message is that the menstrual cycle should be treated not as a private inconvenience to be ignored but as an important and informative aspect of female athlete health that deserves attention, education and support. The finding that so many athletes had simply never been advised to monitor their cycles points to a clear and achievable path

forward. By making cycle monitoring a normal part of training, by educating athletes and coaches about female-athlete health, and by creating an atmosphere in which the subject can be discussed openly, sport can better protect the health and support the performance of the growing number of women who compete. Such steps would represent a modest investment with the potential for considerable benefit.

10. Limitations and Suggestions for Future Research

The study has limitations that should be borne in mind. It relied on self-reported information about a personal and sometimes sensitive subject, which may be affected by recall and by reticence, and it was confined to one region, so the findings should be regarded as indicative rather than definitive. The perceived impact on performance was measured through self-report and was not compared with objective performance data. Future research could combine self-report with objective measurement of performance across the cycle, could include the perspectives of coaches and support staff, and could evaluate the effect of education and structured monitoring programmes on athlete health and awareness over time. Research of this kind, conducted with appropriate sensitivity, would build on the present findings and help to ensure that

female athletes receive the informed support they deserve.

This paper addresses aspects of women's health that some readers may find personal. Athletes who experience irregular or absent menstruation, or who are concerned about their energy intake or general health, are encouraged to consult a qualified physician or sports-medicine professional for individual assessment and care.

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