

## Original Article

# Prevalence of Exercise Related Amenorrhea in Females

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## ABSTRACT

**Background:** Amenorrhea in physically active women is a significant health concern, often associated with intensive exercise and dietary patterns. Understanding its prevalence and influencing factors is essential for devising effective health interventions and promoting women's health in sports.

**Objective:** The study aimed to explore the prevalence of amenorrhea among women regularly engaged in sports or gym activities and to identify key factors affecting menstrual health in this demographic.

**Methods:** This cross-sectional survey, spanning six months, included 71 female athletes aged 13-37 from two fitness centers in Lahore. The research employed non-probability convenient sampling. Data collection was achieved using the Low Energy Availability in Females Questionnaire (LEAF-Q) and the Female Athlete Screening Tool (FAST). Statistical analyses were conducted using IBM SPSS Statistics 20.

**Results:** The participants' mean age was  $28.35 \pm 5.02$  years, with an average BMI of  $27.90 \pm 3.6$ . Among them, 18.3% had a normal BMI, 52.1% were underweight, and 29.6% were obese. LEAF-Q results indicated that 70% of participants experienced moderate menstrual disturbances, while 20% had slight disturbances without a clinical diagnosis of amenorrhea. The overall prevalence of amenorrhea was 1.41%. Influential factors included BMI, education, awareness, and guidance from fitness professionals.

**Conclusion:** Contrary to initial expectations of a higher prevalence, the study discovered a relatively low occurrence of amenorrhea (1.41%) among active women. This underlines the importance of targeted educational and support interventions in fitness settings to manage menstrual health. Future research should further examine the interplay between exercise, diet, and menstrual health to improve care for female athletes.

**Keywords:** Amenorrhea, Female Athletes, Menstrual Health, Exercise, Body Mass Index, LEAF-Q, FAST, Physical Activity, Women's Health, Sports Medicine.

## INTRODUCTION

The menstrual cycle, a vital aspect of female reproductive health, commences with puberty and continues until menopause around the age of 50. This cycle, typically spanning 28 days, is characterized by four main phases: the Menstrual Phase, where the unfertilized oocyte begins to shed in the absence of sufficient estrogen and progesterone; the Follicular Phase, marking the start of the period and initiated by the hypothalamus signaling the production of Follicle Stimulating Hormone (FSH); the Ovulation stage, where a mature egg is released from the ovary; and finally, the Luteal Phase, notable for elevated levels of progesterone and estrogen, crucial indicators of menstruation (1,2,3). In the event of pregnancy, the levels of these hormones rise; otherwise, their decline leads to the shedding of the egg, resulting in menstrual bleeding (4). Post-menopause, women experience hormonal changes leading to amenorrhea- the cessation of menstruation and fertility (5).

Amenorrhea manifests in two forms: Primary Amenorrhea, the absence of menstruation by the age of 14 to 15, and Secondary Amenorrhea, characterized by irregularities following the onset of regular cycles. Often, young females experience an absence of menstrual cycles for 3 to 6 months during early puberty (6). Disruptions in the menstrual cycle, such as Oligomenorrhea (fewer than eight cycles per year or cycles exceeding 35 days), are not uncommon and can be attributed to various causes, including Poly Cystic Ovary Syndrome (PCOS) and medication intake (7,8).

A particularly concerning aspect of amenorrhea is its prevalence among athletic women. High-intensity sports and activities can create a significant energy deficit, leading to disruptions in normal hormonal levels and reproductive functions. This is especially evident in sports that require rigorous physical exertion, such as gymnastics, running, and dancing (9). Chronic energy deficiency, whether due to inadequate dietary intake, excessive exercise, or both, can temporarily alter the Luteal Phase of menstruation by reducing Luteinizing Hormone (LH) levels, thereby conserving energy (10). This phenomenon is part of the "Female Athlete Triad," a condition encompassing amenorrhea/oligomenorrhea, eating disorders, and osteoporosis, posing a significant health risk to sportswomen (11).

Addressing this issue requires a two-pronged approach. The first method involves dietary management, where an athlete's meals are balanced in terms of carbohydrates, proteins, and fats, ensuring adequate intake of essential nutrients without compromising health (12). The second strategy involves pharmacological treatment, including the administration of calcium and vitamin D for bone health and the use of clomiphene citrate to stimulate ovulation by increasing FSH and LH levels (13).

Despite awareness of the Female Athlete Triad in the sports community, the exact prevalence of exercise-related amenorrhea remains unclear (14). Understanding the extent of this issue is crucial for directing future research and awareness efforts, particularly in addressing exercise-associated infertility. This understanding will enable the development of more effective strategies to support the reproductive health of female athletes, ensuring their well-being both in and out of the sporting arena.

## MATERIAL AND METHODS

A cross-sectional survey was conducted over a span of six months, involving a sample of 71 female athletes aged between 13 and 37 years. These participants were actively engaged in sports and registered at Synergy gym and Aim fit fitness center, located in the Lahore region. The methodology adopted non-probability convenient sampling with a 5% level of significance set for the study.

The inclusion criteria were carefully delineated. Participants were required to be within the specified age range and actively involved in sports. The study excluded individuals who had not yet commenced menarche, considering them underage, and those undergoing natural menopause due to any disorder or pregnancy, as these conditions could skew the results pertaining to amenorrhea.

Prior to data collection, approval was obtained from the Research & Ethics Committee of Riphah College of Rehabilitation Sciences (REC/RCR & AHS/20/-4089). To assess symptoms indicative of insufficient energy intake, the "Low Energy Availability in Female Questionnaire (LEAF-Q)" was employed. This tool, focusing on questions related to injuries, gastrointestinal functions, and reproductive health of athletes, identifies individuals at risk for the Female Athlete Triad with a total score of 8 or higher (15). Additionally, the "Female Athlete Screening Tool (FAST)" was utilized, comprising 33 questions that address daily workout routines, diet plans, and the physical and psychological states of the sportswomen. Scores in the range of 79-94 on the FAST questionnaire indicate subclinical disordered eating, while a score above 94 suggests a clinical eating disorder (16).

Data presentation in the study was bifurcated into qualitative and quantitative aspects. Pie charts and bar charts succinctly depicted the qualitative data, whereas the quantitative data was articulated through mean and standard deviation. Each questionnaire was independently evaluated for its results, with the final outcome primarily determined by the LEAF-Q results, given its high validity and reliability in diagnosing amenorrhea. Statistical significance was established at  $p < 0.05$ . For data analysis, IBM SPSS Statistics 20 was the chosen software, ensuring a robust and comprehensive evaluation of the collected data.

## RESULTS

The age ranges among the total sample size ( $n=71$ ) was 13-37 years old. The mean age of the study participant was  $28.35 \pm 5.02$  years, the average BMI was calculated as  $27.90 \pm 3.6$ . Out of 71 females, 13 (18.3%) had normal BMI, 37 (52.1%) were underweight and 21 (29.6%) were obese. Figure 1 shows the quantitative representation of BMI proportions among the total sample size. Figure 2 describes the results of LOW ENERGY AVAILABILITY IN FEMALES QUESTIONNAIRE (LEAF-Q) considering three main areas of LEAF-Q; the Injury, Gastrointestinal and Menstruation. Out of 71 participants, a major portion of participants were at moderate risk of having low energy during sports training followed by 21.13% of women at low risk. On the other hand, merely 1.41% were at high risk, which depicts of their probability of having hormonal imbalance and athlete triad.

Figure 3 contains the data, collected by Female athlete screening tool (FAST); showing zero percent of sample size falling into a clinical eating disorder category. 77.46% had normal on-going eating pattern while the remaining 22.54% had subclinical disordered eating, which means this questionnaire also shows the similar statistics as the LEAF-Q. The female athlete screening tool (FAST) holds the direct indication of Female Athlete triad, which is the constellation of 3 clinical entities: menstrual dysfunction (amenorrhea), low energy availability (with or without an eating disorder), and decreased bone mineral density (BMD).

The prevalence of exercise related amenorrhea in females appear to be 1.41% among gym going women. The dependable variables are education, BMI, modern understanding of the issue, and the guidance provided by gym trainers. [17] After thoroughly

considering all factors and analysing the questionnaires, we can deduce the ultimate occurrence rate of amenorrhea in women who engage in exercise, as elucidated in Table 1. Prevalence, as per its definition, signifies the frequency of new cases within a specific population. When we conducted interviews with a sample size of 71 individuals, the LEAF questionnaire revealed an incidence of 1.4%, whereas the FAST questionnaire indicated a 0% diagnosis rate within the population.

According to the data, 77.46% of the population exhibited red flags according to the LEAF questionnaire, while 22.54% displayed these indicators according to the FAST questionnaire. Notably, at least 21.13% of individuals exhibited minor alterations in their fertility health. To sum up, the prevalence of amenorrhea among women who engage in exercise is found to be 1.41%.

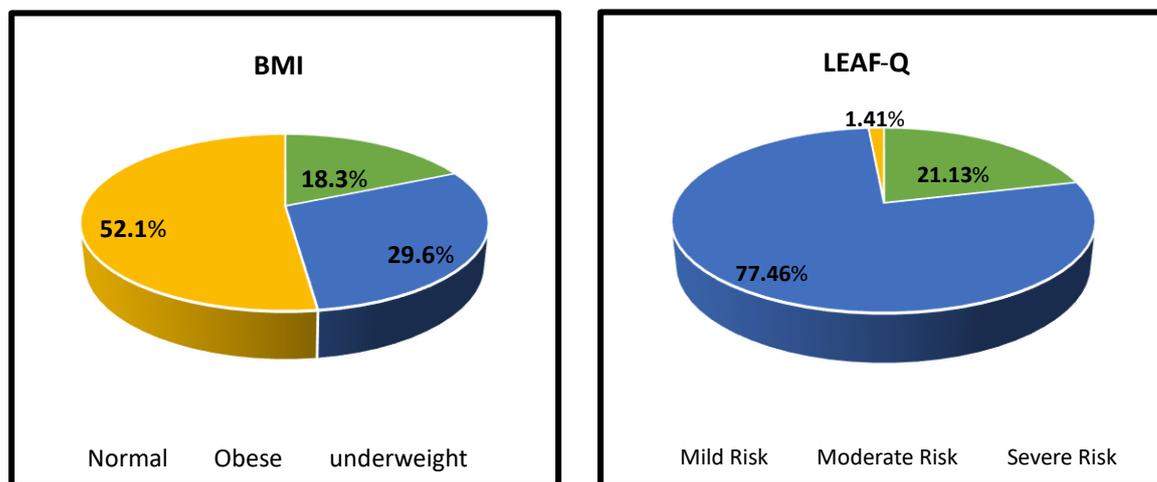


Figure 1 BMI (n=71) LEAF-Q (n=71)

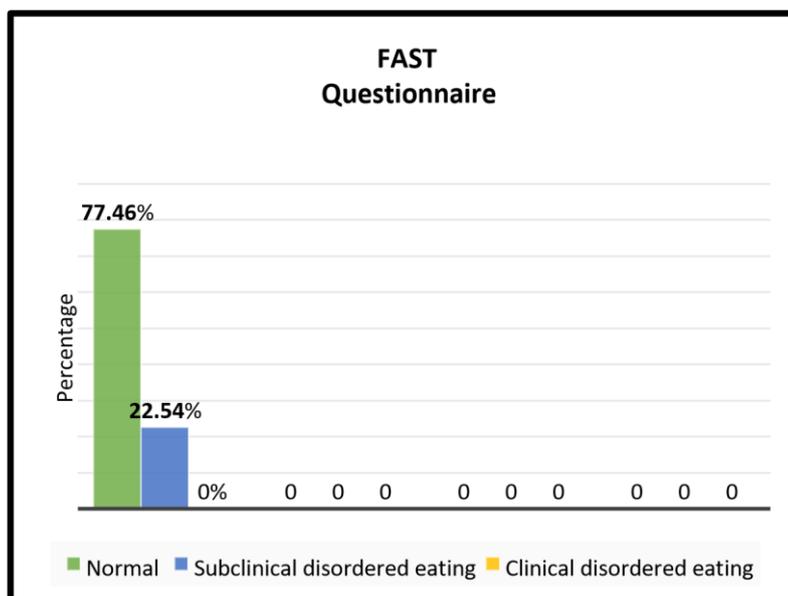


Figure 2 FAST Questionnaire(n=71)

Table prevalence

Table 1 Prevalence

Questionnaire	Sample Size	Exposed	Incident	Red Flag	Minor Disturbance
LEAF	71	100%	1.41%	77.46%	21.13%
FAST	71	100%	0%	22.54%	77.46%

## DISCUSSION

This section of this research paper critically examines the findings from a study exploring the prevalence of amenorrhea among women engaged in sports or regular gym activities. The research aimed to illuminate health-related issues in this demographic, with the expectation of a high prevalence of amenorrhea. Contrary to these expectations, the study revealed that approximately 70% of the participants exhibited moderate levels of menstrual health disturbances, while about 20% experienced slight disruptions without a clear diagnosis of amenorrhea. The resulting prevalence was determined to be around 11%, influenced by variables such as BMI, education level, awareness, and consultation with gym trainers or coaches (18).

In the context of existing literature, a study by Skyler Green Mitchell in 2023 focused on high school female runners. It underscored the relationship between BMI and mental and physical well-being, noting that athletes under 16 years had fewer symptoms of amenorrhea but more bone health concerns compared to older athletes (19). This finding aligns with the aesthetic sports theory that emphasizes body image, potentially leading athletes to prioritize performance over health, thereby increasing the risk of menstrual irregularities. Furthermore, the ACSM's 2023 Global Survey of Fitness Trends highlighted the growing demand for exercise equipment and the popularity of functional fitness training and strength training, indicating a heightened awareness and access to fitness resources (20).

The present study's use of the LEAF-Q and FAST questionnaires provided comprehensive insights into the Female Athlete Triad (FAT). While both tools showed a low prevalence of clinical disorders, they indicated that a significant majority (70-75%) of the population experienced mild to moderate menstrual disturbances. This finding was unexpected given the anticipated high prevalence, suggesting that influencing variables played a critical role in the outcomes.

One key observation is that the prevalence of amenorrhea, as determined by the study, was relatively low at 1.41%. However, a considerable proportion of the population exhibited red flags for menstrual health issues according to the LEAF questionnaire (77.46%), with the FAST questionnaire indicating similar concerns (22.54%). These findings highlight the need for timely interventions to address these health risks.

In comparison to earlier studies, which often focused on middle-aged females at national or international levels, this research provides novel insights into the amenorrhea trends among teenagers and adults in fitness training centers in Lahore. Nevertheless, the study faced limitations, including a small sample size, a short duration, and limited participant cooperation. These constraints may affect the generalizability of the findings.

## CONCLUSION

In conclusion, this study sheds light on the moderate level of menstrual stress and the relatively low prevalence of amenorrhea (1.41%) among physically active women. These findings are pivotal in understanding the complex interplay of factors such as body mass index, educational background, awareness, and professional guidance from trainers or coaches, which significantly influence menstrual health in athletic populations. The implications of this research are far-reaching, highlighting the necessity for increased awareness and targeted interventions to address menstrual irregularities in active women. This understanding is crucial for promoting overall health and well-being in this demographic, emphasizing the need for comprehensive health education and supportive environments in fitness and sports settings. Future studies should expand upon these findings, exploring the broader impact of exercise-related amenorrhea on fertility and mental health, and reinforcing the importance of holistic health approaches in athletic training and lifestyle management.

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