Menstruation Experiences and Subjective Sports Performance of Female Senior High School Athletes in Ajumako District

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ABSTRACT

Variations in sports performance due to menstruation have attracted increasing attention and debate in recent years. This study explored the relationship between menstruation and perceived sports performance among senior high school female athletes in the Ajumako District. A cross-sectional survey design was employed, using a structured questionnaire to collect data from a census sample of 200 female student-athletes. Data analysis involved descriptive statistics and multiple linear regression. The results indicated that a majority of respondents involve themselves in some kind of menstrual practices, although their hygiene and sports-related practices were generally satisfactory. Additionally, the physical and psychological effects of menstruation accounted for 17% of the variance in sports performance ($R^2 = .17$, $F(2,178) = 1.56$, $p = .013$). Both physical ($\beta = -0.044$, $p = .021$) and psychological ($\beta = -0.107$, $p = .036$) effects were predictors of performance outcomes. The study concludes that menstruation moderately impacts sports performance among female athletes but is not extremely strong. It is recommended that physical education teachers, coaches, sports professionals, chaperones, and other stakeholders receive appropriate training to help them adapt training programs and competition schedules to accommodate the physical and psychological changes associated with menstruation.

Keywords: Menstruation**,** Sports Performance**,** Hygiene Practices**,** Psychophysiological Effects**,** Female Athletes

INTRODUCTION

The menstrual cycle is a monthly physiological process regulated by hormonal fluctuations that prepare the female body for potential pregnancy. It begins with menstruation; the shedding of the uterine lining in the absence of fertilization, driven by the interplay of hormones such as follicle-stimulating hormone (FSH), luteinizing hormone (LH), estrogen, and progesterone [41] Typically lasting 26–35 days, though often irregular during adolescence, the cycle consists of four main phases: the menstrual phase, follicular phase, ovulation, and the luteal phase [6, 72]. If fertilization does not occur, hormonal levels drop, prompting menstruation and initiating a new cycle.

Menarche; the first onset of menstruation, generally occurs between the ages of 10 and 16, and may be delayed in athletes or influenced by health and timing of puberty [54]. One notable aspect of the cycle is Premenstrual Syndrome (PMS), a condition involving emotional and physical symptoms such as mood swings, cramps, and anxiety, typically manifesting 7–14 days before menstruation. PMS affects up to 95% of females, with varying degrees of severity and disruption to daily functioning, especially among athletes [84]. Its causes include hormonal shifts, calcium deficiency, psychological stress, and intense physical activity [69]. Fortunately, interventions like yoga and calcium supplementation have proven effective in symptom management [14]. Therefore, understanding the menstrual cycle's phases and associated conditions like PMS is critical for managing female reproductive health and mitigating its impact on daily life and athletic performance [24].

For female athletes, menstrual-related challenges often hinder performance and require tailored management strategies. Common approaches include the use of oral contraceptives to regulate hormonal fluctuations, nonsteroidal anti-inflammatory drugs (NSAIDs) for pain relief, and lifestyle modifications to address fatigue and other symptoms [55]. Iron supplementation is also used to combat anemia, while adequate rest, hydration, exercise, and sodium restriction can alleviate mood swings and bloating [11]. Nevertheless, many athletes still experience menstrual disorders such as exercise-induced amenorrhea, dysmenorrhea, and menorrhagia, frequently associated with intense training, low body fat, psychological stress, and nutritional deficits [58].

In addition, these disorders are often underreported, despite studies revealing their high prevalence across various sports disciplines [79]. A key contributor is Relative Energy Deficiency in Sport (RED-S), a syndrome arising from insufficient caloric intake relative to energy expenditure, which negatively affects menstrual function, bone density, immune response, and mental health [58]. Addressing RED-S requires improved energy availability through nutritional interventions and reduced training load [31]. Furthermore, hormonal fluctuations during the menstrual cycle influence ligament laxity and neuromuscular control, particularly during ovulation, thereby increasing the risk of injury [45].

Hormonal contraceptives, while commonly used to manage symptoms and regulate menstrual cycles, have mixed implications for performance. Some research indicates minor declines in strength or endurance, while others report no significant effects [32].

To address these complex interactions, menstrual cycle education is crucial. Providing female athletes with evidence-based information on cycle phases, hormonal shifts, and their physiological and psychological effects fosters greater body literacy and empowers performance optimization [19]. Educational workshops, tracking apps, and supportive team environments help athletes monitor symptoms and adapt training accordingly. However, persistent knowledge gaps among athletes and coaches; particularly regarding menstrual impacts on performance and the role of hormonal contraceptives, remain widespread [34]. Many athletes report discomfort discussing menstruation, especially with male coaches, and face limited access to relevant resources [43]. Although some teams exhibit better awareness, overall, menstrual health remains underprioritized in sports education.

Consequently, there is a pressing need for physical education teachers, coaches, and healthcare providers to foster open communication, implement inclusive education, and design training programs that incorporate menstrual health considerations. Key practices include symptom tracking, pain relief, physical activity adjustments, personal hygiene, and nutritional support. Maintaining hygiene; such as changing sanitary products regularly and cleansing the genital area, prevents infections and enhances comfort during physical activity [83]. Some athletes maintain their training routines during menstruation, while others reduce intensity depending on symptom severity. Techniques like heat therapy, relaxation, and medication provide relief from cramps and emotional fluctuations [8].

Moreover, hormonal fluctuations significantly affect athletic performance. For example, the follicular phase may enhance endurance, whereas the luteal phase is often marked by fatigue and reduced strength [75]. Although some studies report negative impacts of menstruation; especially among adolescent athletes, others show little to no effect, particularly in elite athletes who benefit from enhanced coping mechanisms and support systems [56]. Psychological changes, such as mood instability, diminished motivation, and altered self-image, also influence performance, albeit variably across individuals. Hormonal contraceptives may improve consistency in training by mitigating symptoms, though responses vary widely. This underscores the need for personalized training and health strategies based on individual experiences of the cycle.

This study draws on the psycho-physiological theory, an interdisciplinary framework exploring the interaction between psychological states and physiological processes [33]. According to this theory, emotions, thoughts, and beliefs can influence bodily systems such as heart rate, hormone production, and blood pressure [12]. Emotional stress, for instance, can provoke physiological responses like elevated heart rate and blood pressure [59]. In sports science, the theory explains how mental states can influence physical outcomes; e.g., menstrual discomfort may trigger negative emotional responses, impacting performance. Likewise, poor motivation

during certain cycle phases can exacerbate physical fatigue [7]. Thus, the psycho-physiological model highlights the need to view menstrual health through both physical and psychological lenses.

Menstruation has long been debated in sports science due to its hormonal, physiological, and psychological influences on female performance [19, 63]. Typically occurring between ages 12 and 15 and continuing until menopause, menstruation can affect mood, energy, coordination, sleep, and injury risk [46, 81, 53, 36, 23]. However, many training programs neglect these female-specific variations, often applying male-based regimens that ignore cyclical hormonal changes [39, 48]. Phases of the menstrual cycle also influence thermoregulation, nutrient needs, and sleep quality, all of which bear on athletic output [15, 76, 38]. Added to this are social stigmas, such as fears of "leaking" and uniform discomfort, which diminish athletes' confidence and willingness to participate [71, 17, 40].

Hormones like estrogen and progesterone are crucial to both reproductive and physical performance. High estrogen can decrease tendon stiffness, while progesterone can heighten fatigue and perceived exertion [52, 21]. The relationship between physical activity and menstruation is bi-directional: while exercise influences cycle regularity, menstrual symptoms can affect training outcomes [67, 44]. Nutritional deficiencies; particularly in iron, calcium, and vitamin D, can exacerbate performance issues and pose long-term health risks [37, 10]. Conditions like the female athlete triad and RED-S further illustrate the link between low energy availability, menstrual disruption, and decreased bone health [58, 28].

Despite increasing research interest, findings remain inconsistent; some studies report significant performance impairments, while others observe negligible effects [66, 3]. This highlights an ongoing gap in both research and the application of menstrual health knowledge within sports. Poor communication and limited awareness among athletes and coaches exacerbate the issue, often resulting in over-reliance on contraceptives and painkillers with potential long-term consequences [74, 26, 16]. Therefore, there is a compelling need for inclusive, evidence-informed approaches that integrate menstrual health into athletic training and performance strategies.

Research Questions

The following questions guided the study:

1. What are female athletes' practices related to menstruation regarding preparation to compete in sports?
2. What is the correlation of menstruation experiences on subjective sports performance of female athletes?

METHODOLOGY

Research Design

This study employed a cross-sectional survey design, which was used to capture a snapshot of the phenomenon under investigation [62]. The aim was to enable generalizations about certain characteristics, attitudes, or behaviours within the population, with data collected at a single point in time [25]. Additionally, this design facilitated the description and interpretation of the phenomenon through basic descriptive statistics [4].

Population

The study's total population comprised 200 female athletes drawn from four public Senior High Schools in the Ajumako district: Enyan Maim Secondary (35 athletes), Enyan Denkyira Secondary Technical School (55 athletes), Mando Secondary Technical School (60 athletes), and Bisease Secondary Technical School (50 athletes). This data was obtained from the heads of the Physical Education units in the respective schools and was subsequently verified by the researcher during school visits. The athletes are enrolled students who are active members of their respective school sports teams and represent their schools in inter-school competitions. They participate in various sports such as football, volleyball, handball, netball, table tennis, and track and

field events. These students initially train for inter-house competitions held in the first semester and, upon selection, continue training for inter-school games conducted early in the second semester. This implies that the athletes train for a minimum of two and a half months each semester throughout the academic year.

Sampling Procedure

The study sample comprised 200 female athletes from the four public senior high schools in the Ajumako district. Census sampling was employed, as it is recommended for small populations [25]. This method gives every population member an equal opportunity to be included, thereby enhancing the sample's representativeness and the accuracy of the findings [20]. It is particularly effective for smaller populations, as it eliminates sampling error and collects data from all individuals in the population [73]. All participants were senior high school students, capable of reading, writing, and comprehension.

Instrumentation

A modified questionnaire originally developed by [50] and [30] was used as the data collection instrument for this study through adaptation and modification. This questionnaire was selected due to its demonstrated advantages, including time efficiency, suitability for gathering relevant data, anonymity, transparency, reliability in addressing sensitive topics, self-paced completion, and ease of administration compared to techniques such as interviews [51].

The questionnaire comprised four sections: A, B, C and D Section A focused on respondents' background information, such as age, age at menarche, menstrual regularity, type of sport played, and duration of participation. It contained eight alternate-choice items. Section B comprised 18 items evaluating athletes' menstrual practices, rated on a three-point Likert scale: Always (A), Sometimes (S), and Never (N). Section C captured perceived effects of menstruation through a four-point Likert scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Section D assessed subjective sports performance; specifically, endurance, running, strength, jumping, coordination, and throwing, using a five-point scale: Excellent (5), Very Good (4), Good (3), Poor (2), and Very Poor (1). Respondents were required to select the option that best reflected their experience.

The researcher expected that the respondents would provide honest and accurate answers, free from external influence [9]. The use of closed-ended items ensured response consistency and reduced subjectivity. Although such items can limit the range of responses, their use supports effective editing and statistical analysis using tools like the Statistical Package for the Social Sciences (SPSS) [2].

Validity and Reliability of Research Instruments

The validity and reliability of the instrument were rigorously established through a series of evaluations and tests. Initially, the instrument underwent scrutiny by two lecturers from the Department of Health, Physical Education, Recreation and Sports (HPERS) of the University of Education, Winneba (UEW), who made essential corrections to ensure that the content was free from ambiguities and reflected both content and face validity. Following this, the supervisors further critiqued the instrument and suggested necessary alterations to enhance its structure and clarity. To reinforce validity, a pre-testing process was conducted through a structured group discussion focusing on the content, outline, number of questions, wording, and potential vagueness in the questionnaire [57]. Observations and suggestions from the group, composed of five conveniently sampled female athletes, were documented and used to refine specific items for better comprehension and quality. Additionally, this pre-testing helped determine whether the instrument's items were reliable, sensitive, and meaningful.

To ascertain the instrument's reliability; ensuring repeatability, stability, and consistency, a test-retest method was employed [1]. This method required the instrument to produce similar results upon repeated administrations, confirming that any observed variation was attributable to actual differences among respondents rather than measurement error [5, 13]. The test-retest was carried out over a two-week interval with 30 female athletes from Apam SHS, representing 15% of the total study sample. These participants were

chosen due to their homogeneity with the main sample and ease of accessibility. As noted by [77], piloting an instrument with a similar population helps verify its reliability and validity before administering it to the full sample. The reliability of the instrument was further confirmed using the Cronbach alpha coefficient, which yielded a value of .79 based on standardized items. This value meets the minimum threshold of .70 required for acceptable internal consistency [68]. Based on this strong reliability coefficient and validated structure, the instrument was deemed appropriate for use in the main study.

Data Collection Procedure

Prior to data collection, an introductory letter was secured from the Head of the Department of Health, Physical Education, Recreation and Sports (HPERS) to permit access to the required information from respondents. This followed approval from the supervisors to proceed with data collection. All selected schools were visited, and permission was obtained from the headmasters and headmistresses. Contact details of school heads and Physical Education teachers were recorded, and meetings with respondents were scheduled based on their availability. The researcher engaged the athletes during their recess periods after consulting with the school heads, Physical Education teachers, and in some cases, coaches.

The study's purpose was clearly communicated to the athletes before data collection commenced. Anonymity and confidentiality were assured, and participants were instructed not to include their names. All sampled athletes signed consent forms prior to completing the questionnaire. Some Physical Education teachers assisted in clarifying certain terms in the questionnaire for better understanding. Athletes were informed that there were no correct or incorrect responses and were encouraged to answer based on their personal perceptions of how menstruation affected their sports performance. The researcher personally administered the questionnaires, which were distributed to the sampled group. Respondents were given 45 minutes to complete the items, after which the questionnaires were collected. Data collection spanned four weeks, and 181 questionnaires were retrieved, resulting in a 90.5% return rate. A 70% return rate is considered acceptable for face-to-face surveys [70].

Data Analysis Procedures

After collecting the completed questionnaires, the researcher first verified their completeness to ensure that respondents had followed instructions accurately and responded to all items. The questionnaires were then coded to facilitate the identification of errors during data entry. Data were examined for missing values and outliers before being processed using SPSS version 22.0. Descriptive statistics were employed to summarize demographic information. Data for research question one was analyzed using frequency counts and percentages, as the aim was to identify the prevalence and patterns of the variables among athletes. Finally, data for research question two was analyzed using multiple linear regression. This choice was guided by [80], who advocate the use of multiple linear regression when assessing the relationship between two or more independent (predictor) variables and a single dependent (outcome) variable.

RESULTS

Research Question One: What are athletes' practices related to menstruation?

The first research question in this study aimed to investigate the practices of female athletes about menstruation. To gather insights into this aspect, the researchers designed a questionnaire in which respondents were requested to provide their feedback on a set of statements. The results obtained from the participants' responses were meticulously analyzed through frequency and percentages and are presented in Table 1.

Table 1: Female Athlete's Practices Related to Menstruation

Statement	Alwaysn (%)	Sometimesn (%)	Nevern (%)
I use disposable sanitary pads to manage menses	130 (71.8)	39 (21.5)	12 (6.6)

I use old clothes to manage menses	8 (4.4)	43 (23.8)	130 (71.8)
I use new clothes to manage menses	13 (7.2)	61 (33.7)	107 (59.1)
I use tampons to manage menses	7 (3.9)	25 (13.8)	149 (82.3)
I take medication to delay menses	16 (8.8)	37 (20.4)	128 (70.7)
I wash my hands after changing menstrual materials	122 (67.4)	52 (28.7)	7 (3.9)
I use only water to wash to clean the external genitalia	114 (63.0)	49 (27.1)	18 (9.9)
I use soap and water to clean the external genitalia	51 (28.2)	55 (30.4)	75 (41.4)
I dispose of menstrual materials in the dustbin	79 (43.6)	53 (29.3)	49 (27.1)
I dispose of menstrual materials by burning them	73 (40.3)	68 (37.6)	40 (22.1)
I dispose of menstrual materials by burying them	33 (18.2)	59 (32.6)	89 (49.2)
I dispose of menstrual materials by throwing them by the roadside	7 (3.9)	6 (3.3)	168 (92.8)
I take painkillers to reduce pain during menses	36 (19.9)	82 (45.3)	63 (34.8)
I reduce the intensity of my training during menstruation	39 (21.5)	123 (68.0)	19 (10.5)
I do not train as frequently as before during menstruation	33 (18.2)	100 (55.2)	48 (26.5)
I skip training sessions during menstruation	32 (17.7)	93 (51.4)	56 (30.9)
I avoid training/ competition during menstruation	35 (19.3)	68 (37.6)	78 (43.1)
I inform my coach when am menstruating	28 (15.5)	75 (41.4)	78 (43.1)

Source: Field survey, 2023

Table 1 reveals that the majority of respondents, 130 (71.8%), reported using disposable sanitary pads to manage their menses, indicating a prevalent reliance on this method. A notable portion, 39 (21.5%), reported using them sometimes, while only 12 (6.6%) claimed never to use them. This data suggests that disposable sanitary pads are the preferred choice for menstrual management among the surveyed individuals. A mere 8 (4.4%) of respondents claimed to always use old clothes for menstrual management, while a significantly higher percentage, 43 (23.8%), reported using them sometimes and the majority, 130 (71.8%), stated that they never use old clothes for this purpose. It was again demonstrated that 13 (7.2%) of respondents always use new clothes for menstrual management, while 61 (33.7%) do so sometimes, and the majority, 107 (59.1%), never use new clothes. This data indicates a moderate preference for new clothes compared to old clothes, but disposable sanitary pads remain the dominant choice. The use of tampons for menstrual management is relatively uncommon, with only 7 (3.9%) reporting always using them, 25 (13.8%) using them sometimes, and a vast majority of 149 (82.3%) never used them. it was revealed that the majority of respondents, constituting 122 (67.4%), reported that they always wash their hands after changing menstrual materials, indicating a commendable adherence to hygiene practices in this aspect. However, it is concerning that 52 (28.7%) of participants admitted to only sometimes doing so, and a further 7 (3.9%) never did.

The table reveals that 16 (8.8%) of respondents always take medication to delay their menses, 37 (20.4%) do so sometimes, and the majority, 128 (70.7%), never take such medications. This data suggests that taking

medication to delay menstruation is not a common practice among the surveyed population, however, to examine the usage of painkillers to alleviate menstrual pain. A significant proportion, 36 (19.9%), reported always using painkillers, while 82 (45.3%) indicated doing so sometimes. Meanwhile, 63 (34.8%) claimed to never resort to painkillers during menstruation. The data shows that 114 (63%) of respondents claimed to always use only water to clean their external genitalia, additionally, 49 (27.1%) reported sometimes using only water, while 18 (9.9%) never do. The table demonstrates that a substantial portion of respondents, 75 (41.4%), reported never using soap and water to clean their external genitalia. Only 51 (28.2%) reported always using soap and water, and 55 (30.4%) sometimes do.

The table indicates that 79 (43.6%) of respondents claimed to always dispose of menstrual materials in the dustbin. While this is a reasonably good practice, it still leaves room for improvement. Approximately 53 (29.3%) reported sometimes disposing of menstrual materials in the dustbin, and 49 (27.1%) never did. Proper disposal of menstrual materials is vital not only for personal hygiene but also for environmental concerns. The result shows that 73 (40.3%) of the respondents reported always disposing of menstrual materials by burning them, and an additional 68 (37.6%) reported sometimes using this method, which still represents a significant proportion. Only 40 (22.1%) of respondents never used this disposal method. These findings underscore the importance of raising awareness about safe and eco-friendly menstrual material disposal methods. It reveals that 33 (18.2%) of the participants claimed to always bury their menstrual materials, while 59 (32.6%) reported doing so sometimes and 89 (49.2%), indicated that they never bury their menstrual materials. On the other hand, sheds light on the practice of disposing of menstrual materials by throwing them by the roadside. The data is quite contrasting, with only 7 (3.9%) admitting to always adopting this method and a mere 6 (3.3%) occasionally doing so. A substantial majority of 168 (92.8%) stated that they never dispose of menstrual materials in this manner.

The results reveal that 39 (21.5%) of the respondents always reduce their training intensity during their cycle, while a substantial 123 (68.0%) do so occasionally. In contrast, a relatively small portion, 19 (10.5%), never adjusts their training intensity during menstruation. Data regarding the frequency with which individuals adjust their training routines during menstruation. Notably, 33 (18.2%) of respondents indicated they always alter their training regimen during this time, 100 (55.2%) sometimes do, and 48 (26.5%) never make such adjustments. The data reveals that 32 (17.7%) of respondents always skip sessions, 93 (51.4%) do so occasionally, and 56 (30.9%) never skip training sessions during this period. With the behaviour of avoiding training or competition entirely during menstruation. The data illustrates that 35 (19.3%) always avoid it, 68 (37.6%) sometimes avoid it, and 73 (43.1%) never do so. Finally, the data explores whether individuals inform their coaches about their menstrual cycles. The findings reveal that 28 (15.5%) always inform their coaches, 75 (41.4%) sometimes do, and 78 (43.1%) never disclose this information.

Research Question Two: **What is the correlation between menstruation experiences and sports performance among female athletes?**

Research question two sought the correlation between menstruation experiences on sports performance among female athletes. The results obtained are presented in Table 2 below**.**

Table 2: Correlation of menstruation experiences on sports performance among female athletes

Variables	**Unstandardized Coefficients**		**Standardized Coefficients Beta**	**R**	**R^2**	**P value**
	B	**Std. Error**				
(Constant)	48.594	1.638		.131	.17	.000
Physical effects	-.044	.113	-.040			.021
Psychological effects	-.107	.110	-.100			.036

F (2,178) = 1.56 Adj R- square 0.06						

N = 181; p = .013

Source: Field Survey, 2023

The result of the overall model shows that there exists a statistically significant association between the independent variables and the dependent variable R^2 = .17, F (2,178) =1.56, p=.013. Consequently, in terms of the model's predictive capacity, it is observed that only 17% of the variability in female athlete's sports performance can be attributed to the Physical and Psychological effects of menstruation (R^2 = .17). This discovery also implies that a substantial 83% (100% - 17%) of the variability is influenced by factors other than those included as predictors in this model.

The general form of the equation to predict the sports performance of athletes from the physical and psychological effects of menstruation is given by

SP = 48.59 - .044 (PHY_EFF) -.107 (PSY_EFF) …….. (1)

Where;

SP= Sports Performance

PHY_EFF = Physical effects

PSY_EFF = Psychological effects

From the regression equation, the 'C' (constant) is 48.59. This constant serves as the forecasted value for the dependent variable, specifically the Sports Performance, under the condition that all independent variables are set to zero (PHY_EFF = 0, and PSY_EFF = 0). This setting represents a situation where female students' sports performance is projected to be 48.59% in the absence of menstruation. Furthermore, the regression coefficients in the equation offer invaluable insights into the expected alterations in the dependent variable, which is the Sports Performance, with each one-unit increase in the respective independent variable. As elucidated in equation 1, the coefficient for 'physical effects of menstruation' stands at -.044. This outcome suggests that, with every unit increment in the physical effects of menstruation, there is a statistically significant decrease in the performance of female athlete students by 4.4% (β = -.044; p = .021). Likewise, a discernible pattern emerges within the regression model when it comes to the psychological effects of menstruation. Here, a per-unit increase in the psychological effects of menstruation corresponds to a substantial, statistically significant decrease in Sports Performance in athletics by 10.7% (β = -.107; p = 0.036). These findings underscore the significance of considering both physical and psychological aspects when analysing the performance of female athletes in the context of menstruation.

DISCUSSIONS

Female Athletes' Practices Related to Menstruation Regarding Preparation to Compete in Sports.

The first research question in this study aimed to investigate the practices of female athletes about menstruation. The results that emerged indicated that female athletes predominantly use disposable sanitary pads for menstruation, maintain proper hygiene through consistent handwashing and cleansing, dispose of menstrual items responsibly in designated dustbins or by burning them, occasionally choosing to bury them, and prioritize eco-friendly practices by avoiding improper roadside disposal. Also, the use of medication to delay menstruation is infrequent while painkillers are occasionally used for pain relief. The findings are in alignment with [30] disposable sanitary materials mostly used for management. The above-mentioned findings unequivocally indicate that female athletes attending public Senior High Schools in the Ajumako district have

embraced a contemporary and sanitary method, with disposable sanitary pads being their preferred option for managing menstruation. Their dedication to personal hygiene is commendable, as they consistently engage in handwashing and cleansing, ensuring that they maintain a high level of cleanliness during this sensitive time. Moreover, their responsible disposal of menstrual materials, whether through designated bins or burning, exemplifies their commitment to environmental responsibility, and the occasional preference for burying materials underscores their carefulness. The findings from this study align with existing literature on menstrual practices among female athletes. They underscore the importance of proper hygiene during menstruation, in line with recommendations from highlighting the need for regular changing of sanitary products and genital area cleansing and this contributes to physical comfort during sports activities, allowing athletes to focus better on their performance rather than discomfort or distractions. Proper hygiene helps prevent infections and irritation which could potentially sideline an athlete due to discomfort or illness. Infections or irritation can also affect concentration and energy levels indirectly impacting performance [47].

In terms of sports, female athletes typically reduce training intensity during menstruation, occasionally adjust training frequency, and skip competitions when necessary and this finding is in agreement with [65] explaining that, while some individual athletes may be able to maintain their normal exercise routine, others may need to take a break or engage in lower-intensity activities as well as the frequency. The results are consistent with the literature's emphasis on adjusting physical activity and training intensity based on menstrual symptoms and hormonal fluctuations, one study found that 60 minutes of moderate to intense exercise during menstruation caused exercise-induced inflammation as discussed by [78, 64]. Inversely, [32] pointed out the substantial individual variability in how menstruation affects performance. Therefore, making generalized recommendations to reduce training may not be suitable for all female athletes.

Furthermore, the relatively rare use of medication to delay menstruation is in alignment with [56] expressed concerns about the long-term health implications of using medication to suppress menstruation and also in sports. It may be considered an unfair advantage and raise questions about the level playing field for all athletes. on the contrary, [29] highlighted that delaying menstruation through medication can help female athletes maintain consistent training and competition schedules, potentially improving overall performance. The findings suggest that these athletes prioritize natural menstrual cycles, while the occasional use of painkillers indicates a pragmatic approach to pain management. The selective communication of menstrual status with coaches reflects a delicate balance between transparency and discretion, emphasizing the multifaceted nature of their approach to menstruation. Within the context of sports and these findings align with a study by [82], female athletes reported feeling uncomfortable discussing their menstrual health with coaches, leading to lack of personalized training adjustments indicating deficiency of open communication between the athletes and their coaches.

From a psychophysiological standpoint, [33] theory comes into play when considering the athletes' management of pain and adjustments in training intensity during menstruation. The occasional use of painkillers aligns with the physiological aspect of pain management reflecting an understanding of the psychophysiological processes involved in menstrual discomfort [35]. Similarly, the athletes' decision to reduce training intensity and occasionally skip training sessions during menstruation demonstrates an awareness of the psychophysiological changes that occur in their bodies during this time, indicating a pragmatic approach to maintaining their physical well-being and performance.

The findings about practices regarding menstruation could emanate from a lot of reasons. Firstly, the preference for disposable sanitary pads may be attributed to their convenience and ease of use, which aligns with an active lifestyle. Disposable pads are readily available, easy to carry, and can be discreetly used during athletic activities, making them a practical choice for female athletes these will boost confidence hence maximizing sports performance. Again, their use may be influenced by the perception of better absorbency and reduced leakage compared to other methods like cloth which is crucial for athletes who need to stay comfortable and focused during their activities. More so, the emphasis on proper hygiene practices such as consistent handwashing and external genitalia cleansing could be attributed to the athletes' awareness of the importance of maintaining personal hygiene during menstruation to prevent infections and discomfort. This heightened awareness might stem from the rigorous training and competition schedules of female athletes, as they strive to minimize any disruptions caused by menstrual issues [42]. Similarly, responsible disposal

methods and avoidance of improper roadside disposal can be linked to the female athletes' understanding of their environmental responsibilities, as many athletes are role models and may be more inclined to uphold eco-friendly practices. Lastly, the infrequent use of medication to delay menstruation and the occasional use of painkillers may reflect a preference for a more natural approach to managing menstrual cycles and discomfort that without focusing on the use of medication, as well as a concern for the potential side effects of medication, which could affect sports performance.

Link Between Menstruation Experience and Subjective Sports Performance of Female Athletes.

The second research question examined how menstruation affects the sports performance of female athletes. The findings revealed that approximately 17% of the variations in female athletes' sports performance can be attributed to the physical and psychological effects of menstruation. Furthermore, the regression analysis demonstrated that for each unit increase in the physical effects of menstruation, there was a statistically significant 4.4% decrease in the performance of female athlete (β = -.044; p = .021). Likewise, the psychological effects of menstruation were found to significantly reduce female students' performance in sports by 10.7% (β = -.107; p = 0.036). The study's findings align with previous research by [22] and [18], which both suggested that the menstrual cycle can indeed impact female athletes' sports performance. [22] emphasized that the menstrual cycle's influence on physical and psychological factors is increasingly recognized as a crucial consideration in women's sports. This supports the current study's assertion that both physical and psychological aspects of menstruation significantly affect sports performance of the female athletes. Also, [18] on the prevalence and impact of heavy menstrual bleeding in elite and non-elite athletes indicated that heavy menstrual bleeding among high school female athletes affects their active participation in sporting activities which subsequently leads to poor sports performance.

From the above, it is glaring that the findings presented in the study have addressed research question four, which aimed to examine how menstruation affects the sports performance of female athletes in public SHS in the Ajumako district. The results provided valuable insights into the relationship between menstruation and sports performance among female student-athletes in this specific context. The regression analysis has provided evidence to support how the physical and psychological effects of menstruation affect female athlete's sports performance. These specific numerical findings lend statistical credibility to the idea that menstruation affects the sports performance of female athletes in public SHS in the Ajumako district.

The observed decline in sports performance among female athletes with increasing physical effects of menstruation could be attributed to various factors. First, menstrual symptoms such as abdominal cramps, fatigue, and bloating could be physically discomforting and distracting, potentially diverting an athlete's focus and energy away from their sport [18]. These physical discomforts might lead to reduced agility, endurance, and overall physical performance. Again, hormonal fluctuations during menstruation could impact muscle strength and coordination, further affecting athletic abilities. Female athletes may also be less inclined to push themselves to their limits when experiencing these physical symptoms, which can result in decreased sports performance. The dire implication is that female athletes who experience heightened physical discomfort during menstruation may face a greater challenge in maintaining their peak performance, leading to disparities in their athletic records and potential missed opportunities in competitions.

On the other hand, the reduction in sports performance associated with the heightened psychological effects of menstruation might be explained by the emotional and cognitive challenges that menstruation can bring. Mood swings, irritability, and anxiety, which are common psychological symptoms during this time can disrupt an athlete's mental state, leading to decreased concentration and focus. Confidence levels may also decrease affecting female athlete's self-belief and performance expectations. Such psychological hurdles could hinder an athlete's overall athletic journey, preventing them from reaching their full potential and affecting their long-term athletic development [60].

The findings of this study offer valuable insights that can be linked to existing theoretical frameworks in the field of sports psychology and performance. One theoretical framework that can be related to these findings is the Psychophysiological theory, as proposed by [33]. This theory suggests that physiological factors play a crucial role in determining an individual's performance in various activities, including sports. In the context of

the study's results, the physical and psychological effects of menstruation align with the psychophysiological perspective, where hormonal changes during menstruation can affect an athlete's physical condition as well mental preparedness which impact their sports performance.

The statistically significant 4.4% decrease in performance with each unit increase in physical effects supports the idea that physiological changes are influential in this context. Furthermore, these findings can be connected to the Hormonal theory. This theory posits that hormonal fluctuations can have significant effects on various aspects of human behaviour and physiology. In the context of female athletes and menstruation, the study's results confirm the relevance of hormonal factors. The significant decrease in sports performance by 10.7 due to psychological effects of menstruation underscores the role of hormonal fluctuations in affecting an athlete's mental state, as postulated by Morgan in the hormonal theory. The emotional and psychological aspects of sports performance could be strongly tied to hormonal changes and this finding aligns with that perspective these can be explained that changes in hormone levels may influence factors like strength, endurance, and susceptibility to injury [52]. Conversely, the findings contradict several studies that have found no significant psychological effects of the menstrual cycle on sports performance. For instance, in a study by [64], female athletes' performance in cycling time trials was not affected by the different menstrual cycle phases. Correspondingly, a study by [19] on middle-distance runners found no significant differences in performance across menstrual cycle phases. Similarly, a study conducted by [27] concluded that no performance differences were seen among top-level female team athletes. This shows that in top-level team athletes, the MC does not affect acute strength and power performance on a collective basis [3]. This implies that the menstrual cycle does not affect sports performance both physically and psychologically. This may be because these elite athletes have a certain amount of knowledge and experience that helps them create techniques to manage with menstruation syndromes that are experienced during their cycle, resulting in an enhancement in their performance. These contradictions in findings could be associated with the fact the variability in sports performance can be influenced by other unknown 83% factors such as improper nutrition, lack of proper training, weather, and others [61].

The findings provide new evidence related to the impact of menstruation on the sports performance of female athletes within the context of SHS in Ajumako who engaged in sports such as athletics, volleyball, soccer, table tennis, netball, and handball. The study has provided quantitative evidence, demonstrating that both physical and psychological aspects of menstruation have statistically significant negative effects on sports performance among female athletes in SHS in Ajumako. These findings contribute to the understanding of how menstrual symptoms can physically and psychologically affect female athletes, potentially leading to a decline in their sports performance in the elements below (endurance, strength, skills, coordination and muscle’s ability to recover) in ball games and athletics.

CONCLUSIONS

The study concludes that menstruation moderately impacts the sports performance of senior high school female athletes although it not strong with physical and psychological effects contributing to a 17% decline. Despite these challenges, the athletes demonstrate responsible menstrual hygiene practices, primarily using disposable sanitary pads, and rarely resort to medication to delay menstruation; only occasionally using painkillers, showing their commitment to both health and athletic performance. Their ability to adapt training routines and selectively communicate with coaches about menstrual issues reflects their resilience and dedication. These findings underscore the need for educational and support systems to address menstruation-related challenges, while also presenting female athletes as role models for sustainable practices and perseverance in sports. Finally, it is suggested that a longitudinal or experimental study should be conducted by other researchers who are interested in the area of study.

RECOMMENDATIONS

Based on the findings, it was recommended that, eco-friendly menstrual hygiene products by encouraging collaboration between schools, organizations, and local sanitary pad manufacturers to provide affordable, sustainable options. At the same time, coaches should maintain open communication with athletes about

menstrual health to create a supportive environment that enables effective management of menstruation alongside athletic participation. To further reduce the negative impact of menstruation on performance, coaches and sports professionals should receive training to develop personalized training and competition strategies that consider menstrual cycle fluctuations. Tools such as menstrual calendars, apps like Spot On, or wearable devices can be used to monitor athletes' cycles and tailor training programs accordingly, helping optimize performance and minimize menstrual-related disruptions.

Limitations

The generalizability of the study was limited to female student-athletes within the Ajumako District and may not extend to professional athletes or non-athletes. Additionally, the use of a questionnaire to measure the variables relied on self-reported data, which may have been affected by the participants' ability to accurately recall information. There is also the possibility that respondents either overestimated or underestimated their abilities, potentially influencing the validity of the findings.

Abbreviations

F.S.H: Follicle-Stimulating Hormone

HPERS: Health Physical Education, Recreation and Sports

L H: Luteinizing Hormone

NSAIDs: Nonsteroidal Anti-Inflammatory Drugs

PHY_EFF: Physical Effects

PMS: Premenstrual Syndrome

PSY_EFF: Psychological Effects

RED-S: Relative Energy Deficiency in Sport

SP: Sports Performance

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Author Contributions

The authors prepared, read and approved the final manuscript.

Ethical Considerations

A letter from the Head of the Department of Health, Physical Education, Recreation, and Sports (HPERS) was used to obtain permission for the study. The researchers explained the study's purpose and assured participants of confidentiality. Informed consent was obtained before administering the research instruments. Approval was also sought from the headmasters and headmistresses of the selected schools. Contact information of the heads and Physical Education teachers was collected, and meetings with participants were scheduled based on their convenience.

The researcher met with the athletes during their break periods, after coordination with school heads, PE teachers, and occasionally coaches. The purpose of the study was explained to the athletes prior to data collection. They were assured of anonymity, and no names were recorded. All participants signed consent forms before completing the questionnaire. PE teachers assisted in clarifying difficult terms. Athletes were informed that there were no right or wrong answers and were encouraged to respond based on their personal experiences with how menstruation affects their sports performance. The questionnaire was administered solely by the researcher.

Conflicts Of Interest

The authors declare no conflicts of interest.

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