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PERCEIVED EFFECT OF SPORT PARTICIPATION ON MENSTRUAL CYCLE AMONG FEMALE ATHLETES IN YENAGOA, BAYELSA STATE, NIGERIA

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Abstract
The global shift in societal and cultural attitudes towards the inclusion of female athletes in the sporting arena has contributed to a surge in the participation of women in competitive sports in recent years. The menstrual cycle and other female-specific physiological traits may be negatively impacted by these activities. This study investigated the perceived effect of sports participation on the menstrual cycle among female athletes in the Yenagoa local government area of Bayelsa State, Nigeria. The descriptive survey design was adopted. A stratified sampling technique and snowballing technique were used to select 160 respondents from the study area. A structured questionnaire with a reliability coefficient of 0.834 was used to collect data, retrieval rate was 93.8%. Data was subjected to descriptive and inferential statistical analysis. Findings from the study revealed the female athletes had a mean menarche age of 13.25±1.68 years, a mean menstrual cycle duration of 28.30±4.15 days, and a mean menstrual flow of 4.30±0.84 days. The majority of the respondents (27.8%) who experienced very severe menstrual pain were found among respondents with very active sports participation. Findings further revealed that sports participation had no significant effect on age at menarche ($F= 1.447$, $p= 0.239$), duration of the menstrual cycle ($F= 2.170$, $p= 0.118$), and length of menstrual flow ($F= 0.516$, $p= 0.598$) but had a significant effect on menstrual pain ($F= 5.056$, $p= 0.002$). Thus, coaches and personal trainers should regularly organise workshops/training for female athletes on the management and balancing of sporting activities about their menstrual cycle; in addition, female athletes should maximise each phase of their cycle for optimum participation and performance.

Keywords: Sports Participation, Female Athletes, Menstrual Cycle, Yenagoa

Introduction

Sport can be described as organised or spontaneous competitive physical activity accepted by the codification of rules in which, individuals engaged either via casual or organised participation, aim to use, maintain and/or improve physical ability, skills, mental relaxation, and bodily fitness while providing entertainment to active participants (players), and in most cases, the passive participants (spectators) (Drummond & Phil, 2011; SportAccord, 2011; Council of Europe, 2012).

The global shift in societal and cultural attitudes toward the acceptance of female athletes into the sporting arena, which historically and traditionally was a male bastion has led to an exponential increase in the participation of females in competitive sports and active physical activities over the past three decades (Lebrun et al., 2013). Most sports, including ice hockey, wrestling and rugby, which were formerly men's only events, now feature women competing at the top levels. Women were first allowed to compete in boxing at the 2012 Summer Olympic Games in London which provided women the chance to take full part in the sport as professional players. However, research on how sports affect these women's menstrual cycle has not kept pace with the exponential rise in participation, considering the anatomical, physiological and endocrinological differentials of the male and female gender (Costello et al., 2014; Sheel, 2016; Forsyth & Roberts, 2018; Emmonds et al., 2019; Alexander et al., 2021).

Large cyclic fluctuations in endogenous sex hormones such as oestrogen and progesterone are seen in the female gender during the menstrual cycle. These fluctuations which are fairly predictable (and measurable) across the menstrual cycle result in significantly different transient hormonal profiles (Davis & Hackney, 2017; McNulty et al., 2020). The hypothalamus, pituitary and ovarian hormones in addition to affecting the sexual organs interact intricately to control the menstrual cycle which affects a variety of processes in the metabolism, water and electrolyte balance and thermoregulation in women (Julian et al., 2017; Wiecek, 2018). One cycle generally lasts (give or take a few days) the same amount of time each month from the beginning of the bleeding

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(period) to the start of the subsequent period (Gunn et al., 2018). It is a regular, natural and cyclical sequence of changes in the female reproductive system that gets her body ready for a possible pregnancy; and is unique to each female, according to the National Health Service's description of what a "normal" menstrual cycle involves: cycle length between 21 and 40 days, blood loss from 30 to 60mL, and menses between 3 to 8 days (NHS Choices, 2017; Thiyagarajan et al., 2021).

Research has shown that though the change in oestrogen and progesterone concentrations during the menstrual cycle has a variety of diverse complex effects on multiple physiological systems, including respiratory, metabolic, neuromuscular and cardiovascular parameters, these hormones' primary function is to support reproduction (Davis & Hackney, 2017; Ansdell et al., 2019). According to previous studies, these normal physiological processes cause over 75% of females to have some unpleasant side effects. Research has also shown that hormonal changes throughout the menstrual cycle are also associated with variations in strength, inflammation, metabolism, fluid balance and risk of injury (Wiecek, 2018).

Menstruation pains are strong spasms in the lower abdominal region that typically occur on the first and second day of menstruation; medically referred to as dysmenorrhea (IQWiG, 2019). The pathophysiology of (primary) dysmenorrhea has been associated with increased and/or aberrant uterine activities as a result of heightened prostaglandin production and release during the onset of the menstrual cycle (Ju et al., 2014; Azagew et al., 2020; ACOG, 2020). Although some females averred that their pain diminished with regular exercise and some scholars have given credence to their assertions (Findlay et al., 2020; Kirmizigi & Demiralp, 2020; Invited Editorial, 2022), others however hold contrary views that exercise neither cure nor aggravate painful menstrual cycle (De-Souza et al., 2010; Kroll-Desrosiers et al., 2017). Physical activity irrespective of the intensity has been demonstrated to ease menstrual cramps because it improves circulation to the uterus and stimulates it. This may be due to the increased amounts of endorphins formed after an extended physical activity such as sports which may lessen the discomfort that some women experience (Gebeyehu et al., 2017; Samy et al., 2019; ElDeeb et al., 2020; Chang et al., 2023). Thus, it is probable that engaging in competitive sports and other energy-intensive demanding activities may have a direct impact on the regular monthly hormonal changes that are brought on by the menstrual cycle (ElDeeb et al., 2020; Invited Editorial, 2022).

In addition to alleviating menstrual cramps (spasms) and bloating, and promoting a positive emotional outlook among female athletes, rigorous exercise and competitive sports have been reported to negatively interfere with the normal physiological activities of female athletes (Verhoef et al., 2021). Chief among the health-related implications of sporting activities in female athletes is menstrual dysfunction particularly the loss of the menstrual cycle, which gynaecologists and endocrinologists rightly referred to as functional amenorrhea (Gordon et al., 2017; Saglam & Orsal, 2020; Antonia et al., 2022; Invited Editorial, 2022). The main predictors of functional amenorrhea among athletes according to the recently published guide by Endocrine Society and co-authored with the European Society of Endocrinology are psychological stress, nutritional deprivation, and strenuous exercise training. These triads are often present among career female athletes, and especially among those involved in highly competitive sporting events (Brown & Knight, 2020; Invited Editorial, 2022).

In addition to functional amenorrhea, active athletic women have been documented to have a wide range of menstrual dysfunctions such as ovulatory eumenorrhea, anovulatory eumenorrhea, luteal phase abnormalities as well as long-lasting amenorrhea. Exercise intensity, duration and training levels all have a significant impact on how the menstrual cycle is affected (Rossmanith, 2022).

Statement of the Problem

The involvement of female athletes in competitive sports has increased exponentially in the past three decades due to global advances in changing societal and cultural perspectives towards accepting female athletes into the sports arena which formerly was a male stronghold. The general benefits of sports participation and sporting activities are well documented. Among women, these benefits include the alleviation of certain disorders and ailments associated with the menstrual cycle. This relief appears to be due to the release of endorphins, a chemical compound that is known for its feel-good effects and pain-relieving properties. Though there are multiple beneficial effects of exercise and sporting activities on the health and well-being of individuals who participate in them; there are also potential negative health outcomes that are associated with these sporting activities especially when it is rigorous and occurs over a long period. Female athletes who participate in elite sports fall into the category of those who may experience these adverse effects. The most significant documented negative health implication of sporting activities among female athletes is functional hypothalamic amenorrhea, and the most serious consequences include a delay in puberty, a menstrual cycle marked by the

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absence of ovulation, anovulatory oligomenorrhea, infertility issues, and long-term adverse effects of deficiency in oestrogen.

Despite the compelling scientific evidence with clear demonstrable impacts of sporting activities on the menstrual cycle among female elite athletes, there is limited information on the influence of sporting activities on the menstrual cycle among female athletes. Furthermore, the available evidence of the impact of sport on the menstrual cycle is not equally distributed across different geographical locations. It is against this backdrop that this study investigated the influence of sports participation on the menstrual cycle among female athletes in Yenagoa Local Government Area of Bayelsa State, Nigeria.

Aims and Objectives of the Study

This study investigated the perceived effect of sports participation on the menstrual cycle among female athletes in Yenagoa Local Government Area of Bayelsa State, Nigeria. Specifically, the objectives are to;

1. Determine the perceived effect of sports participation on the age of menarche among female athletes in the Yenagoa local government area of Bayelsa State, Nigeria.
2. Examine the perceived effect of sports participation on the duration of menstrual flow among female athletes in the Yenagoa local government area of Bayelsa State, Nigeria.
3. Ascertain the perceived effect of sports participation on the length of menstrual flow among female athletes in Yenagoa local government area of Bayelsa State, Nigeria.
4. Determine the perceived effect of sports participation on the severity of menstrual pain among female athletes in the Yenagoa local government area of Bayelsa State, Nigeria.
5. Evaluate the perceived effect of sports participation on symptoms of menstrual pain among female athletes in the Yenagoa local government area of Bayelsa State, Nigeria.

Research Questions

The study was guided by the following research questions;

1. What is the perceived effect of sports participation on the age of menarche among female athletes in Yenagoa local government area of Bayelsa State, Nigeria?
2. What is the perceived effect of sports participation on the duration of menstrual flow among female athletes in the Yenagoa local government area of Bayelsa State, Nigeria?
3. What is the perceived effect of sports participation on the length of menstrual flow among female athletes in the Yenagoa local government area of Bayelsa State, Nigeria?
4. What is the perceived effect of sports participation on the severity of menstrual pain among female athletes in Yenagoa local government area of Bayelsa State, Nigeria?
5. What is the perceived effect of sports participation on symptoms of menstrual pain among female athletes in Yenagoa local government area of Bayelsa State, Nigeria?

Hypotheses

The following null form hypotheses served as a guide;

$H_0$1: Sport participation has no significant effect on the age of menarche among female athletes in Yenagoa local government area of Bayelsa State, Nigeria.

$H_0$2: Sport participation has no significant effect on the duration of menstrual flow among female athletes in Yenagoa local government area of Bayelsa State, Nigeria.

$H_0$3: Sport participation has no significant effect on the length of menstrual flow among female athletes in the Yenagoa local government area of Bayelsa State, Nigeria.

$H_0$4: Sport participation has no significant effect on the severity of menstrual pain among female athletes in Yenagoa local government area of Bayelsa State, Nigeria.

$H_0$5: Sport participation has no significant effect on symptoms of menstrual pain among female athletes in Yenagoa local government area of Bayelsa State, Nigeria.

Materials and Methods

The study used a cross-sectional survey design. All female athletes in the study area (Yenagoa) formed the population of the study. Yenagoa, one of Bayelsa State's eight local government areas serves as the state capital. It is located in the Niger Delta region of Nigeria. To choose the respondents that will participate in the study, a multistage sampling procedure was used. Yenagoa Local Government Area (LGA) was divided into fifteen strata in the first stage based on the number of available wards in the LGA; in the second stage, 50% of the wards were randomly chosen resulting in approximately eight wards; and in the third stage, the snowball sampling technique was used to select twenty respondents from each of the eight wards to make a total of 160 respondents used for the study. A self-structured questionnaire with a reliability coefficient of 0.834 was used to collect data and analysed with the aid of SPSS (version 26).

Results

Sociodemographic characteristics of respondents

Table 1 shows the sociodemographic characteristics of respondents

Variables	Description	Frequency	Percent
Age (Years)	≤ 20	80	53.4
	21-25	29	19.3
	26-30	17	11.3
	31-35	24	16.0
	Mean/SD	*21.78±6.71*	
Marital status	Single	106	70.7
	Married	40	26.7
	Separated	3	2.0
	Divorced	1	0.7
Educational attainment	No formal education	7	4.7
	Primary	9	6.0
	Secondary	90	60.0
	Tertiary	44	29.3
Religion	Christianity	122	81.3
	Islam	27	18.0
	Traditional Worship	1	0.7
Occupational status	Unemployment	81	52.0
	Self-employed	48	32.0
	Civil servant	18	12.0
	Public servant	3	2.0
Estimated income per month (₦)	≤ 20,000	78	52.0
	21,000-40,000	30	20.0
	41,000-80,000	34	22.7
	> 80,000	8	5.3
Household size	2-3	74	49.3
	5-7	71	47.3
	> 7	5	3.3
	Mean/SD	*4.63±1.57*	

The mean age of the respondents was 21.78±6.71 years. The majority of the respondents were single (70.1%), had attained secondary education (60.0%), and were mostly unemployed (52.0%) and this is reflected in their income bracket as the majority (52.0%) who were employed earned 20,000naira or less. The majority of the respondents practised the Christian religion and the mean household size was 4.63±1.57.

Table 2: Perceived effect of sport participation on age of menarche among female athletes in Yenagoa LGA of Bayelsa State

Variables	Age at Menarche (Years)							
Sport Participation	9-11		12-14		15-17		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Passive	9	14.1	38	59.4	17	26.5	64	42.7
Moderate	12	17.6	43	63.2	13	19.1	68	45.3
Very active	4	22.2	7	38.9	7	38.9	18	12.0
Total	25	16.7	88	58.7	37	24.7	150	100.0

Table 2 shows the result on the perceived effect of sports participation on the age of menarche among female athletes in Yenagoa LGA, Bayelsa State, Nigeria. The result revealed that more than half (59.4%) of the respondents who were passive sports participants had their menarche when they were between 12-14 years of

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age. Those who were very active sports participants (38.9%) and had their menarche at the age between 12-14years and 15-17 years respectively.

Table 3: Perceived effect of sport participation on duration of menstrual cycle among female athletes in Yenagoa LGA of Bayelsa State

Variables	Duration of Menstrual Cycle (Days)							
Sport Participation	20-24		25-29		30-35		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Passive	24	37.5	25	39.1	15	23.4	64	42.7
Moderate	24	35.3	30	44.1	14	20.6	68	45.3
Very Active	8	44.4	9	50.0	1	5.6	18	12.0
Total	56	37.3	64	42.7	30	20.0	150	100.0

The result as shown in Table 3 revealed that more than one-third (37.5%), about two-fifths (39.1%), and more than one-fifth of the respondents that had passive sport participation had a menstrual cycle duration of between 20-24 days, 25-29 days, and 30-35 days respectively. Among the respondents that had moderate sports participation, more than one-third (35.3%) had a menstrual cycle duration of between 20-24 days, while among respondents that were very active sport participants, half (50.0%) had a menstrual cycle duration of between 25-29 days. Furthermore, the aggregated result revealed more than one-third (37.3%) of the respondents had a duration of menstrual cycle between 20-24 days, more than two-fifths (42.7%) had menstrual cycle duration of between 25-29 days, and one-fifth (20.0%) had a duration of between 30-35 days.

Table 4: Perceived effect of sport participation on length of menstrual flow among female athletes in Yenagoa LGA of Bayelsa State

Variables	Length of Menstrual Flow (Days)							
Sport Participation	3-4		5-6		> 6		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Passive	36	56.3	27	42.2	1	1.6	64	42.7
Moderate	39	57.4	29	42.6	0	0.0	68	45.3
Very active	7	38.9	10	55.6	1	5.6	18	12.0
Total	82	54.7	66	44.0	2	1.3	150	100.0

Table 4 presented the result on the perceived effect of sports participation on the length of menstrual flow among female athletes in Yenagoa LGA, Bayelsa State, Nigeria. The aggregated result revealed that more than half (54.7%) had length of menstrual flow of between 3-4 days, more than two-fifths (44.0%) had a menstrual flow length of between 5-6 days, while a fraction (1.3%) had a menstrual length of more than 6 days. The disaggregated result revealed that among respondents who were passive participants, more than half (56.3%) had a menstrual flow length of between 3-4 days, more than two-fifths (42.2%) had a flow duration of between 5-6 days, and a fraction had menstrual flow duration of more than 6 days. The result further showed that among respondents that had moderate sport participation, more than half (57.4%) had a monthly menstrual flow duration of between 3-4 days, and more than two-fifths (42.6%) had a menstrual flow duration of between 5-6 days. Among the respondents with very active participation, more than one-third (38.9%) had a menstrual flow duration of between 3-4 days, more than half (55.6%) had a flow duration of between 5-6 days, and a fraction (5.6%) had a menstrual flow duration of more 6 days.

Table 5: Perceived effect of sport participation on severity of menstrual pain among female athletes in Yenagoa LGA of Bayelsa State, Nigeria.

Variables	Menstrual Pain Severity									
Sport	No pain		Mild pain		Severe pain		Very severe pain		Total	
Participation	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Passive	26	40.6	18	28.1	14	21.9	6	9.4	64	42.7
Moderate	33	48.5	13	19.1	17	25.0	5	7.4	68	45.3
Very active	10	55.6	0	0.0	3	16.7	5	27.8	18	12.0
Total	69	46.0	31	20.7	34	22.7	16	10.6	150	100.0

The result in Table 5 presented the perceived effect of sports participation on the severity of menstrual pain among female athletes in Yenagoa LGA of Bayelsa State, Nigeria. The result indicated that two-fifths (40.6%) of the respondents with passive participation, about half (48.5%) of the respondents with moderate sports

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participation, and more than half (55.6%) of respondents who were very active sports participants reported no menstrual pain. The aggregated result revealed more than two-fifths (46.0%) of the respondents experienced no pain during their menstrual cycle, one-fifth (20.7%), (22.7%), and a fraction (10.6%) experienced mild pain, severe pain, and very severe pain respectively.

Hypotheses Testing

$H_0$1: Sport participation has no significant effect on the age of menarche among female athletes in Yenagoa local government area of Bayelsa State, Nigeria.

Table 7: ANOVA on the effect of sport participation on age of menarche among female athletes

	Sum of Squares	Df	Mean Square	F	p-value	Decision
Between Groups	14.622	2	7.311	1.447	0.239	Not significant
Within Groups	742.551	147	5.051			
Total	757.173	149				

Significant at p≤ 0.05

The result of a One-way Analysis of Variance (ANOVA) determining the effect of sport participation on the age of menarche among female athletes in Yenagoa local government area of Bayelsa State, Nigeria as presented in Table 7 revealed sport participation had no significant effect (F= 1.447, p= 0.239) on the age of menarche among female athletes in Yenagoa LGA. Therefore, the null hypothesis was accepted.

$H_0$2: Sport participation has no significant effect on the duration of the menstrual cycle among female athletes in Yenagoa local government area of Bayelsa State, Nigeria.

Table 6: ANOVA indicating the effect of sports participation on the duration of menstrual cycle among female athletes

	Sum of Squares	Df	Mean Square	F	p-value	Decision
Between Groups	21.716	2	10.858	2.170	0.118	Not significant
Within Groups	735.458	147	5.003			
Total	757.173	149				

Significant at p≤ 0.05

Table 6 presented the result of ANOVA between sport participation and duration of menstrual cycle among female athletes in Yenagoa local government area of Bayelsa State, Nigeria. The result showed that sports participation has no significant effect (F= 2.170, p= 0.118) on the duration of the menstrual cycle among female athletes in Yenagoa Local Government Area of Bayelsa State, Nigeria. Therefore, the null hypothesis was accepted.

$H_0$3: Sport participation has no significant effect on the length of menstrual flow among female athletes in Yenagoa local government area of Bayelsa State, Nigeria.

Table 8: ANOVA indicating the perceived effect of sport participation on the duration of menstrual flow among female athletes in Yenagoa LGA

	Sum of Squares	Df	Mean Square	F	p-value	Decision
Between Groups	5.280	2	2.640	0.516	0.598	Not significant
Within Groups	751.894	147	5.115			
Total	757.173	149				

Significant at p≤ 0.05

Table 8 presented the result of ANOVA conducted to determine the effect of sport participation on the duration of menstrual flow among female athletes in Yenagoa local government area of Bayelsa State, Nigeria. The result revealed that sports participation had no significant effect (F= 0.516, p= 0.598) on the duration of menstrual flow among female athletes. Therefore, the null hypothesis was accepted.

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$H_0$4: Sport participation has no significant effect on the severity of menstrual pain among female athletes in Yenagoa local government area of Bayelsa State, Nigeria.

Table 9: ANOVA indicating the effect of sport participation on the severity of menstrual pain among female athletes in Yenagoa LGA

	Sum of Squares	Df	Mean Square	F	p-value	Decision
Between Groups	71.266	3	23.755	5.056	0.002	Significant
Within Groups	685.907	146	4.698			
Total	757.173	149				

Significant at p≤ 0.05

The result of ANOVA as presented in Table 9 above indicated that sport participation among female athletes had a significant effect (F= 5.056, p= 0.002) on menstrual pain among female athletes. Therefore, the null hypothesis was rejected.

Table 10: Post-hoc multiple comparison test

Menstrual pain		Mean Diff	Std. Error	p-value	95% Confidence Interval Lower Bound	Upper Bound
No pain	Mild pain	1.3516*	0.4687	0.005	0.4253	2.2778
	Severe pain	0.3525	0.4542	0.439	-0.5451	1.2501
	Very severe pain	-1.0960	0.6014	0.070	-2.2846	0.0926
Mild pain	No pain	-1.3516*	0.4687	0.005	-2.2778	-0.4253
	Severe pain	-.9991	0.5383	0.065	-2.0628	0.0647
	Very severe pain	-2.4476*	0.6672	0.000	-3.7662	-1.1289
Severe pain	No pain	-.3525	0.4542	0.439	-1.2501	0.5451
	Mild pain	0.9991	0.5383	0.065	-.0647	2.0628
	Very severe pain	-1.4485*	0.6571	0.029	-2.7472	-0.1498
Very severe pain	No pain	1.09601	0.6014	0.070	-.0926	2.2846
	Mild pain	2.4476*	0.6672	0.000	1.1289	3.7662
	Severe pain	1.4485*	0.6571	0.029	.1498	2.7472

*. The mean difference is significant at the 0.05 level.

To further determine the effect of sports participation on the severity of menstrual pain among female athletes in the study area, a post-hoc multiple comparison was carried out using the Least Significance Different (LSD) test. The result revealed there was a significant difference between the respondents with no menstrual pain (p= 0.005) and those with mild menstrual pain, and respondents with no menstrual pain were observed to be 1.35 times more (mean difference= 1.3516) actively participating in sports than those with mild menstrual pain. The result also revealed there was a significant difference between respondents with mild menstrual pain (p= 0.000) and those with very severe menstrual pain, and the respondents with very severe menstrual pain were observed to have had 2.5 times less (mean difference= -2.4476) active sports participation than the respondents with mild menstrual pain. Furthermore, there was a significant difference between the respondents with severe menstrual pain (p= 0.029) and those with very severe menstrual pain. Those with very severe menstrual pain were observed to have had 1.45 times less (mean difference= -1.4485) active sports participation than respondents with severe menstrual pain. However, there was no significant difference between respondents with mild menstrual pain (p= 0.065) and those with severe menstrual pain.

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$H_0$5: Sport participation has no significant effect on symptoms of menstrual pain among female athletes in Yenagoa local government area of Bayelsa State, Nigeria.

Table 11: Regression model on Perceived effect of sport participation on symptoms of menstrual pain among female athletes

Model	Beta(B)	T	p-value	Decision
Headache	-0.060	-0.720	0.473	Not significant
Cramps	0.048	0.536	0.593	Not significant
Backache	0.135	1.473	0.143	Not significant
Dizziness	-0.220*	-2.758	0.007	Significant
Nausea	0.228*	2.912	0.004	Significant
Vomiting	-0.041	-0.525	0.600	Not significant
Fatigue/Tiredness	0.227*	2.840	0.005	Significant
Irritation	0.087	1.057	0.293	Not significant
Moodiness	-0.059	-0.758	0.450	Not significant
Confusion	0.035	0.444	0.658	Not significant

R= 0.643; R^2= 0.384

Table 11 presented the regression model showing the perceived effect of sports participation on symptoms of menstrual pain among female athletes in Yenagoa LGA of Bayelsa State, Nigeria. The model R^2 was 0.384 which indicated that the model explained 38.4% of the effect of sport participation on symptoms of menstrual pain among the respondents. The result further revealed that active participation in sports affected dizziness (β= -0.220, p= 0.007), nausea (β= 0.228, p= 0.004), and fatigue/tiredness (β= 0.227, p= 0.005); implicating that active sport participation would result in 0.220 times reduction of dizziness, 0.228 times increment in nausea, and 0.227 times increment in fatigue/tiredness that is associated with menstrual cycle.

Discussion

The female athletes who participated in this study were in their prime as observed from their mean age of 21.78±6.71 years. The majority were single with a minimum level of education as indicated by the large number who had attained at least a secondary education. Half of the respondents were unemployed and the majority who were employed earned 20,000naira or less. The Christian religion was the predominant religion and the mean household size was 4.63±1.57. Findings from the study showed that passive to moderate sports participation could cause early menarche, while very active participation in sports could delay the onset of menarche in female athletes. The finding is in agreement with the work of Findlay et al., (2020) who reported higher menarche age for elite female athletes that participated in high-impact games such as rugby. In addition, the mean menarche age of this study was observed to be 13.25±1.68 years, a study by Otobo et al., (2018) reported similar mean age. Other studies by Anikwe et al. (2020) in Abakaliki, and Adinma et al., (2021) in Nnewi yielded 13.0±1.0, and 12.79±1.20 respectively.

Findings from the study also showed that among respondents who were very active sports participants, less than half had a menstrual cycle duration of between 20-24 days, half had between 25-29 days, and a fraction had between 30-35 days of menstrual cycle duration. The mean menstrual cycle duration was found to be 28.30±4.15 days and the intensity of sport participation was observed to increase the number of respondents that move to the median class. Hence, it could be deduced that respondents in the median class benefit more from active sports participation. The different menstrual cycle stages have an impact on how well elite athletes perform in sports (Carmichael et al., 2021). The mid-luteal ovulatory phases were found to be better for sprint performance while the early follicular phases were better for vertical jump height. Research has shown that female athletes' strength peaks in the ovulatory phase and they are also most motivated to practise and compete during this phase (Tasmektepligil et al., 2010; Cook et al., 2018). From the study, the mean menstrual flow among the female athletes was 4.30±0.84 days and more than half of the study participants had a menstrual flow of between 3-4 days. The finding is in tandem with the work of Otobo et al., (2018) who reported similar menstrual flow duration. More than half of those who actively participated in sports reported no menstrual pain compared to less than half with passive participation who reported no menstrual pain. Regular sport and exercise have been used therapeutically to mitigate dysmenorrhea. This is accomplished by increasing the premenstrual pelvic blood flow, and enhancing faster transfer of waste and prostaglandins, which are the source of menstrual pain during menstruation (Dehnavi et al., 2018).

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The findings further revealed that sports participation had no significant effect on the duration of female athletes' menstrual flow, age at menarche, and length of menstrual flow. However, significant effects were established between sports participation and menstrual pain. Active sport participation was observed to significantly reduce menstrual pain symptoms like dizziness, while nausea and fatigue/tiredness associated with the menstrual cycle were significantly increased by active sport participation. Regular exercise has been linked with stress reduction and improvement in blood circulation as well as the enhancement of the levels of endorphins and nerve transducers which counteract and alleviate pains in female athletes (Heidarianpour et al., 2016; Nasri et al., 2016; Dehnavi et al., 2018; Carmichael et al., 2021).

Conclusion

Sports participation had no significant effect on the age at menarche, duration of female athletes' menstrual flow, and length of menstrual flow, while a significant effect was established between sport participation and menstrual pain. Active sports participation significantly reduced menstrual pain symptoms like dizziness, while nausea and fatigue/tiredness were significantly increased by active sports participation.

Recommendations

The following recommendations were made based on the findings of the study;

1. The participation and performance of female athletes have an impact on certain aspects of their physiology, hence coaches and personal trainers should regularly organise workshops/training for female athletes on the management and balancing of sporting activities with regards to their menstrual cycle to reduce possible adverse effects.
2. There is a need for female athletes to study and understand their body physiology and the complexity of the menstrual cycle to maximise each phase of the menstrual cycle for optimum participation and performance.
3. Sports administrators should create efficient athlete management plans to increase female athletes' involvement and performance while also maintaining their well-being.

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