Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

A SURVEY ON SPORTS ACTIVITY INVOLVEMENT, MENSTRUAL HISTORY AND EATING DISORDERS IN MALAYSIAN ELITE FEMALE ATHLETES

Afiqah Khairunnisa Yunan
Ooi Foong Kiew
Nur Syamsina Ahmad
Nur Dalila Adilah Abdul Raof
Exercise and Sports Science Programme, School of Health Sciences, Universiti Sains Malaysia

Yeo Wee Kian
National Sports Institute of Malaysia NSIM, Division of Research and Innovation

Ong Kong Swee
Rohizat Achop Bin Borhan Janang
Sarawak Sports Corporation

Received: 13 March, 2023 **Accepted: 16 June, 2023** **Published: 15 Sept, 2023**

Corresponding Author

Nur Syamsina Binti Ahmad
Email: nursyamsina@usm.my
Exercise and Sports Science Programme,
School of Health Sciences,
Universiti Sains Malaysia

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

A SURVEY ON SPORTS ACTIVITY INVOLVEMENT, MENSTRUAL HISTORY AND EATING DISORDERS IN MALAYSIAN ELITE FEMALE ATHLETES

Afiqah Khairunnisa Yunan[1], Ooi Foong Kiew[2], Nur Syamsina Ahmad[3], Nur Dalila Adilah Abdul Raof [4], Yeo Wee Kian[5], Ong Kong Swee[6], & Rohizat Achop Bin Borhan Janang[7]

[1234]Exercise and Sports Science Programme, School of Health Sciences, Universiti Sains Malaysia
[5]National Sports Institute of Malaysia NSIM, Division of Research and Innovation
[67]Sarawak Sports Corporation

ABSTRACT

This study investigated sports activity involvement, menstrual history, and prevalence of eating disorders among Malaysian elite female athletes. A total of 50 female national and state level athletes with a mean age of 21.16 ± 2.31 years old participated in this study. They were 6 gymnasts, 17 swimmers, 5 cyclists, 7 long distance runners, and 15 silat athletes. The participants were required to answer the sports activity involvement questionnaire, menstrual history questionnaire, and Eating Disorder Examination Questionnaire (EDE-Q). The present study found that 44 (88%) of the total participants had regular menstruation, while 6 (12%) participants had irregular menstruation. The global score of EDE-Q subscales was 1.71 (60 to 65 percentile rank) in all the participants. Comparisons of measured variables between participants with regular menstruation and irregular menstruation showed that age in years at the beginning of training was younger in participants with irregular menstruation (9.83 ± 4.07) than participants with regular menstruation (11.84 ± 3.52). The global score of EDE-Q subscales was higher in participants with irregular menstruation (2.32; 75 to 80 percentile rank) than participants with regular menstruation (1.63; 60 to 65 percentile rank). In conclusion, the results of the present study show that participants with irregular menstruation seem to have higher global score of EDE-Q subscales, i.e., restrain, eating concern, shape concern, and weight concern. Irregular menstruation may be related to the young starting age of the athletes involved in training and the long total training period in years.

Keywords: *sports activity involvement, menstrual, eating disorder, elite female athletes*

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

INTRODUCTION

The reproductive system of women displays standard cyclic changes that can be considered teleological as a periodic preparation for pregnancy and fertilization. The process is a menstrual cycle in primate species and human beings, and its most conspicuous feature is the periodic vaginal bleeding that occurs with uterine mucosa shedding (menstruation). The duration of the cycle varies, but the average is 28 days from the beginning of one woman's cycle to the beginning of the next cycle. The days of the cycle are identified by number, beginning with the first days of menstruation. It begins during puberty, extends for 10 to 16 years of age, and comes to an end at menopause at a mean age of 51 years (Rosner et al., 2021).

Chavez-MacGregor et al. (2008) found that during the women lifetime, they will have an estimate of about 450 menses. Furthermore, because of the risk factors, effects, and pain that it might have, it is necessary for an individual to understand menstrual cycle as well as its physiological functions. To evaluate these factors, the female dealing with primary or secondary amenorrhea will require some to clinical examinations. Yet, fair monitoring cannot be performed from the level of the ovaries to the hypothalamus unless the hormone feedback mechanism is fully understood by a health professional. There could also be issues with menstrual process itself, such as premenstrual syndrome, dysmenorrhea, or menorrhagia. A clinician must obtain a complete history and physical examination for clarification of the main issue without a comprehension of the female anatomy and menstrual cycle physiology (Gunn et al., 2020). It is also generally known that prolonged and strenuous exercise or physical activities, involvement in leanness-dependent and weight-dependent sports, eating disorders etc. could disturb menstrual cycle of female athletes.

Disordered eating (DE) is described as a constellation of behaviours and attitudes caused by unhealthy consumption and weight, which might have medical and/or psychological implications (Chin et al., 2020). Pengpid and Peltzer (2018) mentioned that in South-East Asia, the prevalence of DE was growing in lower- and upper-middle-income countries compared with other regions in the world. For comparison, 11.5% of students in South-East Asian nations have eating disorder, ranging from below 10 % in Indonesia, Thailand, and Vietnam to 13.8% in Malaysia and 20.6% in Myanmar.

DE includes dieting, skipping meals and imbalance eating habits, and has been linked with an unhealthy desire for thinness. Consequently, even short- and long-term health hazards, including exhaustion and hormonal disturbances, have been associated with DE, which can lead to menstrual irregularities and reduced bone mineral density (Rock et al., 1996). According to Sundgot-Borgen and Torstveit (2004), the prevalence of athletes with eating disorders is 13.5% of that are subclinical or clinical. Among the athletes, the prevalence of DE is especially higher in female athletes than in male athletes, and more popular than in other sports for those participating in leanness-dependent and weight-dependent sports.

Quah et al., (2009) revealed in his study that the risk of developing eating disorders, irregular menstrual cycles, and osteoporosis, which are commonly referred to as the 'female athlete triad' appears higher for women competing in a wide variety of competitive sports. The goal of this previous research study was to determine the prevalence of the female athlete triad among athletes competing in various sports and factors associated with this disorder. The research study included a total of 67 elite female athletes aged between 13-30 years and were partitioned into classes of 'leanness' and 'non-leanness.' The prevalence of respondents at risk

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

of menstrual irregularity, low bone density and eating disorders in the leanness community was 47.6%, 13.3% and 89.2% respectively; and in the non-leanness group, 14.3%, 8.3% and 89.2% respectively.

METHODOLOGY

Study Design

This was a cross-sectional study using purposive sampling method. A 50 Malaysian elite female state level athletes, i.e., gymnasts, swimmers, cyclists, long distance runners, and silat with the age ranged from 18 to 30 years old were recruited. This research aimed to investigate menstrual history and identify eating disorder in the Malaysian elite female athletes. Thus, the participants were required to answer the Sports Activity Involvement, Menstrual History Questionnaire, and Eating Disorder Examination Questionnaire (EDE-Q) through online (Google form). The questionnaires took approximately 15 minutes to complete. Figure 1 visualize the flow chart of the study data collection and analysis.

.

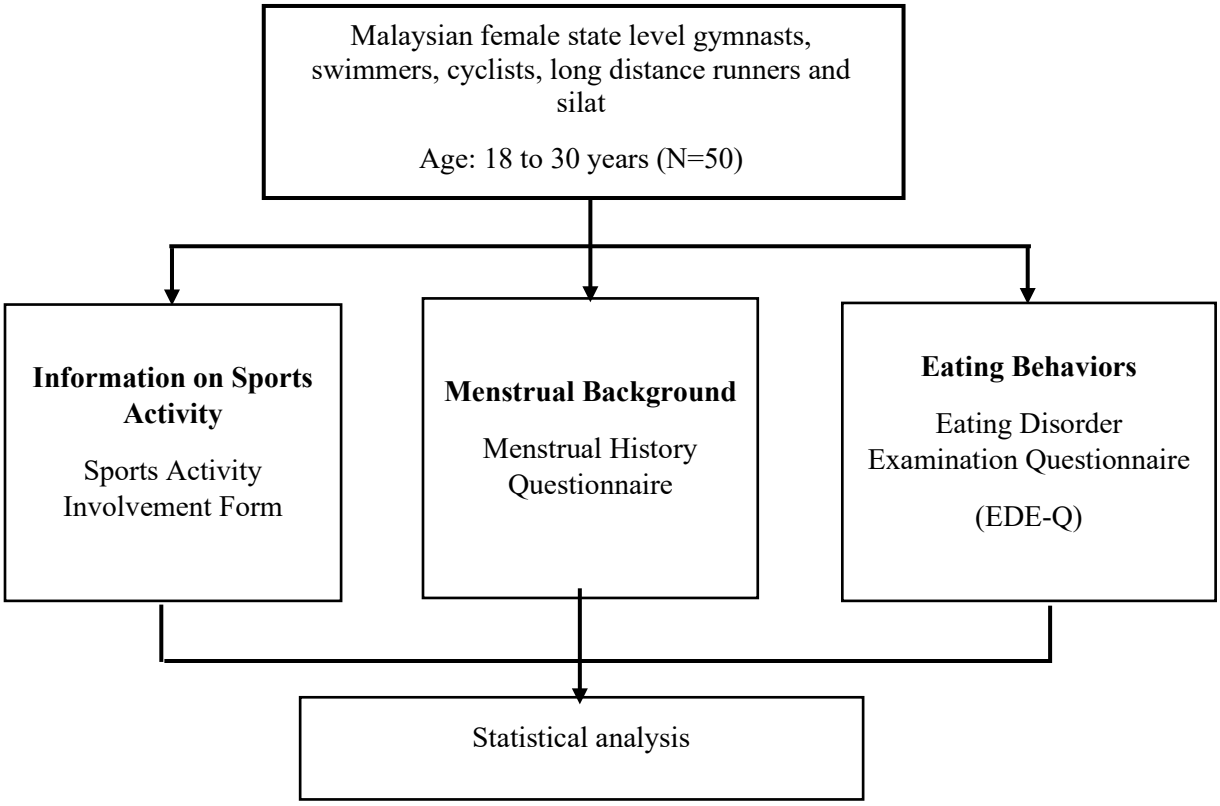

Figure 1 Flow chart of the study

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

Participants' Recruitment and Selection Criteria

Fifty participants who were Malaysian elite female state level gymnasts, swimmers, cyclists, long distance runners, and silat with age ranged between 18 to 30 years old who had represented the respective sport events for at least two years a state level competition were recruited in this study. Athletes in these sports events were recruited because they tend to have high risks of eating disorder and menstrual disorders.

The athletes were recruited via WhatsApp messages with information of the current research study through the contact of the coaches. The participants volunteered to join this study and no compulsion if they have any obstacle. Participants were provided with consent forms and those that met the inclusion criteria and agreed to participate were recruited for the study.

The participants were given a Research Information sheet and were briefed on details of the study design including inclusion and exclusion criteria, termination or withdrawal, potential risks, and benefits.

The participants were told the information gathered for this research would be kept strictly confidentiality. Participants were not be required to include any detail that could be used to identify them. Participants could only include their email addresses to prevent duplication and to allow for responses. Their participation could also be terminated if they did not complete any or all the questionnaires.

DATA COLLECTION

Sports Activity Involvement

The questions included type of sports involved, level of sports participation, age at the beginning of training, total training period in years, total hour of training per day, number of training session per week and total hour of training per week.

Menstrual History Questionnaire

The menstrual history questionnaire was used to assess the menstrual status of participants. The questionnaire consisted of questions such as age of first menstruation (age at menarche), the date of last menstrual period if the participant has irregular period, the age of menstrual period stops and the average duration, i.e., length of the menstrual cycle. The menstrual history questionnaire was administered in the previous research by Galuska and Sowers (1999).

Eating Disorder Examination Questionnaire (EDE-Q)

In this study, the eating disorder examination questionnaire (EDE-Q) (Mond et al., 2007) assesses the frequency of objective binge episode (OBEs; defined as feeling a loss of control while eating unusually large quantities of food); this definition corresponds to the DSM-V criteria for binge eating), subjective binge episodes (SBEs; defined as feeling a loss of control while eating, but without eating unusually large quantities of food, inappropriate weight control and purging methods over the past 28 days). It comprises four subscales (Restraint, Eating Concern, Weight Concern and Shape Concern) and a Global total score. The eating disorder

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

test (EDE) is a semi-structured assessment used internationally for clinical techniques and for the determination of the primary psychopathology of the eating disorder. The eating disorder examination questionnaire (EDE-Q) was designed as a self-reported survey variant of the full-length interview (Ro et al., 2010). The EDE-Q has strong test-retest reliability and a good success in group studies (Mond et al., 2007).

RESULTS

Physical characteristics and body composition

A total of 50 Malaysian participants, i.e., 6 gymnasts, 17 swimmers, 5 cyclists, 7 long distance runners and 15 silat athletes completed the study questionnaires. The mean age of the participants was 21.16 ± 2.31 years (range: 18 - 28). Table 1 illustrates the descriptive characteristics of the participants.

Table 1: Descriptive characteristics of the participants

Parameters	Mean ± SD
Age (years)	21.16 ± 2.31
Body weight (kg)	52.79 ± 7.63
Body height (cm)	158.71 ± 7.03
Body Mass Index (BMI)($kg.m^{-2}$)	20.90 ± 2.25

Sports activity involvement

Table 2(a) illustrates the sports activity involvement of all the participants, such as type of sports involved and their level of participation in competition. In terms of level of sports participation, 24 athletes represented Malaysia at national level, 26 athletes represented state at state level. Also, there were 6 national level swimmers and 11 state level swimmers ($n_{swimmer}$ =17) while 6 national level silat athletes and 9 state level silat athletes (n_{silat} =15). Next, all six of the gymnasts' athletes represented Malaysia at national level while 2 from long distance runners athletes represented Malaysia at national level and 5 were state level ($n_{long\ distance\ runners}$ =7). Meanwhile, there were 4 national level cyclists and 1 state level cyclists ($n_{\ cyclists}$ =5). In total, there were 24 athletes represented Malaysia at national level while 26 represented Malaysia at state level.

Table 2(a): Types of sports involved and their level of participation in competition of the participants

		Level of participation in competition	
	Types of sports involved	National level	State level
1	Swimmers	6	11
2	Silat athletes	6	9
3	Long distance runners	2	5
4	Gymnasts	6	0
5	Cyclists	4	1

Table 2(b) presented information about the age at the beginning of training, total training period in years, total hour of training per day, number of training session per week and total hour of training per week of the study participants.

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

Table 2(b): Means of age at the beginning of training, total training period in years, total hour of training per day, number of training session per week and total hour of training per week of all the participants

	Mean ± SD
Age at the beginning of training (years old)	11.60 ± 3.61
Total training period in years (years)	7.96 ± 3.70
Total hour of training per day (hours/day)	3.48 ± 1.90
Number of training session per week (session/week)	6.64 ± 3.26
Total hour of training per week (hours/week)	20.76 ± 14.44

Table 3 illustrates results of four subscales (restraint, eating concern, weight concern and shape concern) and the global total score of Eating Disorder Examination-Questionnaire (EDE-Q) of all the participants. The global score of EDE-Q subscales was 1.71 (60 to 65 percentile rank) in all the participants.

Table 3: Eating Disorder Examination-Questionnaire (EDE-Q) subscales of all the participants

EDE-Q subscales	Question	Category	Mean ± SD
Restraint	1	Restraint overeating	1.48 ± 0.25
	2	Avoidance overeating	(60 to 65
	3	Food avoidance	percentile rank)
	4	Dietary rules	
	5	Empty stomach	
Eating concern	7	Preoccupation with food, eating or calories	1.15 ± 0.40
	9	Fear of losing control overeating	(75 to 80
	19	Eating in secret	percentile rank)
	21	Social eating	
	20	Guilt about eating	
Shape concern	6	Flat stomach	2.22 ± 0.49
	8	Preoccupation with shape or weight	(55 to 60
	23	Importance of shape	percentile rank)
	10	Fear of weight gain	
	26	Dissatisfaction with shape	
	27	Discomfort seeing body	
	28	Avoidance of exposure	
	11	Feelings of fatness	
Weight concern	22	Importance of weight	2.00 ± 0.52
	24	Reaction to prescribed weighing	(60 percentile
	8	Preoccupation with shape or weight	rank)
	25	Dissatisfaction with weight	
	12	Desire to lose weight	
Global scale			1.71
			(60 – 65
			percentile rank)

Comparisons of measured variables between participants with regular menstruation and irregular menstruation

Table 4(a) presents the characteristics of the participants with regular menstruation and irregular menstruation. Table 4(b) highlights results of age at the beginning of training, total training period in years, total hour of training per day, number of training session per week and total hour of training per week of participants with regular menstruation and irregular menstruation.

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

Meanwhile, Table 4(c) illustrates results of Eating Disorder Examination-Questionnaire (EDE-Q) subscales of the participants with regular menstruation and irregular menstruation.

Table 4(a): Means of age, body height, body weight and body mass index (BMI) of the participants with regular menstruation irregular menstruation

Variables	Participants with regular menstruation (n=44)	Participants with irregular menstruation (n=6)
Age (years)	21.27 ± 2.30	20.33 ± 2.42
Body weight (kg)	52.80 ± 7.99	52.75 ± 4.64
Body height (cm)	158.76 ± 7.04	158.33 ± 7.58
Body Mass Index (BMI)(kg.m-^{2})	20.89 ± 2.37	21.03 ± 1.03

Table 4(b): Means of age at the beginning of training, total training period in years, total hour of training per day, number of training session per week and total hour of training per week of participants with regular menstruation and irregular menstruation

	Participants with regular menstruation (n=44)	Participants with irregular menstruation (n=6)
Age at the beginning of training (years old)	11.84 ± 3.52	9.83 ± 4.07
Total training period in years (years)	7.89 ± 3.77	8.50 ± 3.33
Total hour of training per day (hours/day)	3.64 ± 1.94	2.33 ± 1.03
Number of training session per week (session/week)	6.80 ± 3.44	5.50 ± 0.55
Total hour of training per week (hours/week)	22.09 ± 14.88	11.00 ± 3.29*

** $p<0.05$, significantly different from participants with regular menstruation*

Table 4(c): Eating Disorder Examination-Questionnaire (EDE-Q) subscales of the participants with regular menstruation and irregular menstruation

EDE-Q subscales	Question	Category	Participants with regular menstruation (n=44)	Participants with irregular menstruation (n=6)
Restraint	1	Restraint overeating	1.42 ± 0.26 (60 to 65 percentile rank)	1.93 ± 0.34 (70 to 75 percentile rank)
	2	Avoidance overeating		
	3	Food avoidance		
	4	Dietary rules		
	5	Empty stomach		
Eating concern	7	Preoccupation with food, eating or calories	1.06 ± 0.33 (75 to 80 percentile rank)	1.77 ± 0.99 (80 to 85 percentile rank)
	9	Fear of losing control overeating		
	19	Eating in secret		
	21	Social eating		
	20	Guilt about eating		
Shape concern	6	Flat stomach	2.10 ± 0.46 (50 to 55 percentile rank)	3.09 ± 1.02 (65 to 70 percentile rank)
	8	Preoccupation with shape or weight		
	23	Importance of shape		
	10	Fear of weight gain		
	26	Dissatisfaction with shape		
	27	Discomfort seeing body		

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

	28	Avoidance of exposure		
	11	Feelings of fatness		
Weight concern	22	Importance of weight	1.93 ± 0.51 (55 to 60 percentile rank)	2.50 ± 0.80 (65 to 70 percentile rank)
	24	Reaction to prescribed weighing		
	8	Preoccupation with shape or weight		
	25	Dissatisfaction with weight		
	12	Desire to lose weight		
Global score			1.63 (60 to 65 percentile rank)	2.32 (75 to 80 percentile rank)

Regarding EDE-Q subscales, the participants with irregular menstruation showed higher scores compared to participants with regular menstruation, i.e., restrain, eating concern, shape concern and weight concern, as well as global score. The most concern for both participants with regular and irregular menstruation was eating concern.

Individual results of information on measured variables of the participants who had irregular menstruation

The individual results of information on measured variables of the participants who had irregular menstruation (n=6) are shown in Table 5. It was found that that national level swimmer exhibited the highest global score of EDE-Q subscales, followed by national level gymnasts, state levels silat athlete, state level long distance runner, state level swimmer, and state level cyclist. Out of 5 concerns, national level swimmers showed the highest restraint concern compared to others. National level gymnasts appeared to focus more on weight concern while state level swimmers showed high scores on eating concern which was similar to state level long distance runner. Lastly for state level cycling and silat athletes' scores were higher on shape concern.

Table 5: Individual results of information on measured variables of participants who had irregular menstruation (n=6)

	Participants' Identification number (ID)					
	1	2	3	4	5	6
Age, anthropometry, and body composition:						
Age (years)	24	18	19	18	22	21
Body weight (kg)	51	58	55	45	51.50	56
Body height (cm)	155	165	164	145	163	158
Body Mass Index (BMI)(kg.m^{-2})	21.23	21.30	20.45	21.40	19.38	22.43
Type of sports involved	Gymnastics (National level)	Swimming (State level)	Swimming (National level)	Cycling (State level)	Long distance running (State level)	Silat (State level)
Sports activity involvement:						

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

Age at the beginning of training (years old)	7	8	9	12	6	17
Total training period in years (years)	14	10	8	7	8	4
Total hour of training per day (hours/day)	3	2	2	4	1	2
Number of training session per week (session/week)	6	5	6	5	6	5
Total hour of training per week (hours/week)	16	10	12	20	6	10
Eating Disorder Examination-Questionnaire (EDE-Q) subscales						
Restraint	3.20 (85-90 percentile rank)	0.80 (50 percentile rank)	6.00 (99 percentile rank)	0.00	0.60 (45 percentile rank)	1.00 (55 percentile rank)
Eating concern	1.80 (85 percentile rank)	2.20 (85-90 percentile rank)	2.40 (90 percentile rank)	0.20 (30-50 percentile rank)	2.00 (85-90 percentile rank)	2.00 (85-90 percentile rank)
Shape concern	3.75 (75-80 percentile rank)	1.50 (40 percentile rank)	3.50 (75 percentile rank)	2.13 (55 percentile rank)	3.13 (70 percentile rank)	4.50 (85-90 percentile rank)
Weight concern	4.00 (90 percentile rank)	1.60 (50-55 percentile rank)	2.80 (75 percentile rank)	0.60 (30 percentile rank)	2.20 (65 percentile rank)	3.80 (85-90 percentile rank)
Global score	3.19 (85-90 percentile rank)	1.53 (55-60 percentile rank)	3.68 (85-90 percentile rank)	0.73 (30-35 percentile rank)	1.98 (65-70 percentile rank)	2.83 (80-85 percentile rank)

DISCUSSIONS

A total of 50 Malaysian participants completed this study. Among all the participants, the age at the beginning of training was 11.60 ± 3.61 years. Meanwhile, the total training period was 7.96 ± 3.70 years and the total hour of training per week (hours/week) was 20.76 ± 14.44 hours/week. Moreover, there was no significant differences between the mean age at the beginning of training, the total training period in years, and the total hour of training per week (hours/week) among all the participants.

The mean restraint was 1.48 ± 0.25 (60 to 65 percentile rank) while for the mean eating concern was 1.15 ± 0.40 (75 to 80 percentile rank). Moreover, the mean shape concern was 2.22 ± 0.49 (55 to 60 percentile rank) and the mean weight concern was 2.00 ± 0.52 (60

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

percentile rank). Also, the global score of EDE-Q subscales was 1.71 (60 to 65 percentile rank) in all the participants. According to Sundgot-Borgen & Torstveit (2004) the prevalence amongst eating disorders was 13.5 % among athletes that are subclinical or clinical. The prevalence of disordered eating was higher among athletes compared to sedentary individuals and higher in female athletes compared to male athletes especially for those who participate in leanness-dependent and weight-dependent sports.

In previous study, 18% of athletes were diagnosed with an eating disorder in a survey of 522 elite female athletes compared with just 5 % of non-athletes control (Loucks et al., 2003). Eating disorder was more prevalent among athletes than non-athletes, highlighting the relative importance of this topic in the athlete population (Sundgot-Borgen & Torstveit, 2004). In comparison, relative to the control group, athletes appeared to under-report disordered eating symptoms on questionnaires. Different findings were observed in a similar but larger sample, involving 1620 athletes and 1696 controls, with 20% of female athletes meeting eating disorder requirements compared to 9% of female controls. Since, the prevalence was higher among the athletes, eating disordered matter should be identified by coaches and sports trainers before it is too late.

It was found that 44 out of the 50 participants (88%) had regular menstruation, while 6 participants out of 50 of the participants (12%) had irregular menstruation. The number of athletes who had irregular menstruation was 2 in swimming, 1 in gymnastic, cycling, long distance running and silat respectively. Kin et al. (2000) stated that 54.37 percent of female athletes and 72.73 percent of the control group had irregular menstruation when they analysed 103 athletes and 99 sedentary women between the ages of 12 – 25 years old. The results show that there was not surprised that there is a major difference for participant with irregular menstruation between previous research and this study. Participants that were recruited for previous study recruited greater number of the participants compared to this present study. Meanwhile, there was wider age range between 12 to 25 years old. This range of age could be a reason why the number of participants with irregular menstruation was higher in that study.

The present study also discovered that there were no statistically significant differences of age at the beginning of training (years old), total training period in years (years), total hour of training per day (hours/day), and number of training session per week (session/week) between the participants with regular menstruation and irregular menstruation. However, the mean total hour of training per week (hours/week) was a statistically significant lower in participants with irregular than participants with regular menstruation.

Regarding age at menarche, none of the participants had first menstruation younger than 10 years old, 26 of the participants had first menstruation between 10 to 12 years old, 22 of the participants had first menstruation between 13 to 15 years old, and 2 of the participants had first menstruation at 16 years old or older. The average duration of menses of all the participants was 6.68 ± 1.61 days. The average length of the menstrual cycle of all the participants was 24.28 ± 8.66 days.

Furthermore, the comparisons of measured variables between participants with regular menstruation and irregular menstruation showed that age at the beginning of training was younger in participants with irregular menstruation (9.83 ± 4.07 years old) than participants with regular menstruation (11.84 ± 3.52 years old). Moreover, the total training period in years was longer in participants with irregular menstruation (8.50 ± 3.33 years) than in participants

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

with regular menstruation (7.89 ± 3.77 years). Thus, excessive exercise could lead the athletes had irregular menstruation. Moreover, Loucks and Thuma (2003) stated that gonadotropin-releasing hormone suppression triggered by exercise-associated hypothalamic dysfunction might affect menarche to be delayed and menstrual cycle phases to be disrupted by reducing the production of luteinizing hormone (LH) and follicle-stimulating hormone (FSH). As claimed by Redman and Loucks (2005), certain females get menstruation problems in sports by following inappropriate food and training guidance, and their therapy can be in the form of improved advice.

The results indicate that the global score of EDE-Q subscales was higher in participants with irregular menstruation (2.32; 75 to 80 percentile rank) than participants with regular menstruation (1.63; 60 to 65 percentile rank). The mean of restraint concern of the participants with irregular menstruation 1.93 ± 0.34 (70 to 75 percentile rank) was higher than participants with regular menstruation 1.42 ± 0.26 (60 to 65 percentile rank) and the mean of eating concern participants with irregular menstruation 1.77 ± 0.99 (80 to 85 percentile rank) was also higher compared to participants with regular menstruation 1.06 ± 0.33 (75 to 80 percentile rank). Conversely, the mean of shape concern of participants with irregular menstruation 3.09 ± 1.02 (65 to 70 percentile rank) was greater than participants with regular menstruation 2.10 ± 0.46 (50 to 55 percentile rank). Furthermore, the mean of weight concern of participants with irregular menstruation 2.50 ± 0.80 (65 to 70 percentile rank) was higher than participants with regular menstruation 1.93 ± 0.51 (55 to 60 percentile rank).

Excessive concern about food, calories intake and weight were the reason why participants with irregular menstruation had greater global score of EDE-Q subscales than participants with regular menstruation. From the result, we can see that the highest mean EDE-Q subscales for participants with regular and irregular menstruations was eating concern. This condition occurred due to their obsession with food, eating, or calories (Huhmann, 2020). Additionally, concern and distress of losing control, overeating and feeling guilty about their eating behaviour might be one of the reasons why the mean of eating concern is higher compared to other subscales. Poor eating habits have been linked to unusual changes in the menstrual cycle, such as prolonged duration between periods or cycle cessation (Thein-Nissenbaum et al., 2011).

The mean of restraint concern among national level swimmer athlete was 6.00 (99 percentile rank) which is the highest mean among the other athletes. Meanwhile, the highest mean of eating concern was 2.40 (90 percentile rank) which is among national level swimmer athlete. Furthermore, the mean of shape concern of state level silat athlete was 4.50 (85-90 percentile rank) which is the highest mean among the athletes. Finally, the last subscale of EDE-Q which is weight concern has the highest mean among national level gymnast athlete 4.00 (90 percentile rank). Therefore, the present results indicate that the individual results of the measured variables of participants who had irregular menstruation showed that national level swimmer 3.68 (85-90 percentile rank) exhibited the highest global score of global score of EDE-Q subscales, followed by national level gymnasts 3.19 (85-90 percentile rank), state levels silat athlete 2.83 (80-85 percentile rank), state level long distance runner 1.98 (65-70 percentile rank), state level swimmer 1.53 (55-60 percentile rank), and state level cyclist 0.73 (30-35 percentile rank).

The present study uncovered that the age at which swimmers and gymnasts started involving in training was young which was 7 to 9 years old and the total training period in years

Malaysian Journal of Sport Science and Recreation
Vol. 19. No. 2. 269 - 283, 2023.
DOI: https://doi.org/10.24191/mjssr.v19i2.24002

was long between 8 to 14 years. The total hour of training per week was high (12-16 hours/week) in swimmers and gymnasts. All the participants were considered as elite athletes thus, it was not surprised to observe that these might be the reason why some of the participants face menstrual disorder. The reason is the athletes started their training in the earlier age and the high training load can cause irregular menstrual problem.

The findings by Sanborn et al. (1982) supported the results of menstrual irregularities due to higher incidences in aesthetic, endurance, weight division sports, higher volumes of exercise and lower body weights at younger ages. Klentrou (2003) stated that the occurrence of oligomenorrhoea in athletes were as high as 61% around one year after menarche in rhythmic gymnasts. In summary, according to Redman and Loucks (2000), if these menstrual problems were caused by exercise stress, female's exercise programs would need to be adjusted; but, if they were induced by energy deficiency, they might be controlled or corrected by dietary reform without any exercise modification.

CONCLUSIONS

The present study results imply that irregular menstruation seems to be related to high global score of EDE-Q subscales particularly restrain, eating concern, shape concern and weight concern. Irregular menstruation may be related to the young starting age of the athlete's involving in training and the long total training period in years. The mean total hour of training per week (hours/week) was a statistically significantly lower in participants with irregular than participants with regular menstruation. Finally, the present study findings can be applied to athletes, coaches, trainers, team physicians, and sport nutritionists who need to be aware of athlete's with eating disorders and menstrual disorders to assist them in achieving a healthy lifestyle and ideal body weight that promotes optimal health and performance.

Conflict of interest

There are no conflicts of interest declared by the authors.

Author's contribution

Authors have made substantial contribution to the study design and data analysis. Authors also did revise the manuscript before submission and will take full responsibility for each content of this manuscript.

Acknowledgements

The authors wish to thank Dr. Teh Lah Hoon, Chee Lee Meng, Tengku Nur Nazihah Binti Abu Bakar, Fatin Mahirah Binti Abdul Manaf, and all the participants for their commitment and cooperation in this study. Special gratitude to all staff from Exercise and Sports Science Laboratory, School of Health Sciences, Universiti Sains Malaysia for their guidance and technical support.

REFERENCES

Chavez-MacGregor, M., Van Gils, C. H., Van Der Schouw, Y. T., Monninkhof, E. M., Van Noord, P. A., & Peeters, P. H. (2008). Lifetime cumulative number of menstrual cycles and serum sex hormone levels in postmenopausal women. Breast Cancer Research and Treatment, 108(1), 101–112. https://doi.org/10.1007/s10549-007-9574-z

Chin Y, Appukutty M, Kagawa M, Gan W, Wong J, Poh B et al. Comparison of Factors Associated with Disordered Eating between Male and Female Malaysian University Students. Nutrients. 2020;12(2):318.

Galuska D, & Sowers M. Menstrual history and bone density in young women. Journal of Women's Health & Gender-Based Medicine. 1999;8(5):647-656.

Gunn H, Tsai M, McRae A, Steinbeck K. Menstrual Patterns in the First Gynecological Year: A Systematic Review. Journal of Pediatric and Adolescent Gynecology. 2018;31(6):557-565.e6.

Huhmann, K. Menses Requires Energy: A Review of How Disordered Eating, Excessive Exercise, and High Stress Lead to Menstrual Irregularities. Clinical Therapeutics, 2020:42(3), 401–407. Available from: https://doi.org/10.1016/j.clinthera.2020.01.016

Kin et al. (2000), Kin A, Yegul I, Cilli M. Some features comparison on athletes in women with and without menstruation. Gazi Physical Education and Sport Science 1st Congress Proceedings, 2000:159-164.

Klentrou P. Onset of puberty, menstrual frequency, and body fat in elite rhythmic gymnasts compared with normal controls. British Journal of Sports Medicine. 2003;37(6):490-494.

Loucks A, Thuma J. Luteinizing Hormone Pulsatility Is Disrupted at a Threshold of Energy Availability in Regularly Menstruating Women. The Journal of Clinical Endocrinology & Metabolism. 2003;88(1):297-311.

Mond J, Hay P, Rodgers B, Owen C. Health service utilization for eating disorders: Findings from a community-based study. International Journal of Eating Disorders. 2007;40(5):399-4.

Pengpid S, Peltzer K. Risk of disordered eating attitudes and its relation to mental health among university students in ASEAN. Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity. 2018;23(3):349-355.

Quah Y, Poh B, Ng L, & Noor M. The female athlete triad among elite Malaysian athletes: prevalence and associated factors [Internet]. PubMed. 2009 [cited 26 October 2021]. Available from: https://pubmed.ncbi.nlm.nih.gov/19713179/

Redman L, Loucks A. Menstrual Disorders in Athletes. Sports Medicine. 2005;35(9):747-755.

Rø Ø, Reas D, Lask B. Norms for the eating disorder examination questionnaire among female university students in Norway. Nordic Journal of Psychiatry. 2010;64(6):428-432.

Rock C, Gorenflo D, Drewnowski A, Demitrack M. Nutritional characteristics, eating pathology, and hormonal status in young women. The American Journal of Clinical Nutrition. 1996;64(4):566-571.

Rosner J, Samardzic T, & Sarao M. Physiology, Female Reproduction [Internet]. PubMed. 2021 [cited 26 October 2021]. Available from: https://pubmed.ncbi.nlm.nih.gov/30725817/

Sanborn C, Martin B, Wagner W. Is athletic amenorrhea specific to runners? American Journal of Obstetrics and Gynecology. 1982;143(8):859-861.

Sundgot-Borgen, J, Torstveit, M. Prevalence of eating disorders in elite athletes is higher than in the general population. Clinical Journal of Sport Medicine. 2004;14(1):25–32.

Thein-Nissenbaum J, Rauh M, Carr K, Loud K, McGuine T. Associations between disordered eating, menstrual dysfunction, and musculoskeletal injury among high school athletes. Journal of Orthopaedic & Sports Physical Therapy. 2011;41(2):60-69.