

Eating disorders among physically disabled national athletes in Malaysia

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ABSTRACT

Introduction: Eating disorders are becoming a cause of concern amongst athletes in recent times. The objective of this study was to determine the prevalence of eating disorders amongst physically disabled athletes in Malaysia. Athletes were sampled and screened for eating disorders utilising the Eating Disorder Examination-Questionnaire 6.0 (EDE-Q-for females) and the Eating Disorder Assessment in Males (EDAM-for males).

Materials and Methods: Athletes were approached individually, and they responded via an online questionnaire. A total of 271 athletes responded (sample needed 269) from the total of 700 athletes (38.7%).

Results: From the total, 14.4% (n = 39, 95% CI = 10.56–19.28) of the athletes had eating disorders (14.4% of the male athletes and 14.5% of female athletes). The final model of a binary logistic regression was conducted and found that the higher the body weight (AOR: 1.02, 95% CI: 1.00–1.04, p = 0.03), the higher the income (AOR: 0.992, 95% CI: 0.990–0.994, p = 0.02), the more athlete suffered from coaches intimidating behaviours (AOR: 1.17, 95% CI: 1.03–1.33, p = 0.02), a perception of having stress (AOR: 7.61, 95% CI: 1.69–34.39, p = 0.01) and having stress (AOR: 3.70, 95% CI: 1.02–9.68, p = 0.04) were common factors seen in athletes with eating disorders.

Conclusion: About two in every 10 disabled athletes suffered from eating disorders.

KEYWORDS:

Eating disorders, disabled athletes, athletes, eating disorder examination questionnaire, eating disorder assessment in males, Malaysia

INTRODUCTION

Eating disorders have been discussed since the early 80s and in South East Asia- since the 90s.^{1,2} Eating disorders have always been linked to the female gender- with many initial and early studies only showing that the problem was prevalent among females.^{1,3} However, that has been attributed to the fact that many of the screening scales have been validated amongst females only, and questions that are used to screen lacked male outlooks on eating patterns as well as body image perceptions.³⁻⁵ The prevalence of eating disorders among females is between 5.5–17.9% and 0.6–2.4%

amongst males.⁶ The yearly incidence among females is eight in 100,000 population and five in 1,000,000 population.⁷ In Malaysia, though limited, research published in 2022 reported that 0.8% had anorexia nervosa, 1.4% had bulimia nervosa, 0.1% had binge eating disorders and 51.4% of them had Other Specified Feeding and Eating Disorders (OSFED).⁸

Eating disorders are not strangers in the field of sports athletes. Athletes have been prone to eating disorders for some time now due to different reasons- such as competing in weight-sensitive sports, body weight, gender, genetics, mental health issues and many others.^{3,9-13} Disabled athletes are also at risk if not even at higher rates, compared to ordinary athletes.^{10,14} Disabled athletes might be more at risk as some disabilities are linked to specific co-morbidities like diabetes especially if they are physically disabled and/or are suffering from genetical disorders.^{15,16} However, little is known about their prevalence of eating disorders.

In Malaysia, there were a few research papers that studied eating disorders among athletes and disabled athletes. Generally, the prevalence of eating disorders in Malaysia (from previous studies) was between 13.9 to 18.2% and the sample population were mostly from the female population.^{1,8,17-19} A study in 2009 looking at the female athlete triad (menstrual dysfunction, bone density reduction and low energy availability) amongst female athletes in Malaysia reported that 1.9% of female athletes suffered from it.²⁰ In 2011, a Malaysian study that sampled both males and females reported that female athletes were more prone to eating disorders and body dissatisfaction than their male colleagues.²¹ A general study conducted in 2019 sampling disabled Malaysian athletes concluded that 37.6% had eating disorders due to changing emotions (emotional eating disorder), 34.3% had uncontrolled eating and 28% had restrained eating disorders due to cognition impairment.¹⁴

Studies worldwide reported that the associated factors of eating disorders amongst athletes without disabilities and disabled athletes were about the same.²²

Eating disorders have been known to increase the rate of injuries among athletes, especially those that involve the musculoskeletal system.²³ The situation may be made worse that many injured athletes with eating disorders tend to either get repeated injuries or risk not recovering from recent injuries.²³ Poor general health, especially that involving anaemia, bone health and the irregularity of menstrual

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cycles in female athletes, are among the consequences that can be seen from eating disorders.^{20,23-25} Picking up eating disorders early might help rehabilitate the athlete so that they do not suffer further from the after-effects of eating disorders like injuries.²⁶

Eating disorders and disordered eating are often used interchangeably but do not refer to the same thing. Eating disorders can be diagnosed via the classification of anorexia nervosa, bulimia nervosa, binge eating disorder or OSFED.²⁷ For it to be an eating disorder, it must meet the criteria set by the DSM-5 manual.³ On the other hand, disordered eating is described as a spectrum of abnormal or harmful eating behaviours that might be linked in an attempt to alter weight.²⁷ However, it must be understood that all screening tools that have been used in the past are to screen for eating disorders and not disordered eating, though they might not be able to pinpoint a specific eating disorder.^{3,5,27} In this research, the term eating disorder is used in the context of the ability of screening tools to pick up eating disorders among those who answer it. Though it might not be specific to the type of eating disorder suffered, it is used as a screening tool to detect the presence of an eating disorder.

The main objective of this study was to identify the prevalence of eating disorders amongst disabled national athletes in Malaysia. It was also the objective to identify factors associated with eating disorders among them.

In this study, we defined disabled athletes as physically disabled athletes who have represented the country at least once. Eating disorders were defined as having an eating disorder that the final score of the EDE-Q 6.0 (global score >2.3) and EDAM (Scale ≥ 2) indicated.⁵

MATERIALS AND METHODS

We conducted a cross-sectional study from October 2021 to May 2022 amongst Malaysian paralympic athletes to identify the prevalence of eating disorders. We obtained the database of athletes from the central repository kept by the Paralympic Athletes' Division in the Ministry of Youth and Sports. We then approached the athletes via short messaging or electronic mail, inviting them to participate in the study. We included Malaysian national athletes who were above the age of 18 and were still competing professionally. We excluded those already with an eating disorder (to calculate factors affecting unknown eating disorders) or those who were on long sabbatical leave. The athletes had an option to either answer the questionnaire in Malay (local language) or English. The consent and data collection was done online (due to the COVID-19 pandemic) that was accessible via any electronic device that had access to the internet. They were provided a link to read and understand this study's objectives before giving their electronic informed consent. They were then asked about their brief demographic details such as age, gender, sport they were involved in, their level of representation and other relevant details. Then, the female athletes were automatically directed (based on their answers for their birth gender) to the EDE-Q 6.0 questionnaire, and the males were directed to the EDAM questionnaire. After answering them, the male and female athletes answered the

DASS-21 questionnaire (to screen for depression, anxiety and stress), the CAREMS questionnaire (to screen for coach-athlete relationship emotional maltreatment scale, to identify if they were suffering from any emotional issues with their coaches) and the CRAFFT 2.1 (a questionnaire to detect substance use and abuse). The time taken to complete the questionnaire was estimated to be about an hour. Once the questions were answered, the respondents clicked 'Send,' their answers were stored in a database accessible to the researchers only. Data was later imported and analysed in the SPSS v21.0 software.

Sample Size

We calculated the sample size with multiple objectives given. To calculate the sample size, we calculated all the objectives for identifying the prevalence in general, by gender, by levels of depression, anxiety and stress, by coach relationship, and by addiction. The largest sample size was yielded by using the precision formula in the EpiCalc Calculator v1.01 (2000)- by setting the prevalence of coach-athlete emotional maltreatment at 22.4% (from the study of Coker-Craney & Reel, 2015), the final sample needed was 267 athletes.²⁸ For the gender sample, it was calculated that the minimum required male athletes for this study was 58, and the female athletes needed were 33 (a total of 91).²⁹ There were about 700 athletes in the database and all were approached via social media.

Tools Used

We utilised the EDE-Q 6.0 and Eating Disorder Assessment in Males (EDAM) questionnaires (in English and the translated Malay version (a local native language) to identify the prevalence of eating disorders. The EDE-Q 6.0 questionnaire was used amongst the female athletes, and the EDAM was used amongst the male athletes.^{4,5} To identify the coach-athlete relationship and emotional maltreatment relationship, the researchers utilised the Coach-Athlete Relationship Emotional Maltreatment Scale (CAREMS).³⁰

To identify if the athlete was having any depressive, anxiety or stress symptoms- the DASS-21 scale was used.³¹ To identify substance abuse, CRAFFT 2.1 was used.³² Except for the DASS-21 (already translated to Malay before this), forward and backward translation was done for all the questionnaires. The reliability (Cronbach alpha) obtained for the Malay language was as follows:

- EDAM = 0.87 (original in English: 0.91)⁴
- EDE-Q = 0.95 (original in English: 0.93)⁵
- CAREMS = 0.97 (original in English: 0.96)³⁰
- CRAFFT 2.1 = 0.79 (original in English: 0.73)³³

All necessary permissions to utilise the EDAM and CAREMS questionnaire were obtained. The CRAFFT 2.1 and EDE-Q questionnaires were openly available. All data was entered and analysed via SPSS v21.0.

Perceived Depression, Anxiety and Stress

From the demographic variables, the researchers enquired from the participants if they generally felt depressed, anxious or stressed. This was solely the perception by the participant without a formal medical diagnosis.

EDAM

The EDAM questionnaire has a specific section (from 4) to identify eating disorders. The questions of interest are 5, 10, 12, 26, 30, 40, 41, 42, 45, 47 and 50. The responses to these questions are in the form of a Likert scale with 'Never' scored as 0, 'Rarely' as 1, 'Sometimes' as 2, 'Often' as 3, and 'Always' as 4. These scoring for the eating disorder domain were then totalled, with scores 0-11 given the 'scale of 1', 12-17 as the 'scale of 2', 18-22 as the 'scale of 3', 23-28 as the 'scale of 4', 29-33 as the 'scale of 5', 34-38 as the 'scale of 6' and 39-44 as the 'scale of 7'. The 'scale of 1' was interpreted as 'Little or No Concern', 'scale of 2-3' as 'Slight concern', 'scale of 4-5' as 'Moderate concern' and 'scale of 6-7' as 'Significant concern'. This was according to the analysis and cut-off suggested for using the EDAM questionnaire.⁴ This was later put into a binary form: 'scale of 1' as 'Not having an eating disorder' and scales 2-7 as 'Having an eating disorder'. This scale was used for male athletes only.

EDE-Q 6.0

The EDE-Q questionnaire was analysed using the Global Score- the mean of the scores obtained from each athlete. This was later categorized as 'having an eating disorder' for scores of 2.3 or above, and those below 2.3 were classified as 'Not having an eating disorder'. This followed the recommendation of Mond et al. (2004).³⁴ This scale was utilised amongst female athletes only.

CAREMS

The CAREMS questionnaire was utilised, looking at the five domains.³⁰ The domains were: 'Performance-based disparagement', 'direct personal disparagement', 'embarrassing behaviours', 'indirect personal disparagement' and 'intimidating behaviours'. Responses were given in the form of a 5-point Likert scale, and the scores ranged from 'Never' = 1 to 'Always' = 5.³⁰ The higher the score, the more the relationship-emotional maltreatment between the coach and athlete.³⁰ This scale was used to compare those with eating disorders and those without. The mean and standard deviations were used to compare the 'eating disorders' and 'no eating disorders' groups.

DASS-21

The DASS-21 questionnaire responses were calculated based on the categories Gomez gave in 2016.³⁵ Depression scores from 0-9, anxiety from 0-7, and stress from 0-14 were considered normal. The outcomes were further made binary-anything higher than the scores previously mentioned was deemed to be having depression, anxiety or stress (based on the domain).

CRAFFT 2.1

The CRAFFT 2.1 questionnaire was used to identify if there was substance abuse amongst the respondents. The identification of abuse was made based on 'does not have a substance issue' for a score of 0 for questions 1 to 3, and anything above is considered 'may have a substance issue'. This was per the CABHRE 2018 manual.³⁶

Statistical Analysis

A binary logistic regression analysis was conducted to identify factors affecting the eating disorders of disabled

athletes. The outcome variable was then compared to those with eating disorders against those who do not have eating disorders.

A univariate analysis was conducted by comparing one variable with the outcome variable. The variables yielding a p-value of ≤ 0.3 were deemed significant and included in the final analysis of the multivariate binary logistic regression. A multivariate analysis was conducted, including all variables that yielded a p-value of ≤ 0.3 in the univariate analysis.³⁷ The final model with factors affecting eating disorders will be determined with variables that yield a p-value of < 0.05 .

ETHICAL APPROVAL

The researchers applied for an ethical approval within the *Universiti Kebangsaan Malaysia* medical ethics committee and were provided with the ethical approval (Malaysia (FF-2020-468; JEP-2020-594)). No identifiers were collected for the purpose of analysis and all data remained anonymous as well as confidential. The database containing data collected was only accessible by researchers through password mechanisms.

RESULTS

The researchers obtained 271 physically disabled athletes (38.7% of the number listed in the database) to participate in the survey (there were no athletes that had a known history of eating disorder and none of them were on long sabbatical leave). Of the total, 195 (72.0%) athletes were male, and 76 (28.0%) were female.

Of the 271 athletes sampled, 14.4% ($n = 39$, 95% CI = 10.56-19.28) had eating disorders. When calculated according to the athletes' gender, 14.4% ($n = 28$, 95% CI = 9.94-20.30) were male athletes, and 14.5% ($n = 11$, 95% CI = 7.81-24.88) were female athletes.

The participants were described and separated into those with eating disorders and those without eating disorders. From the total, the majority had answered the questionnaires in the Malay language, were of the Malay race, were male, involved in athletics, were not involved in weight-sensitive sports, competed mainly at the state level, were mainly for the state of Perak, were of the normal body mass index (BMI) category, mainly clerical support staff, did not perceive to have an eating disorder, did not perceive to have a family history of eating disorders, perceived that they did not have depression, perceived not to have anxiety, perceived not to have stress, were non-diabetics, were non-smokers, had no active substance abuse, had no previous history of substance abuse and did not consume alcohol.

A statistical comparison between those with an eating disorder and those without an eating disorder showed that the only statistical significance found was the difference in the distribution of BMI between the two groups ($p = 0.03$), those who perceived to have stress ($p = 0.01$). These categorical variables were compared via a Chi-square.

Table I: Description of the participants by their eating disorder status

Categorical variables	With an eating disorder N (%) (n = 39)	Without an eating disorder (n = 232)	p-value	
Language answered in				
Malay language	36 (14.8)	208 (85.2)	0.78*	
English	3 (11.1)	24 (89.9)		
Race				
Malay	33 (15.1)	186 (84.9)	0.48*	
Chinese	1 (6.7)	14 (93.3)		
Indian	0	9 (100)		
Others	5 (17.9)	23 (82.1)		
Gender				
Male	28 (14.4)	167 (85.6)	0.98	
Female	11 (14.5)	65 (85.5)		
Sports involved in				
Athletics	11 (14.7)	64 (85.3)	0.65*	
Bowling	6 (21.4)	22 (78.6)		
Lawn bowls	4 (25.0)	12 (75.0)		
Archery	8 (18.2)	36 (81.8)		
Ping-pong	2 (6.5)	29 (93.5)		
Weightlifting	2 (20.0)	8 (80.0)		
Swimming	1 (5.9)	16 (84.1)		
Boccia	1 (11.1)	8 (88.9)		
Badminton	3 (13.6)	19 (86.4)		
Cycling	0	11 (100)		
Others	1 (12.5)	7 (87.5)		
Involved in weight-sensitive sports				
Yes	2 (20.0)	8 (80.0)	0.64*	
No	37 (14.2)	224 (85.8)		
Common level of representation				
State	28 (15.1)	158 (84.9)	0.97*	
South East Asia	5 (14.3)	30 (85.7)		
Asia	2 (13.3)	13 (86.7)		
World	4 (11.4)	31 (88.6)		
State represented				
Perlis	1 (20.0)	4 (80.0)	0.76*	
Kedah	0	5 (100)		
Pulau Pinang	1 (16.7)	5 (83.3)		
Perak	7 (17.5)	33 (82.5)		
Pahang	9 (30.0)	21 (70.0)		
Kelantan	2 (14.3)	12 (85.7)		
Terengganu	2 (8.3)	22 (91.7)		
Selangor	2 (12.5)	14 (87.5)		
Negeri Sembilan	1 (10.0)	9 (90.0)		
Melaka	2 (12.5)	14 (87.5)		
Johor	2 (7.4)	25 (92.6)		
Sarawak	3 (18.8)	13 (81.3)		
Sabah	5 (15.6)	27 (84.4)		
WP Labuan	0	1 (100)		
WP Kuala Lumpur	1 (7.4)	13 (92.9)		
National representation only	1 (7.1)	13 (92.9)		
BMI status				
<18.5- underweight	4 (11.8)	30 (88.2)		0.03*
18.5 -<25- normal weight	11 (9.8)	101 (0.2)		
25 -<30 – overweight	12 (18.5)	53 (81.5)		
30 -<35 – Class I obesity	8 (25.0)	24 (75.0)		
35 -<40 – Class II obesity	0	16 (100)		
40 and above- Class III obesity	4 (33.3)	8 (66.7)		
Working status				
Not working	14 (19.2)	59 (80.8)	0.18*	
Clerical support staff	17 (18.3)	76 (81.7)		
Technical and certified workers	3 (6.0)	47 (94.0)		
Trade and services	4 (12.9)	27 (87.1)		
Professional workers	1 (5.3)	18 (94.7)		
Civil service workers	0	5 (100)		

Table I: Description of the participants by their eating disorder status

Categorical variables	With an eating disorder N (%) (n = 39)	Without an eating disorder (n = 232)	p-value
Perceived to have an eating disorder			
Yes	7 (14.6)	41 (85.4)	0.97
No	32 (14.3)	191 (85.7)	
Perceived to have a family history of eating disorder			
Yes	6 (20.7)	23 (79.3)	0.31
No	33 (13.6)	209 (86.4)	
Perceived to have depression			
Yes	3 (10.3)	26 (89.7)	0.59*
No	36 (14.9)	206 (85.1)	
Perceived to have anxiety			
Yes	3 (7.9)	35 (92.1)	0.30*
No	36 (15.5)	197 (84.5)	
Perceived to have stress			
Yes	3 (4.4)	65 (95.6)	0.01*
No	36 (17.7)	167 (82.3)	
Diagnosed as a diabetic			
Yes	1 (6.7)	14 (93.3)	0.49*
No	38 (14.8)	218 (85.2)	
Smoking status			
Yes	5 (12.5)	35 (87.5)	0.53*
No	30 (15.9)	159 (84.1)	
Smoked before and stopped	4 (9.5)	38 (90.5)	
Addiction status (Marijuana, Elicit drugs, Cocaine etc)			
Yes	0	0	-
No	39 (14.4)	232 (85.6)	
Previously addicted (Marijuana, Elicit drugs, Cocaine etc)			
Yes	0	4 (100)	0.54*
No	39 (14.6)	228 (85.4)	
Alcohol consumption			
Yes or consumed previously	1 (5.9)	16 (94.1)	0.48*
No	38 (15.0)	216 (85.0)	
Continuous variables	Mean (SD)	Mean (SD)	p value
Age (in years)	30.67 (8.79)	30.65 (9.67)	0.99
Weight (in kilograms)	68.69 (18.67)	63.91 (16.72)	0.10
Continuous variables	Median (IQR)	Median (IQR)	p value
Height (in meters)	1.60 (0.20)	1.63 (0.18)	0.54
BMI (kg/m ²)	26.72 (9.93)	24.08 (8.31)	0.06
Staying alone (in months)	1.00 (2.00)	2.00 (4.00)	0.27
Monthly income (RM)	800 (900)	1100 (1700)	0.08

*Fisher-exact or Exact test was applied

For the continuous variables that were normally distributed (age in years and weight in kilograms), an independent t-test was conducted. A Mann-Whitney U test was applied for the continuous variables that were not normally distributed (height, BMI, months stayed alone and income in Ringgit Malaysia). There was no statistically significant difference when comparing those with and without eating disorders (Table I).

Analytical Analysis

The DASS-21, CRAFFT 2.1 and CAREMS variables were calculated as stipulated in the mode of analysis section. The analysis comparing those with eating disorders and those without eating disorders found that the majority had no depression, anxiety or stress. The majority also did not have any substance abuse. However, when a Chi-square statistical analysis was applied, there was a statistically significant

difference between the groups where stress was concerned ($p = 0.03$).

Comparing the CAREMS score to identify the Coach-Athlete relationship with emotional maltreatment, a Mann-Whitney U test showed no statistically significant difference between the two groups (Table II).

Statistical Analysis

Before moving on to the binary logistic regression with the outcome of looking at those with eating disorders against those without, we examined the possible interactions between all independent variables. This was also done for the final model.

Upon review, there was a high interaction between 'monthly income' and 'working status'. There was also an interaction

Table II: Comparison of the DASS-21, CRAFFT 2.1, and CAREMS scale between those with eating disorders and those without

Categorical variables			With an eating disorder N (%) (n = 39)	Without an eating disorder N (%) (n = 232)	p-value
DASS-21	Depression	Yes	15 (20.8)	57 (79.2)	0.07
		No	24 (12.1)	175 (87.9)	
	Anxiety	Yes	15 (18.1)	68 (81.9)	0.25
		No	24 (12.8)	164 (87.2)	
	Stress	Yes	9 (26.5)	25 (73.5)	0.03
		No	30 (12.7)	207 (87.3)	
CRAFFT 2.1	May have a substance issue		1 (8.3)	11 (91.7)	0.70*
	Does not have a substance issue		38 (14.7)	221 (85.3)	
Continuous variables			Mean (SD)	Mean (SD)	p-value
CAREMS	Performance-based disparagement		9.82 (5.10)	10.56 (5.97)	0.47
	Direct personal disparagement		5.72 (2.91)	5.89 (3.43)	0.77
	Embarrassing behaviours		4.74 (2.84)	4.70 (2.80)	0.93
	Indirect personal disparagement		4.51 (2.62)	4.37 (2.41)	0.73
	Intimidating behaviours		5.21 (3.04)	4.67 (2.60)	0.17

*Fisher-exact or Exact test was applied

Table III: Univariate and multivariate analysis table

Variables		Univariate analysis			Multivariate analysis		
		OR	95%CI	p	AOR	95%CI	p
Perceived to have anxiety	Yes	Reference		0.30	Reference		0.83
	No	2.13	0.62–7.31		1.19	0.23–6.18	
Perceived to have stress	Yes	Reference		0.01	Reference		0.01
	No	4.67	1.39–15.71		7.61	1.69–34.39	
Weight in kilograms		1.02	1.00–1.04	0.10	1.02	1.00–1.04	0.03
Stayed alone (in months)		0.96	0.89–1.03	0.27	0.96	0.88–1.05	0.37
Monthly income (RM)		1.00	0.99–1.00	0.08	0.992	0.990–0.994	0.02
Depression status	No	Reference		0.07	Reference		0.13
	Yes	1.91	0.94–3.91		2.66	0.76–9.37	
Anxiety status	No	Reference		0.25	Reference		0.32
	Yes	1.51	0.75–3.05		1.86	0.55–6.34	
Stress status	No	Reference		0.03	Reference		0.04
	Yes	2.48	1.06–5.83		3.70	1.02–9.68	
CAREMS	Intimidating behaviours	1.08	0.97–1.21	0.17	1.17	1.03–1.33	0.02

between the BMI with the variables ‘weight’ and ‘height’. For these interactions and variables- the researchers picked ‘monthly income’, ‘weight,’ and ‘height’ as they provided the best model value. BMI and ‘Working status’ were removed from the regression model.

A model for Goodness-of-fit was conducted for the binary logistic regression.

A Hosmer-Lemeshow test was done, and the value obtained was $p = 0.38$. A correctly classified percentage was conducted, and it showed 86.3%, and the Nagelkarke R^2 done was 0.202. This interpreted that the dataset for the binary logistic regression was good and acceptable.

The researchers conducted a univariate and a multivariate logistic regression with the outcome of ‘With an eating disorder’ being compared with ‘Without an eating disorder’. The univariate analysis was conducted, comparing the independent variables with the outcome. All variables that yielded a p-value of less than 0.3 in the univariate analysis were included in the multivariate regression. The odds in the univariate were reported as odds ratio (OR). For the

multivariate analysis, independent variables with a p value <0.05 were deemed statistically significant. The multivariate analysis was reported with an adjusted odds ratio (AOR).

From the univariate analysis (Table I analysis), we found that ‘Perceived to have anxiety’, ‘Perceived to have stress’, ‘Weight in kilograms’, ‘Stayed alone’, ‘Monthly income’, and ‘Depression status’. Anxiety status’, ‘Stress status,’ and the ‘CAREMS score for intimidating behaviours’ all yielded a p-value of ≤ 0.3 . These variables were included in the multivariate analysis (Table III).

The independent variables that yielded $p \leq 0.3$ from the univariate analysis were included.³⁷ The final model showed that “Perceived to have stressed” (AOR: 7.61; 95% CI: 1.69–34.39, $p = 0.01$), “Having stress” (AOR: 3.70; 95%CI: 1.02–9.68, $p = 0.04$), an increase in weight (AOR: 1.02, 95%CI: 1.00–1.04, $p = 0.01$), an increase in income (AOR: 0.992, 95%CI: 0.990–0.994, $p = 0.02$) and an increase in the CAREMS score for ‘Intimidating behaviour’ (AOR: 1.17, 95% CI: 1.03–1.33, $p = 0.02$) were factors that were related to those athletes with an “eating disorder” when compared to those “Without an eating disorder”. Independent variables of

“Perceived to have anxiety”, “Staying alone”, “Depression status,” and “Anxiety status” were deemed to be confounders. Full details are available in Table III.

Summary of results

- (1) Athletes who perceived stress were eight times more likely to have an eating disorder than those who did not.
- (2) Athletes who are stressed are four times more likely to have an eating disorder than those who do not.
- (3) For every rise in 1 kg, there is a 1.02 times likelihood that the athlete might have eating disorders compared to those who do not.
- (4) For every 1 Ringgit Malaysia extra income earned, athletes are likelier to have an eating disorder than those who do not.
- (5) For every 1.00-point increase in the CAREMS score for intimidating behaviour, there is 1.17 times increase in an athlete having an eating disorder compared to those who do not.

DISCUSSION

Prevalence of Eating Disorders Amongst Athletes

The prevalence of eating disorders among Malaysian athletes can range anywhere between 13.9% to 18.2%.^{1,8,17-19} The prevalence in other countries might differ because some differentiate between eating disorders and disordered eating. A similar prevalence study conducted in Spain during the 2016 period, reported that among the 60 disabled athletes sampled, 1.67% of them were deemed to have eating disorders. This differs from the prevalence of the current study discussed perhaps due to a different screening tool utilised and the sample of athletes used were smaller.

In a 2013 Norwegian study, it was reported that 7% of athletes had an eating disorder compared to the control group (2.3%).³⁸ It was also reported that more female athletes had eating disorders (14.0%) compared to male athletes (3.2%).³⁸ It must be understood that the screening process from the Norwegian study picked up 25% of athletes suspected to have an eating disorder, it was only 7% of them who finally had an actual eating disorder (after a clinical interview).³⁸ Thus, the prevalence of eating disorders might differ from study to study- because of the different tools used to screen and diagnose eating disorders among athletes.^{3,5}

Compared with a published paper on eating disorders in South East Asia in 2015, it was reported that eating disorders had been actively picked up ever since the 90s, especially in Singapore, Malaysia, and Hong Kong.¹ Though it was reported that the prevalence of eating disorders in this region was low, it might be underdiagnosed and is expected to increase in the future.¹

Research conducted in 2019 amongst 150 female, non-disabled athletes in Sarawak (a state in the East of Malaysia) reported that less active and non-weight sensitive sports exhibited higher eating disorder issues. The current study did not obtain that, but it might have been due to the different sample populations (disabled athletes). A study published in 2023 in Malaysia regarding relative energy deficiency in sports reported that most sampled athletes (non-disabled)

were at medium risk.²³ Of the 192 athletes sampled by Marzuki et al, 64.7% were worried about what they consumed, and 69.3% thought about burning calories while exercising.²³ This can be related to the ‘Binge eating disorder,’ explaining that the prevalence in Malaysia could be much more than what was found.

Factors that Affected Eating Disorders

Before moving into the details of factors that affect eating disorders in disabled athletes, attention must be paid to a paper that was published amongst Australian athletes in 2018 that reported that there was no statistically significant difference between non-disabled and disabled athletes when it comes to mental health issues except for alcohol consumption habits and the level of self-confidence.²² Therefore, the researcher for this paper deduced that since eating disorders are considered a mental health issue, factors that affected non-disabled athletes in this instance would not be different from those affecting disabled athletes.

In research conducted amongst 93 disabled Malaysian athletes in 2020, it was reported that 37.6% of the athletes had eating disorders due to emotional stress, 34.3% had uncontrolled eating, and 28% had cognitive restraint.¹⁴ One of the reasons reported that affected emotional eating was the athlete being obese.¹⁴ This might explain why eating disorders were linked with increased weight and stress, as found in the current study.

A study conducted in 2015 mentioned that coaches often utilise intimidating and pressure modalities to get the best out of their athletes.³⁹ This might have efficacy in terms of performances, but as it was found in this study, it might affect the mentality of athletes, causing them to be more prone to eating disorders.

Other factors that might lead to eating disorders are other associated mental health issues like stress and perceived stress. Some of them are linked to participation prior to big-staged events, especially regarding thoughts on injuries.⁴⁰ It was also stated in the same study that factors that play a role in injuries and recovery are eating habits.⁴⁰ This might mean that eating disorders, injuries, and stress might be a vicious cycle that must be intervened early to prevent prolonged periods of being out of competitive fitness.

A previous study conducted during the year 2016 in the United States reported that one of the factors that increases eating disorders is having a higher income.⁴¹ Similarly, a study in China (2008) reported that higher-income houses were more likely to be where eating disorders were more commonly seen.⁴² An increase in weight might also indicate a possibility of suffering from an eating disorder, especially where binge eating disorders are concerned.^{3,5}

STRENGTHS AND LIMITATIONS

Amongst the strengths of this study was that it was one of the few studies conducted with a large sample size of disabled national athletes compared to previously published work. The study also utilised forward and backward-translated questionnaires to obtain the data from a Malay language (a

locally preferred language) version of the questionnaires. Some of the limitations are that there might have been an under or over-estimation of the prevalence as the list of athletes obtained might be incomplete as it might not have been updated from the system – not allowing the researchers to sample new athletes. Due to the limited local data, the sampling was not done by different sports.

CONCLUSION

It was found that the prevalence of eating disorders amongst Malaysian disabled athletes was 14.4%. Factors that affected the eating disorders were perceived to be stressed, being stressed, an increase in weight, an increase in income, and an increased score for the CAREMS intimidating behaviour scale. The researchers would recommend that future studies look at screening for eating disorders amongst disabled athletes by sports (proportionate sampling) so that eating disorders can be more screened in a targeted manner. It might be useful for stakeholders to screen for eating disorders amongst disabled athletes so that the repercussions that can arise will be minimal.

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CONFLICT OF INTEREST

The authors do not have any conflicts of interest to declare.

REFERENCES

- Pike KM, Dunne PE. The rise of eating disorders in Asia: a review. *J Eat Disord* 2015; 3: 33.
- Yates A. Current perspectives on the eating disorders: i. history, psychological and biological aspects. *J Am Acad Child Adolesc Psychiatry* 1989; 28(6): 813-28.
- American Psychiatric A, American Psychiatric A, Force DSMT. Diagnostic and statistical manual of mental disorders: DSM-5. Arlington, VA: American Psychiatric Association; 2016.
- Stanford SC, Lemberg R. Measuring eating disorders in men: development of the eating disorder assessment for men (EDAM). *Eat Disord* 2012; 20(5): 427-36.
- Baer L, Blais MA. 2012. Handbook of Clinical Rating Scales and Assessment in Psychiatry and Mental Health. Humana.
- Silen Y, Keski-Rahkonen A. Worldwide prevalence of DSM-5 eating disorders among young people. *Curr Opin Psychiatry* 2022; 35(6): 362-71.
- Hoek HW, van Hoeken D. Review of the prevalence and incidence of eating disorders. *Int J Eat Disord* 2003; 34(4): 383-96.
- Chua SN, Fitzsimmons-Craft EE, Austin SB, Wilfley DE, Taylor CB. Estimated prevalence of eating disorders in Malaysia based on a diagnostic screen. *Int J Eat Disord* 2022; 55(6): 763-75.
- Currie A, Morse ED. Eating disorders in athletes: managing the risks. *Clin Sports Med* 2005; 24(4): 871-83, ix.
- Glazer JL. Eating disorders among male athletes. *Curr Sports Med Rep* 2008; 7(6): 332-37.
- Pope Z, Gao Y, Bolter N, Pritchard M. Validity and reliability of eating disorder assessments used with athletes: a review. *J Sport Health Sci* 2015; 4(3): 211-21.
- Sanford-Martens TC, Davidson MM, Yakushko OF, Martens MP, Hinton P. Clinical and subclinical eating disorders: an examination of collegiate athletes. *J Appl Sport Psychol* 2005; 17(1): 79-86.
- Schatzlein KM. *Disordered Eating Behaviors in Collegiate Athletes*. United States of America: James Madison University; 2016.
- Manaf H, Nor NM, Azhari NAM, Ismut NRA. Eating behaviour among disabled athletes in Malaysia. *Malays J Med Sci* 2019; 26(3): 129-34.
- Puce L, Okwen PM, Yuh MN, Akah Ndum Okwen G, Pambe Miong RH, Kong JD, et al. Well-being and quality of life in people with disabilities practicing sports, athletes with disabilities, and para-athletes: Insights from a critical review of the literature. *Front Psychol* 2023; 14: 1071656.
- Almena FM, Collazos JFR, del Pilar Montero M. Spanish high level handicapped sportsmen and eating disorders: are they at risk? *J Negat No Posit Results* 2016; 1(7): 262-67.
- Gan WY, Mohd Nasir MT, Zalilah MS, Hazizi AS. Disordered eating behaviors, depression, anxiety and stress among Malaysian university students. *Coll Stud J* 2011; 45(2): 296-309.
- Cheah WL, Hazmi H, Chang CT. Disordered eating and body image issues and their associated factors among adolescents in urban secondary schools in Sarawak, Malaysia. *Int J Adolesc Med Health* 2017; 29(2): 20150044.
- Chan YL, Samy AL, Tong WT, Islam MA, Low WY. Eating disorder among Malaysian university students and its associated factors. *Asia Pac J Public Health* 2020; 32(6-7): 334-39.
- Quah YV, Poh BK, Ng LO, Noor MI. The female athlete triad among elite Malaysian athletes: prevalence and associated factors. *Asia Pac J Clin Nutr* 2009; 18(2): 200-8.
- Lim C, Omar-Fauzee M, Rosli M. The body dissatisfaction among female athletes and non-athletes in Malaysia. *J Asia Pac Stud* 2011; 2(1): 55-69.
- Olive LS, Rice S, Butterworth M, Clements M, Purcell R. Do rates of mental health symptoms in currently competing elite athletes in paralympic sports differ from non-para-athletes? *Sports Med Open* 2021; 7(1): 62.
- Marzuki MIH, Mohamad MI, Chai WJ, Farah NMF, Safii NS, Jasme JK, et al. Prevalence of relative energy deficiency in sport (RED-S) among national athletes in Malaysia. *Nutrients* 2023; 15(7): 1697.
- Greenleaf C, Petrie TA, Carter J, Reel JJ. Female collegiate athletes: prevalence of eating disorders and disordered eating behaviors. *J Am Coll Health* 2009; 57(5): 489-95.
- Smolak L, Murnen SK, Ruble AE. Female athletes and eating problems: a meta-analysis. *Int J Eat Disord* 2000; 27(4): 371-80.
- Dosil J, de Los Fayos EJG. The assessment and diagnosis of eating disorders in sport. *Eat Disord Athletes* 2008; 65-97.
- Beals KA. *Disordered Eating Among Athletes: A Comprehensive Guide for Health Professionals*. Human Kinetics; 2004.
- Coker-Cranney A, Reel JJ. Coach pressure and disordered eating in female collegiate athletes: is the coach-athlete relationship a mediating factor? *J Clin Sport Psychol* 2015; 9(3): 213-31.
- Martinsen M, Bratland-Sanda S, Eriksson AK, Sundgot-Borgen J. Dieting to win or to be thin? a study of dieting and disordered eating among adolescent elite athletes and non-athlete controls. *Br J Sports Med* 2010; 44(1): 70-6.

30. Dietz C, Casey S, Stirling A, Porter N. Development and validation of the coach-athlete relationship emotional maltreatment scale (CAREMS). *Athl Insight* 2016; 7(3): 209-226.
31. Musa R, Fadzil MA, Zain Z. Translation, validation and psychometric properties of Bahasa Malaysia version of the depression anxiety and stress scales (DASS). *Asean J Psychiatry* 2007; 8(2): 82-9.
32. Subramaniam M, Cheok C, Verma S, Wong J, Chong SA. Validity of a brief screening instrument-CRAFFT in a multiethnic Asian population. *Addict Behav* 2010; 35(12): 1102-4.
33. Knight JR, Sherritt L, Harris SK, Gates EC, Chang G. Validity of brief alcohol screening tests among adolescents: a comparison of the AUDIT, POSIT, CAGE, and CRAFFT. *Alcohol Clin Exp Res* 2003; 27(1): 67-73.
34. Mond JM, Hay PJ, Rodgers B, Owen C, Beumont PJ. Validity of the eating disorder examination questionnaire (EDE-Q) in screening for eating disorders in community samples. *Behav Res Ther* 2004; 42(5): 551-67.
35. Gomez F. A Guide to the Depression, Anxiety and Stress Scale (DASS 21). Central and Eastern Sydney Primary Health Networks; 2016.
36. Mitchell SG, Kelly SM, Gryczynski J, Myers CP, O'Grady KE, Kirk AS, et al. The CRAFFT cut-points and DSM-5 criteria for alcohol and other drugs: a re-evaluation and re-examination. *Subst Abuse* 2014; 35(4): 376-80.
37. Arvinder-Singh HS. Comparison of the COVID-19 mortality occurring in hospitals and those brought in dead within Malaysia. *Med J Malaysia* 2022; 77(3): 338-46.
38. Martinsen M, Sundgot-Borgen J. Higher prevalence of eating disorders among adolescent elite athletes than controls. *Med Sci Sports Exerc* 2013; 45(6): 1188-97.
39. Radcliffe JN, Comfort P, Fawcett T. Psychological strategies included by strength and conditioning coaches in applied strength and conditioning. *J Strength Cond Res* 2015; 29(9): 2641-54.
40. Janse Van Rensburg DC, Schwellnus M, Derman W, Webborn N. Illness among paralympic athletes: epidemiology, risk markers, and preventative strategies. *Phys Med Rehabil Clin N Am* 2018; 29(2): 185-203.
41. Schmidt U, Adan R, Böhm I, Campbell IC, Dingemans A, Ehrlich S, et al. Eating disorders: the big issue. *Lancet Psychiatry* 2016; 3(4): 313-5.
42. Chen H, Jackson T. Prevalence and sociodemographic correlates of eating disorder endorsements among adolescents and young adults from China. *Eur Eat Disord Rev* 2008; 16(5): 375-85.