

ORIGINAL ARTICLE

Eating Disorder Among Adult Malaysian Attending Urban and Rural Primary Health Clinics in Malaysia and Its Associated Factors - A Cross Sectional Study (EDAM)

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ABSTRACT

Introduction: Our survey showed that fifty per cent of adult Malaysians have symptoms of eating disorders. The burden of eating disorders showed that individuals with current or former eating disorders are at risk of increased mortality, high years lived with disability (YLD) rates, poorer quality of life, increased costs, and problems with child-bearing. **Methodology:** We determined the factors associated with eating disorders among adults attending 11 health clinics between August to November 2022 using the Eating Disorder Examination Questionnaire (EDE-Q). **Results:** The response rate was 83% (n=829). Logistic regression was done to analyse the association between sociodemographic characteristics, depression, and anxiety scores, body mass index, with eating disorder score. Higher score in females; rural 0.40 (95% CI: 0.15, 0.66; p-value = 0.002) urban 0.25 (95% CI: 0.02, 0.48; p-value = 0.037), obese participants 0.90 (95% CI: 0.38, 1.43; p-value = 0.0010), anxiety and depression increase scores rural 0.32 (95% CI: 0.04, 0.59; p-value = 0.023) and 0.54 (95% CI: 0.22, 0.87; p-value <0.001) urban; depression 0.31 (95% CI: 0.10, 0.52; p-value = 0.004) and anxiety 0.67 (95% CI: 0.41, 0.93; p-value <0.001). **Conclusion:** Screening of females, the obese and those with mental health issues should be considered.

Malaysian Journal of Medicine and Health Sciences (2026) 22(3): 1-12.doi:10.47836/mjmh.v22i3.1573

Keywords: Eating Disorder, Primary Health Care, Adult, Malaysia, Rural and Urban, Depression, Anxiety

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INTRODUCTION

DSM-5 diagnostic criteria define eating disorders as mental health conditions involving persistent and severe disruptions in eating behaviours, often linked with emotional distress and disruptive thoughts. (1) Types of eating disorders include anorexia nervosa, bulimia nervosa, binge eating disorder, avoidant restrictive food intake disorder, other specified feeding and eating disorder, and pica and rumination disorder. (1) Data

from a systematic review and meta-analysis showed cumulative and 12-month prevalence rates of eating disorders were 0.9% and 0.43%, respectively.(2) However, cumulative and 12-month prevalence rates of subgroups that cover all types of eating disorders were with are 1.5 times higher than the prevalence of the eating disorder. (2) Prevalence of anorexia nervosa, bulimia nervosa, and binge eating disorder was 0.16%, 0.63% and respectively. (2) This review also revealed estimated prevalence of eating disorders across the lifespan in developed countries was 1.89%, and higher at 2.58% among females. (2) Once considered a disorder of the Western hemisphere, recent data showed an increasing trend in eating disorders among Asian countries in particularly East and South Asia countries, which are

highly populous. (3) In Malaysia, a recent population-based study done in 2022 showed an alarmingly high rate of 50% of Malaysians reporting symptoms suggestive of eating disorders. (4) Most studies on eating disorders done in Malaysia were mainly among secondary school and university students, which showed a gender preponderance to females and prevalence rates of 21-25%. (5-7) Reviews on the burden of eating disorders showed individuals with current or past history of eating disorders are at risk of increased disability adjusted years (YLD) rates, poorer quality of life, increased costs, increased mortality and problems with childbearing. (8) One individual dies every 62 minutes due to an eating disorder, with those with anorexia nervosa showing the highest mortality, whereby 10% of them will die in 10 years. (9) Fear of being overweight often compels individuals to perform various unsafe weight-loss behaviours such as excessive exercise, extreme dieting, and even self-induced vomiting. (5) Eating disorders, major depressive disorder and anxiety have a unique relationship, in which individuals with major depressive disorder and anxiety often have eating disorders, and those with eating disorders often have undiagnosed or diagnosed depression or anxiety disorders. (10,11) Given that the 2019 Malaysian National Health and Morbidity Survey showed close to half a million or 2.3% of adults have symptoms of depression, there may be a role to screen patients attending health clinics for eating disorders. (12) In reality, many patients are unaware of their eating disorder and often present to primary health clinics with weight-related issues or coexisting medical and psychiatric conditions. (13) Qualitative studies also showed individuals with eating disorders regard primary healthcare providers like doctors, nurses, social workers, dieticians, counsellors, or psychologists as the most suitable and opportunistic setting to diagnose eating disorders and provide appropriate intervention. (14) Early intervention at primary health care clinics, which include recognising risk factors, providing screening, increasing patients' motivations for treatment, and assisting them with multidisciplinary coordinated care, will increase favourable outcomes among individuals with an eating disorder. (14) There is a dearth of data on eating disorders among adults attending primary healthcare clinics both globally and in Malaysia. This study aims to determine the prevalence and factors associated with eating disorders among Malaysian adults seeking care at primary health care clinics.

Materials and methods

Study design, Setting and Participants

A cross-sectional study was conducted in Malaysia's rural and urban government primary healthcare clinics in the states of Negeri Sembilan, Perak, Sabah, Selangor, Putrajaya and Sarawak. Rural sites comprised of Kuala Pilah, Hulu Perak and Tuaran, while urban sites included the federal territory of Putrajaya, Petaling, Kuching and Miri. The study was conducted from August to November

2022. All male and female adult participants aged 18 years old attending the government primary health care clinics were included in the study, while those illiterate in English or the Malay language, pregnant or with poor cognition were excluded.

Sample size and Sampling

We determined the sample size of the study using a single sample proportion for the dependent variable, and the derived formula is as below:

$$n = Z^2 \frac{1-\alpha/2}{P1} \frac{P1(1-P1)}{(d)^2}$$

$$Z \frac{1-\alpha/2}{2} = 1.96 \text{ for } \alpha = 0.05$$

d = absolute precision (at 95% CI or based on the width of the confidence interval)

P1 = anticipated sample or population proportion derived from a study carried out among adults with eating disorders in Singapore with clinical DSM-5 and other specified feeding or eating disorder (4)

This study was selected as it was most comparable to the present study in terms of the socio-demographic status of the study area when compared to other studies locally. The item that resulted in the largest sample size was used to determine the sample size. From the sample size calculation, the sample size of 995 participants was taken as the desired sample size for this study.

Study Instrument

Participants were given a hard copy self-administered anonymous questionnaire to determine confidentiality and mitigate response bias. There were four sections in the questionnaire, whereby the first section evaluated the socio-demographic characteristics of the participants: age, gender, marital status, race, education, occupation, monthly income, and smoking status. The second section examined the clinical parameters of the participants: body mass index (BMI), mental health status and medical co-morbidities. The participants' mental health status was examined with a validated General Anxiety Disorder-7 (GAD-7) and Patient Health Questionnaire-9 (PHQ-9) questionnaire made available in both English and Malay (15,16). The third section examined the participants' awareness of eating disorders, health-seeking behaviour of participants' weight, body shape and exercise.

The fourth section examined the participants' eating behaviours in the past twenty-eight days according to the validated Eating Disorder examination questionnaire (EDE-Q 6.0) made available in both English and Malay languages. Twenty-two items are rated on a seven-point scale ranging from 0 (no days or not at all) to 6 (every day or markedly), yielding four subscale scores assessing restraint, eating concern, shape concern, and weight concern (17,18) The global score represents an average of the four subscale scores, with higher scores indicating

greater eating disorders. (17,18) The measure also includes six free-response items assessing the frequency of ED behaviours (e.g., bingeing, purging). (17,18)

Variables

The main outcome variable measures the level of severity of eating disorders both in urban and rural Malaysia. EDE-Q 6.0 generates two types of data: behavioural frequency (Q13-18) and severity of psychopathology of eating disorders (Q1-Q12 and Q19-Q28). (17,18) The subscale score can be obtained by 16 adding together the scores of relevant items and dividing the sum by the total number of items forming the subscale. (17,18)

Descriptive statistics were used to report frequency distribution of demographic factors like age, sex, marital status, race, occupation, income, education and smoking status, clinical parameters like Body Mass Index (BMI), comorbidity, depression and anxiety score, awareness of eating disorders and health-seeking behaviour on weight and body shape. Depression scores based on PHQ-9 were categorised based on the score 0-4 as normal, 5-9 as mild, 10-14 as moderate, 15-19 as moderately severe and 20-27 as severe depression. (16) GAD-7 scores 0-4 as normal, 5-9 as mild, 10-14 as moderate and 15 and above as severe anxiety. (15)

Data collection method

Researchers obtained permission from the State and District Health Department, and data collection was coordinated by site investigators. Participants were approached by the researchers while waiting to see their doctors and were informed of the purpose of the study. Participants were informed that this study aimed to estimate the prevalence of eating disorders and their associated factors among patients attending primary health clinics. Participants were then provided the patient information sheet, which contained further details of the study, and a consent form was presented first before proceeding to the questionnaire. Participants were allowed to agree or decline to participate in the study after reading the participant information sheet. Consented participants answered the questionnaire in the clinic. All the answered questionnaires were collected by the site investigator, and the data were entered into SPSS. Patients presenting with eating disorders, depression, and/or anxiety were referred to a family medicine specialist and a psychiatrist for further evaluation to ensure accurate diagnosis and appropriate management.

Data analysis

The data was analysed using the IBM SPSS Statistics version 26.0. There were two outcomes of this study: the presence of eating disorders in the rural and urban territories by the global EDE-Q 6.0 eating disorder

score. The predictive validity of the EDE-Q 6 was also established using an independent t-test as a predictor of depression and anxiety in patients with eating disorders. Table I shows a significant association between a global cut-off score and depression and anxiety scores. The outcome variables were reported as mean and standard deviation.

Table I: Independent t-test result on the predictive validity of the eating disorder global score

Variables	Mean (95% CI) Eating disorder		p-value
	Yes	No	
Depression score PHQ	(-1.787,-0.404)	(-1.867,-0.324)	0.001
Anxiety score GAD	(-1.279,-0.137)	(-1.332,-0.085)	0.006

To examine the associated factors with the eating disorders in the rural and urban government health clinics, multiple linear regression analysis was used. From the univariate analysis using simple linear regression, factors with p-values equal to or less than 0.25 and biologically significant were included in the variable selection stage of multiple linear regression. Testing for multicollinearity and assumptions was also carried out for the model. Testing for multicollinearity of the independent variables was carried out by examining the variance inflation factor (VIF). The statistical significance in the final model was accepted at p-values equal to or less than 0.05.

Results

Among the approached participants, the overall response rate was 83% (n=829), with 359 participants recruited from rural clinics and 470 from urban clinics. All participants agreed to participate and completed the self-administered questionnaire, giving a response rate of 100%. The sociodemographic factors of the participants are shown in Table II. In both rural and urban settings, most participants were females (633/829, 76.3%), and 90% of participants were aged 40 years and below (750/829, 90.4%), with 59% of participants being married (488/829, 58.9%). Participants had secondary (317, 38.2%) and tertiary education (485, 58.5%), with 84% of participants being employed (698/829). Participants were mainly of the low-income group (619/829, 74.6%) and earned below RM 4,849 per month. Clinical parameters showed participants in the rural setting were obese (147/40.9%) while in the urban setting, most of the participants were overweight (169, 36%). The mean BMI of the study participants was 29.23 kg/m². Most participants had normal depression and anxiety scores, however, we also found 10% of the participants had a depression score of moderate and higher (85/829, 10.2%) with a mean PHQ-9 score of 4.25. Mild anxiety was found in 15% of the participants (123/829, 14.8%) and the mean GAD-7 score was 2.37.

Table II: Sociodemographic characteristics, clinical parameters and health-seeking behaviour of respondents attending rural and urban government primary healthcare clinics (N=829)

Characteristics	Frequency	
	Rural (N=359)	Urban (N=470)
Sociodemographic	N (%)	N (%)
Age		
<30 years	160 (44.6)	179 (38.1)
30-39 years	171 (47.6)	240 (51.1)
40-49 years	23 (6.4)	50 (10.6)
50- 59years	4 (1.1)	1(0.2)
≥60 years	1 (0.3)	0 (0)
Gender		
Male	113 (31.5)	83 (17.7)
Female	246 (68.5)	387 (82.3)
Marital status		
Single	126 (35.1)	191 (40.6)
Married	223 (62.1)	265 (56.4)
Divorced	2 (0.6)	7 (1.5)
Widowed	8 (2.2)	7 (1.5)
Race		
Malay	279 (77.7)	251 (53.4)
Chinese	5 (1.4)	76 (16.2)
Indian	9 (2.5)	33 (7.0)
Bumiputra Sabah	55 (15.3)	5 (1.1)
Bumiputra Sarawak	2 (0.6)	95 (20.2)
Others	9 (2.5)	10 (2.1)
Education		
None	2 (0.6)	3 (0.6)
Primary	8 (2.2)	14 (3.0)
Secondary	164 (45.7)	153 (32.6)
Tertiary	185 (51.5)	300 (63.8)
Occupation		
Government	106 (29.6)	192 (40.9)
Private	88 (24.5)	159 (33.8)
Self-employed	52 (14.5)	35 (7.4)
Unpaid	50 (13.9)	16 (3.4)
Retiree	0 (0)	3 (0.6)
Student	46 (12.8)	44 (9.4)
Unemployed	17 (4.7)	21 (4.5)
Monthly income		
<RM2,500	195 (54.3)	142 (30.2)
RM2,500- RM4,849	121 (33.7)	161 (34.3)
RM4,850-RM10,959	40 (11.1)	149 (31.7)
RM10,960-RM15,039	3 (0.8)	10 (2.1)
≥RM15,040	0 (0)	8 (1.7)
Smoking status		
Never smoker	287 (79.9)	397 (84.5)
Ex-smoker	36 (10.0)	30 (6.4)
Active smoker	36 (10.0)	43 (9.1)

CONTINUE

Table II: Sociodemographic characteristics, clinical parameters and health-seeking behaviour of respondents attending rural and urban government primary healthcare clinics (N=829) (CONT.)

Characteristics	Frequency	
	Rural (N=359)	Urban (N=470)
Sociodemographic	N (%)	N (%)
Clinical parameters		
BMI (kg/m²)		
Obese ≥27.5	147 (40.9)	148 (31.5)
Overweight 23.0-27.4	100 (27.9)	169 (36.0)
Normal <23.0	112 (31.2)	153 (32.6)
Depression score		
Normal	195 (54.3)	305 (64.9)
Mild	121 (33.7)	123 (26.2)
Moderate	33 (9.2)	29 (6.2)
Moderate- severe	8 (2.2)	9 (1.9)
Severe	2 (0.6)	4 (0.9)
Anxiety score		
Normal	280 (78.0)	387 (82.3)
Mild	60 (16.7)	63 (13.4)
Moderate	14 (3.9)	16 (3.4)
Severe	5 (1.4)	4 (0.9)
Comorbid		
No	329 (91.6)	395 (84.0)
Yes	30 (8.4)	75 (16.0)
Health seeking behaviour		
Heard of eating disorder		
No	198 (55.2)	198 (42.1)
Yes	161 (44.8)	272 (57.9)
Ever seek help for weight		
No	282 (78.6)	88 (18.7)
Yes	77 (21.4)	382 (81.3)
Ever seek help for shape		
No	329 (91.9)	428 (8.9)
Yes	29 (8.1)	42 (91.1)
Regular exercise		
No	215 (59.9)	291 (61.9)
Yes	144 (40.1)	179 (38.1)

Participants in the urban setting were more aware of eating disorders (57.9%) as compared to the rural (44.8%), with 81 % of the urban participants in this study seeking help for their weight. A total of 21.7 % (180/829) of participants had a Global Eating Disorder score of 1.68 and above, with the rural setting 24% and the urban 20% having a significant score. The descriptive statistics of adults with eating disorders according to their subscales are shown in Figure 1 in the

supplements. Shape and weight concerns were higher among rural participants (40.1%,40.4%) as compared to urban participants (35.3%,33.6%). Participants of this study also had restrained eating habits (rural 34.3%, urban 29.6%). Predictive validity of the EDE-Q 6.0 global score of 1.68 was also established as a predictor of depression and anxiety in Malaysian patients with eating disorders.

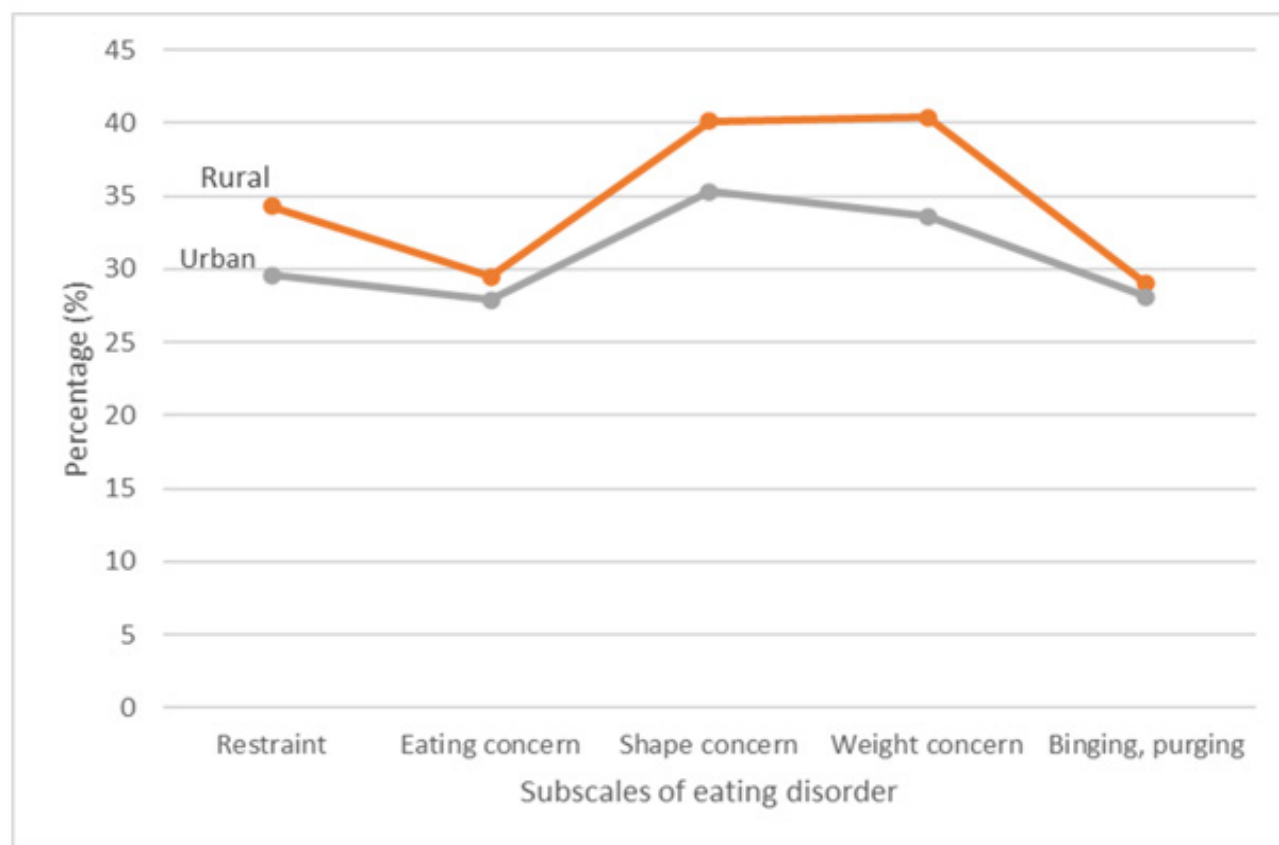


Figure 1: Descriptive statistics of adult patients with eating disorders attending rural and urban government primary health care clinics.

Factors associated with the global eating disorder score among attending rural health clinic are shown in Table III. Gender, BMI categories, presence of depression and anxiety were among the significant factors associated with eating disorders in rural areas. The multiple linear regression model revealed a strongly significant model ($F = 12.64$, $p\text{-value} < 0.001$) and 17.7% of the variance of the data was explained by the model. Among rural participants, females had higher global scores of 0.40

(95% CI: 0.15,40.66; $p\text{-value} = 0.002$) compared to males. Obese participants were revealed to have a higher global score of 0.90 (95% CI: 0.38, 1.43; $p\text{-value} = 0.001$) when compared to those in the underweight category. Presence of anxiety and depression will increase the participants' global scores by 0.32 (95% CI: 0.04, 0.59; $p\text{-value} = 0.023$) and 0.54 (95% CI: 0.22, 0.87; $p\text{-value} < 0.001$), respectively.

Table III: Univariate analysis of eating disorder with sociodemographic, clinical parameters and health seeking behavior factors among rural, urban and total study participants with eating disorder.

Factor		Rural (N=359)			Urban (N=470)			Overall (N=829)		
Sociodemographic										
Age (years)	OR	95% CI	p-value	OR	95% CI	p-value	OR	95%CI	p-value	
< 30	1.000			1.000			1.000			
30-39	1.069	(0.642,1.782)	0.797	1.049	(0.651,1.691)	0.843	0.832	(0.623,1.111)	0.212	
>40	1.139	(0.448,2.894)	0.785	0.888	(0.396,1.992)	0.773	0.658	(0.395,1.096)	0.658	
Gender										
Male	1.000			1.000			1.000			
Female	2.639	(1.412,4.932)	0.002	1.421	(0.763,2.645)	0.269	1.896	(1.222,2.943)	0.004	
Marital Statues										
Single	1.000			1.000			1.000			
Married	1.293	(0.773,2.163)	0.327	1.048	(0.666,1.648)	0.841	1.161	(0.827,1.628)	0.388	
Race										
Malay	1.000			1.000			1.000			
Bumiputra Sabah Sarawak	1.399	(0.744,2.632)	0.297	1.116	(0.640,1.945)	0.699	1.194	(0.790,1.804)	0.401	
Others	0.314	(0.072,1.373)	0.124	0.755	(0.428,1.332)	0.332	0.640	(0.389,1.054)	0.079	
Education										
Secondary and below	1.000			1.000			1.000			
Tertiary and above	0.766	(0.469,1.250)	0.286	0.880	(0.554,1.397)	0.588	0.809	(0.580,1.128)	0.212	
Occupation										
Unemployed	1.000			1.000			1.000			
Employed	5.430	(0.708,41.642)	0.104	1.321	(0.440,3.968)	0.620	2.124	(0.820,5.503)	0.121	
Others	3.368	(0.389,29.189)	0.270	1.111	(0.297,4.155)	0.876	1.557	(0.529,4.585)	0.422	
Monthly Income (RM)										
<2500	1.000			1.000			1.000			
2500- 4849	2.148	(1.074,4.297)	0.031	0.608	(0.362,1.020)	0.060	0.869	(0.581,1.300)	0.494	
4850-10,959 and above	<0.001	(<0.001,<0.001)	0.999	0.666	(0.187,2.366)	0.529	0.576	(0.167,1.982)	0.381	
Clinical Parameters										
Smoking										
Never smoker	1.000			1.000			1.000			
Ex- smoker	0.655	(0.215,1.996)	0.457	0.831	(0.372,1.858)	0.653	0.746	(0.389,1.429)	0.377	
Active Smoker	0.357	(0.123,1.041)	0.059	0.748	(0.320,1.746)	0.502	0.543	(0.280,1.052)	0.070	
BMI categories (kg/m2)										
Underweight (<18)	1.000			1.000			1.000			
Normal	1.263	(0.697,2.287)	0.442	0.464	(0.274,0.784)	0.004	1.585	(0.734,3.420)	0.241	
Overweight	1.012	(0.538,1.905)	0.970	0.313	(0.167,0.586)	<0.001	1.139	(0.521,2.491)	0.744	
Obese	1.437	(0.516,4.005)	0.488	0.269	(0.077,0.937)	0.039	0.862	(0.384,1.934)	0.719	
Depression Category										
Normal	1.000			1.000			1.000			
Mild	6.031	(0.368,98.879)	0.208	6.051	(0.828,44.225)	0.076	6.042	(1.196,30.529)	0.030	
Moderate	16.083	(4.052,63.842)	<0.001	30.256	(3.442,265.949)	0.002	19.637	(6.228,61.922)	<0.001	
Moderate-Severe	5.227	(2.276,12.006)	<0.001	3.301	(1.512,7.206)	0.003	4.083	(2.318,7.191)	<0.001	
Severe	2.872	(1.618,5.097)	<0.001	2.035	(1.234,3.355)	0.005	2.335	(1.603,3.400)	<0.001	
Anxiety Category										
Normal	1.000			1.000			1.000			
Mild	17.630	(1.932,160.889)	0.011	16.397	(1.676,160.370)	0.016	17.344	(3.556,84.585)	<0.001	
Moderate	5.142	(1.661,15.914)	0.005	10.020	(3.565,28.161)	<0.001	7.433	(3.483,15.864)	<0.001	
Severe	2.791	(1.463,5.326)	0.002	2.623	(1.496,4.600)	0.001	2.664	(1.746,4.064)	<0.001	
Medical Comorbidity										
No	1.000			1.000			1.000			
Yes	0.875	(0.438,1.746)	0.705	3.131	(1.682,5.828)	<0.001	1.706	(1.084,2.684)	0.021	
Health seeking Behaviour										
Heard of eating disorder										
No	1.000			1.000			1.000			
Yes	1.603	(0.974,2.636)	0.063	0.834	(0.533,1.307)	0.429	1.120	(0.804,1.560)	0.502	
Ever seek help for weight										
No	1.000			1.000			1.000			
Yes	2.185	(1.258,3.796)	0.006	1.470	(0.858,2.520)	0.161	1.786	(1.217,2.620)	0.003	

CONTINUE

Table III: Univariate analysis of eating disorder with sociodemographic, clinical parameters and health seeking behavior factors among rural, urban and total study participants with eating disorder. (CONT.)

Factor	Rural (N=359)			Urban (N=470)			Overall (N=829)		
Health seeking Behaviour									
Ever seek help for shape									
No	1.000			1.000			1.000		
Yes	6.298	(2.975,13.331)	<0.001	1.907	(0.924,3.934)	0.081	3.376	(2.975,13.331)	<0.001
Regular exercise									
No	1.000			1.000			1.000		
Yes	0.918	(0.559,1.509)	0.737	1.383	(0.876,2.183)	0.164	1.155	(0.825,1.616)	0.401

For the urban area, the results of multiple linear regression are presented in Table IV. The finding showed that gender, education level, smoking status, BMI categories, presence of depression and anxiety were significantly associated factors for eating disorders. The final model revealed a strongly significant model ($F = 16.07$, $p\text{-value} < 0.001$), with 22.2% of variance explained by the model. Female participants had 0.25 (95% CI: 0.02, 0.48; $p\text{-value} = 0.037$) higher global score of eating disorder compared to males. Those with tertiary education had 0.27 (95% CI: 0.09, 0.46; $p\text{-value} = 0.003$) higher global score compared to those with secondary education or below. Those who

ever smoked had a lower score of 0.35 (95% CI: -0.59, -0.10; $p\text{-value} = 0.006$) compared to those who never smoked. Participants in the overweight and obese BMI categories will have lower global scores of 0.75 (95% CI: 0.36, 1.14; $p\text{-value} < 0.001$) and 1.09 (95% CI: 0.69, 1.48; $p\text{-value} < 0.001$) compared to participants in the underweight category, respectively. Participants who had depression will have an increased global score of 0.31 (95% CI: 0.10, 0.52; $p\text{-value} = 0.004$) while those who had anxiety will have an increased global score of 0.67 (95% CI: 0.41, 0.93; $p\text{-value} < 0.001$).

Table IV: Multivariate analysis of sociodemographic, clinical parameters and health seeking behavior factors among rural, urban and total study participants with eating disorder

Factor	Rural (N=359)			Urban (N=470)			Overall (N=829)		
Sociodemographic									
Age (years)	OR	95% CI	p-value	OR	95% CI	p-value	OR	95%CI	p-value
< 30	1.000			1.000			1.000		
30-39	0.905	(0.457,1.791)	0.775	1.072	(0.567,2.028)	0.830	0.955	(0.620,1.470)	0.833
>40	0.537	(0.158,1.830)	0.320	0.684	(0.244,1.917)	0.471	0.706	(0.337,1.478)	0.356
Gender									
Male	1.000			1.000			1.000		
Female	1.655	(0.771,3.552)	0.196	1.354	(0.638,2.875)	0.430	1.440	(0.867,2.394)	0.159
Marital Statues									
Single	1.000			1.000			1.000		
Married	0.918	(0.449,1.877)	0.814	0.818	(0.439,1.523)	0.527	0.976	(0.632,1.508)	0.913
Race									
Malay	1.000			1.000			1.000		
Bumiputra Sabah Sarawak	1.304	(0.575,2.960)	0.527	1.292	(0.678,2.462)	0.436	1.407	(0.877,2.259)	0.157
Others	0.358	(0.070,1.828)	0.217	0.869	(0.451,1.676)	0.676	0.736	(0.426,1.274)	0.274
Education									
Secondary and below	1.000			1.000			1.000		
Tertiary and above	0.568	(0.303,1.063)	0.077	0.880	(0.500,1.549)	0.658	0.731	(0.494,1.083)	0.118
Occupation									
Unemployed	1.000			1.000			1.000		
Employed	5.095	(0.481,53.949)	0.176	1.410	(0.408,4.870)	0.587	2.432	(0.850,6.955)	0.098
Others	3.200	(0.250,40.907)	0.371	1.257	(0.274,5.761)	0.768	1.742	(0.509,5.956)	0.376
Monthly Income (RM)									
<2500	1.000			1.000			1.000		
2500- 4849	3.277	(1.374-7.817)	0.007	0.730	(0.388,1.376)	0.331	1.189	(0.736,1.920)	0.479
4850-10,959 and above	<0.001	(<0.001,<0.001)	0.999	1.538	(0.390,6.061)	0.539	1.361	(0.373,4.965)	0.641
Clinical Parameters									
Smoking									
Never smoker	1.000			1.000			1.000		
Ex- smoker	0.398	(0.105,1.511)	0.176	0.748	(0.282,1.983)	0.560	0.553	(0.262,1.163)	0.118
Active Smoker	0.386	(0.105,1.411)	0.150	0.574	(0.212,1.556)	0.275	0.499	(0.234,1.064)	0.071

CONTINUE

Table IV: Multivariate analysis of sociodemographic, clinical parameters and health seeking behavior factors among rural, urban and total study participants with eating disorder. (CONT.)

Factor	Rural (N=359)			Urban (N=470)			Overall (N=829)		
BMI categories (kg/m2)									
Underweight (<18)	1.000			1.000			1.000		
Normal	0.878	(0.235,3.275)	0.847	5.307	(1.321,21.322)	0.019	1.771	(0.744,4.213)	0.196
Overweight	0.685	(0.183,2.556)	0.573	2.814	(0.688,11.516)	0.150	1.269	(0.526,3.061)	0.595
Obese	0.592	(0.155,2.253)	0.442	1.657	(0.392,7.009)	0.492	0.989	(0.403,2.428)	0.981
Depression Category									
Normal	1.000			1.000			1.000		
Mild	1.899	(0.041,87.617)	0.743	<0.001	(<0.001,<0.001)	0.999	0.878	(0.107,7.230)	0.904
Moderate	11.500	(1.755,75.350)	0.011	10.432	(0.3611,301.173)	0.172	7.313	(1.835,29.148)	0.005
Moderate-Severe	3.682	(1.193,11.363)	0.023	1.262	(0.403,3.948)	0.690	2.349	(1.117,4.939)	0.024
Severe	2.404	(1.212,4.767)	0.012	1.661	(0.895,3.084)	0.108	1.942	(1.259,2.995)	0.003
Anxiety Category									
Normal	1.000			1.000			1.000		
Mild	18.156	(0.545,605.004)	0.105	<0.001	(<0.001,<0.001)	0.999	18.334	(2.150,156.341)	0.008
Moderate	1.945	(0.431,8.772)	0.387	9.052	(1.868,43.865)	0.006	4.000	(1.478,101.826)	0.006
Severe	1.288	(0.542,3.062)	0.566	2.228	(1.093,4.539)	0.027	1.764	(1.052,2.957)	0.031
Medical Comorbidity									
No	1.000			1.000			1.000		
Yes	0.964	(0.410,2.265)	0.933	3.894	(1.807,8.391)	0.001	1.920	(1.142,3.226)	0.014
Health seeking Behaviour									
Heard of eating disorder									
No	1.000			1.000			1.000		
Yes	1.301	(0.709,2.387)	0.395	0.771	(0.452,1.315)	0.339	0.929	(0.639,1.352)	0.701
Ever seek help for weight									
No	1.000			1.000			1.000		
Yes	0.833	(0.333,2.086)	0.696	0.821	(0.363,1.858)	0.635	0.967	(0.553,1.693)	0.908
Ever seek help for shape									
No	1.000			1.000			1.000		
Yes	9.902	(3.070,31.936)	<0.001	1.411	(0.506,3.938)	0.511	3.153	(1.572,6.324)	0.001
Regular exercise									
No	1.000			1.000			1.000		
Yes	0.815	(0.436,1.526)	0.523	1.463	(0.863,2.479)	0.157	1.212	(0.831,1.769)	0.318

95% CI: 95% confidence interval

OR: Odd ratio

¶ p-value <0.05

Discussion

Our study highlights the differences in risk factors among urban and rural populations associated with eating disorders. Similar factors were the co-existence of anxiety and depression in both rural and urban participants at elevated risk of developing eating disorders. Among urban participants, the risk factors strongly associated with an eating disorder include education level, smoking status, and being overweight. In contrast, among rural participants, females and being in the obese category were assessed to be at an increased risk of eating disorders.

Looking into the observed differences in risk factors between urban and rural populations underscores the importance of considering broader socio-cultural and structural influences on eating disorder prevalence. Urban environments often promote greater exposure to Westernised beauty ideals through social media and mass media, which can increase body dissatisfaction and disordered eating behaviours, especially among

those with higher educational attainment who may be more exposed to such influences. (19,20) Additionally, urban lifestyles, including unhealthy diet, inactivity, and body image pressures, contribute to higher obesity rates and increased risk of eating disorders. (21) Conversely, in rural settings, our findings suggest that female gender and obesity are predominant risk factors. Rural communities often face structural challenges such as limited access to healthcare services, lower levels of health literacy, and cultural norms that may stigmatise weight or discourage seeking mental health support. (22) Additionally, the scarcity of mental health resources in rural areas impedes early detection and intervention, thereby perpetuating the burden of EDs. These findings highlight the need for culturally sensitive, context-specific public health strategies that address social determinants of health, including education, mental health literacy, and access to care, to effectively prevent and manage EDs across our diverse populations.

Our study identified that young Malaysian females aged 30 to 39 with higher BMI were at an increased

risk of developing eating disorders (EDs). This finding aligns with existing literature indicating that individuals with higher BMI are susceptible to EDs, particularly binge eating disorder (BED) and bulimia nervosa (BN). Research suggests that obesity and EDs share common risk factors, including body dissatisfaction, exposure to weight-related stigma, and engagement in unhealthy weight control behaviours. These factors can contribute to the development and maintenance of disordered eating patterns in individuals with higher BMI. (23) Furthermore, societal pressures and internalised weight bias can exacerbate body image concerns among individuals with higher BMI, leading to increased vulnerability to EDs. Studies have shown that weight stigma and discrimination are associated with psychological distress, which may prompt maladaptive coping mechanisms such as binge eating. (24) Therefore, it is important to note that EDs can occur across the weight spectrum, and individuals with higher BMI may experience similar severity of ED symptoms as those with lower BMI. However, due to prevailing stereotypes, EDs in individuals with higher BMI are often underdiagnosed and undertreated. It emphasises the need for early identification and intervention not only among underweight individuals but also among those with higher BMI who may be experiencing body dissatisfaction and disordered eating behaviours.

In addition, a systematic review by Suarez-Albor et al.(25) and Stice et al (26) Being female is the most reported biological risk factor for developing an eating disorder. Females, as compared to males, have more general dissatisfaction with their body image, lower self-esteem, and exhibit greater self-image instability. Identifying these risk factors is essential in formulating preventive measures for developing eating disorders. (27)

We found that the prevalence of eating disorders was higher in the low-income both in the rural and urban participants and among the Malay ethnicity. According to a 2019 World Obesity Federation analysis, Indians, Sarawakians, and Malays were the ethnicities with the highest rates of obesity in Malaysia.(28) A recent online survey done in Malaysia showed a significant probability of having ED in almost 59% of its correspondence and, ethnic Malays and Indians exhibited a higher prevalence of ED with higher BMI values..(29) This is similar to in The Malaysian Adult Nutrition Survey 2014 (30) and a more recent review which identified food insecurity in key populations led to a less effective food-related coping mechanism such as reducing the amounts of food consumed, borrowing money to buy food, borrowing food, and skipping meals. (30) Similar findings were also seen in Singapore, where being from a Malay-speaking household was identified as one of the risk factors of developing ED. (31) Ethnicity prevalence of eating disorder has been attributed to the cultural and socioeconomic differences, which created food

insecurity. (29,32)

Higher education is frequently linked to positive ED test results. (30) similar to our finding among urban participants with tertiary level education (p-value =0.003). Another research done among local college students also showed that one in five college students was at risk of developing ED.(31) The major risk factor for developing an eating disorder in this population was shown to be attributed to their efforts to lose weight and going through post-traumatic stress disorder (PTSD). On the contrary, there are also studies which have shown that the level of education was not a risk factor for developing an eating disorder. (32)

Eating disorder is more often associated with a psychiatric disorder compared to other medical comorbid. Mainly, it is associated with general anxiety disorder, followed by mood disorder, substance use disorder and post-traumatic stress disorder.(33) Approximately 40–70% of patients with eating disorders have an increased risk of self-harm and suicide with psychiatric comorbidities. (33–35) Similar to our findings, participants who were identified at risk of developing an eating disorder across the study setting had a significant risk of anxiety disorder. People who have an eating disorder have been found to have anxiety about getting fat and a fear of losing control of their body weight. (34) and linked with those who have high body dissatisfaction. (35,36) Body dissatisfaction, which is caused by insecure attachment and separation anxiety, has been highlighted to be a risk factor for developing an eating disorder in females (37). This can alert healthcare personnel to screen for eating disorders in patients who present with anxiety disorders.

In our research, participants with high BMI were more associated with ED among the urban population. This is similar to a cross-sectional study done in Thailand among young college students, which was attributed to stress in college. (38) A systematic review that was done concluded that an interventional weight management programme in primary care and eating disorders has a good outcome. (39) We can suggest that any intervention targeting high BMI patients must be done cautiously, as it can precipitate an eating disorder. According to a 2019 study by the World Obesity Federation in Malaysia, one in every two individuals is currently obese, with an annual increase of 4.7% expected from 2020 to 2030. (37) As a result, there is a growing need for effective healthcare interventions to combat the obesity epidemic and effectively manage eating disorders.

This study is the first to screen and diagnose eating disorders among urban and rural primary health clinic participants. It also provided a clear association between major depressive and anxiety disorder and an eating disorder. This study reaffirms the role of primary healthcare providers in the management of eating disorders, as individuals at risk often seek care for other

medical concerns, and those opportunities should be used to diagnose and manage eating disorders. Our study is not without limitations; in a multilingual country like Malaysia, those not literate in English or the Malay language were not included in this study. There was also a risk of self-recall and biases during the data collection. The evaluation of body dissatisfaction and media influences should also be incorporated into future research.

Findings from this study can guide national policy makers to plan future strategies on interventions focused on disadvantaged populations to reduce social inequalities in diet. This research highlights the existing burden of eating disorders in our population and prompts healthcare providers to screen high-risk individuals as well as provide early intervention. There are limitations to increasing screening for eating disorders when the awareness and knowledge among healthcare providers remain low and uncertain. There is an urgent need to increase awareness and knowledge among healthcare personnel to enhance their clinical diagnostic skills in managing eating disorders in primary care.

Strengths and Limitations

This is the first research to screen and diagnose eating disorders among urban and rural primary health clinic participants. It also provided a clear association between major depressive disorder and anxiety disorder and an eating disorder. This study reaffirms the role of primary healthcare providers in the management of eating disorders, as individuals at risk often seek care for other medical concerns, and those opportunities should be used to diagnose and manage eating disorders. Our study is not without limitations; in a multilingual country like Malaysia, those not literate in English or the Malay language were not included in this study. Although the Malay version of the EDE-Q 6.0 has demonstrated good internal consistency in a student population (Mohd Taib et al., 2021), its validation in the general adult or primary care population remains limited. This represents a potential limitation of the study, and further validation work is recommended to support its broader application. There was also a risk of self-recall and biases during the data collection. The evaluation of body dissatisfaction and its correlation with media influences warrants inclusion into future research.

Policy Implications

Policymakers should consider integrating screening of eating disorders in the National Health Screening program or, at the very least, an extension among those screened positive for major depressive and anxiety disorders. Screening for eating disorders should also be done among individuals with comorbidities, particularly those with poor diet control. Awareness and knowledge of the importance of early diagnosis and intervention must be increased in the community and among primary healthcare providers. Training of primary healthcare

providers on eating disorders is lacking and needs to be addressed urgently.

Conclusion

There is a growing need to acknowledge and manage eating disorders, especially in underprivileged and understudied population in Malaysia. Besides healthcare workers, there is a growing need to create an effective public health intervention to better comprehend this complex issue, which in turn will guide health policy and service development.

Acknowledgements

The authors would like to extend their sincere appreciation to the participants who were involved in this study. The authors would also like to thank the Director General of Health of Malaysia for his kind permission to publish this article.

Part of this study was presented as an oral presentation at the 25th Family Medicine Scientific Conference (FMSC) 2023, which was organised by Malaysian Family Medicine Specialists Association (FMSEA) and will be held from Aug 23 - 26, 2023, at Muvenpick Hotel and Convention Centre Klia, Sepang, Selangor, Malaysia.

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