ORIGINAL ARTICLE

A Survey On Prevalence Of Orthorexia Nervosa And Its Risk Factors Among The Undergraduate Medical Students In Private Medical College, Malaysia.

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ABSTRACT

INTRODUCTION**:**

Orthorexia nervosa (ON) is a new eating behaviour disorder which is characterized by pathological obsession of biological pure food, free from artificial substances such as pesticides and herbicides. [1] The prevalence of ON is higher among the health professions and also medical students.

OBJECTIVE**:**

To find the prevalence of ON (dependent variable) and its risk factors (independent variable) such as age, anxiety level, gender, BMI, ethnicity, vegetarian or non-vegetarian among the undergraduate medical students in private medical college, Malaysia.

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METHODS:

This cross-sectional study was carried out from June to July 2019 among 202 medical students in Melaka Manipal Medical College, Muar, Johor, Malaysia. The research is carried out by distributing a questionnaire that consists of 3 sections, which are social-demographic details, Beck Anxiety Inventory (BAI) questionnaires and validated ORTO-15 questionnaires. Chi-Square test and multiple logistic regression were used to analyse the data and P<0.05 was accepted as statistically significant.

RESULTS:

Out of 202 students participated in the study, 66.83% of the students are suffering ON. However, there is no significant association between age (p-value 0.073), gender (p-value 0.143), diet (p-value 0.538), ethnicity (p-value for malay, indian and others are 0.991. 0.314 and 0.057 respectively), BMI (p-value for underweight <18.5, overweight >25.0 are 0.441 and 0.526 respectively) and anxiety level (p-value for mild, moderate and severe are 0.621, 0.150 and 0.699 respectively) and ON.

CONCLUSION:

Most of the medical student in the college are suffering from ON. There are no significant association between ON and the risk factors such as age, gender, ethnicity, diet, BMI and anxiety level.

INTRODUCTION

Orthorexia is a new eating behavior disorder which is characterized by pathological obsession of biological pure food, free from artificial substances such as pesticides and herbicides [1]. It is described with the term "obsession with health and proper nutrition" [2]. The concept is defined by Dr. Steven Bratman in 1996 [3]. It is able to cause substantial dietetic limitations which leads to an individual having obsessive ideas about foods, affective dissatisfactions and intense social isolation [1, 2]. ON is a harmful behavior and a disorder connecting behavior and personality for paying too much attention on consuming healthy food, spending excessive amount of time with this preoccupation to the extent of causing dysfunctions in everyday life [1]. A study on orthorexia is done among 318 resident medical doctors in Ankara, Turkey shows that the prevalence of orthorexia is found to be 45.5% [4].

According to Dr. Steve Bratman, both orthorexia and anorexia are parallel to each other [3]. Based on symptom wise, both orthorexia and anorexia have tendencies towards perfectionism, high comorbid anxiety and need for control [5]. Individuals with orthorexia and individuals with anorexia will follow a restricted diet in order to achieve self-discipline and perceive deviation from strict diet as a failure of self-control [5]. They involve controlling behavior where orthorexic individuals feel obligated to reach the greatest height of dietary perfection, feeling totally clean, pure and transparent; people who are anorexic seek for continuous reduction in their body weight [3, 6]. Even though both anorexia and orthorexia share similarities among each other, however, the ultimate goal between both of them are different. For orthorexic individuals, their ultimate goal is to improve or manage their health with diet whereas for anorexic individuals, they are focused on their physical body image with the fear of obesity. These individuals relate this type of diet to better quality of life in terms of life satisfaction, happiness, self-esteem, optimism, and lower tendency to be depressed.

Fear of illness is the most obvious anxiety suffered by people who are orthorexic [3]. In most of the general population, we believe that prevention of illness is better than curing and one of the easiest way to prevent illness is by eating healthily. According to the WHO (World Health Organisation), a healthy diet helps to protect all forms of malnutrition and non-communicable diseases such as diabetes, heart disease, stroke and cancer [7]. Proper control of the quality of diet is a good habit, however, if overdoing it, may lead to major health concern.

There is no main diagnostic criteria for ON and different researchers have different approach to diagnosis [8]. However, it is found that most early diagnosis of ON is done by assessing "Bratman Orthorexia Self-test" (BOT) invented by Dr. Steve Bratman [3]. It consists of a 10-item orthorexia questionnaire and it is a useful screening tool in the early diagnosis of ON. The BOT is modified to produce ORTO-15 by Donini et al. [9]. In our study, we are using ORTO-15 scales to evaluate the tendencies of ON among the medical students in private medical college, Malaysia who are in their semester 6, 7, 8, 9 and 10 and their

behavior towards it [10]. ORTO-15 is it is used to determine the prevalence of highly sensitive behavior regarding health and proper nutrition. Each of the 15-item corresponds to a unique score, in which the total score of less than 40 is diagnosed as orthorexic whereas the total score of more than 40 is free of orthorexia [4].

In Malaysia, there is a study by Universiti Teknologi MARA, Selangor on association between ON and quality of life. The study shows there is a prevalence of 67.4% of the university undergraduate students experiencing ON [11]. However, to our knowledge, there has been no study conducted on prevalence of ON among medical students associated with its risk factors. Therefore, the research objective of our study is to find the prevalence of ON (dependent variable) and its risk factors (independent variable) such as age, anxiety level, gender, BMI, ethnicity, vegetarian or non-vegetarian among the undergraduate medical students in private medical college, Malaysia.

METHODOLOGY

Study design:

A cross sectional analytical study about the relationship between ON with age, gender, ethnicity, BMI, diet (vegetarian/not vegetarian) and anxiety, which will be conducted amongst semester 6, 7, 8, 9, 10 medical students in a private medical college in Malaysia.

Study time, setting, and population:

The study will be conducted from June to July 2019 in a Melaka Manipal Medical College, Muar, Johor, Malaysia. Our college provides three programmes which is; Bachelor of Medicine and Surgery (MBBS), Bachelor of Dentistry (BDS) and Foundation in Science (FIS). This study includes participants of semester 6 and 7 students of MBBS at Muar Campus and semester 8 and 9 student at Melaka Campus. The total number of students enrolled in these MBBS programmes is approximately 750.

Sample size:

The sample size was calculated using the finite study population formula where a 0.07 error rate, level of significance (α=0.05) and estimated proportion (p=0.445) is accepted and there would be a 95% confidence level. For this formula, we were using Statistics and Sample Size version 1.0 software. The previous study stated the prevalence of ON among medical students in Turkey is 45.5%* [4], which was used as the proportion in this formula as 0.445

$$n \geq \frac{NZ_1^2 - \frac{a}{2}p(1-p)}{d^2(N-1) + Z_1^2 - \frac{a}{2}p(1-p)}$$

Where;

- Population size, N = 750
- Proportion, p = 0.455
- Error, d = 0.07
- Alpha, = 0.05
- n = Sample size
- Minimum number = 155

The formula used for adjustment for non-response was as follows;

$$n_{final} = \frac{n_{calculated}}{1 - nonresponse\%}$$

$$n_{final} = \frac{155}{1 - 30\%}$$

$$n_{final} = 222$$

30% of non-response were allowed in this study. Thus, 222 questionnaires were distributed among students.

Sampling:

Sampling method used was non-probability sampling method which is a purposive sampling. Thus, purposive sampling was carried out to take sample from 222 of semester 6, 7, 8 9 and 10 students out of a total 750 MBBS students.

For semester 6 and 7 students, self-administer questionnaires were distributed to students during class hours, whereas for semester 8, 9 and 10 students, questionnaires were distributed using google link and their participation was voluntary. Students who wished to participate were asked to sign the consent form attached along with the questionnaire.

Certain exclusion criteria were applied. Failure to complete the questionnaire or no consent or the absence students will be excluded from the study. All ethnic groups, races and nationality as well as both sexes were invited to participate. Students participating in the study are in semester 6, 7, 8, 9 and 10. We used validated questionnaires from the ORTO-15 questionnaires and Beck Anxiety Inventory (BAI) questionnaires.

Data Collection:

For this study, we prepared a questionnaire which consisted of three sections. The first section consisted of socio-demographic detail section asking about batch, age, gender, weight, height, diet (vegetarian/non vegetarian), ethnicity/nationality, followed by another 2 sections.

Section 2 contained the brief version of the Beck Anxiety Inventory (BAI) questionnaires [12]. This scale is a self-report measure of "anxiety". It consisted of 21 questions of list of common symptoms of anxiety. Indicate how much they have been bothered by that symptom during the past month. All items were scored on a 4-point Likert scale ranging from 0 (not at all) to 4 (Severely – it bothered me a lot). The minimum score is 0 and the maximum score is 80. Higher total scores indicate more severe anxiety symptoms. The standardized cut-offs [13] are:

0–7: minimal anxiety
8-15: mild anxiety
16-25: moderate anxiety
26-63: severe anxiety

Section 3 contained the validated ORTO-15 questionnaires. The ORTO-15 Questionnaire is a tool consisting of 15 items describing the intensity of the Orthorexia behavior [11]. Each item was assessed using Likert scale- always, often, sometimes, and never. The minimum score is 1 and the maximum score is 60. Scoring grid responses were used where each question has different scoring for different responses. Score of 1 is given to the response that was more indicative ON and a score of 4 is given to those that indicates a normal eating behaviour. The score for question 2,5,8 and 9 is a positive statement where the score increasing from 'never' to 'always' response (1 to 4). The score for question 3,4,6,7,10,11,12,14 and 15 is a negative statement where the score decreasing from 'never' to 'always' response (4 to 1). Question 1 and 13 are has 'often' as the highest score 4, 'sometimes' 3, 'always' 2 and 'never' 1. Scores below 40 points in the ORTO15 test were classified as Orthorexia and eating behaviour reaches normal eating pattern as the score increases [11]. This questionnaire has been validated by prior study.

Question number	Responses			
	Always	Often	Sometimes	Never
2,5,8,9	4	3	2	1
3,4,6,7,10,11,12,14,15	1	2	3	4
1,13	2	4	3	1

Data processing and analysis:

For the data analysis, software used was Microsoft Excel 2010 and Epi info version 5.0. Frequency and percentage for qualitative data like age, gender, BMI, ethnicity and diet (vegetarian/non vegetarian). Mean, standard deviation and odds ratio were calculated for quantitative data like anxiety (measured using BAI questionnaire) and ON (measured using the ORTO-15 Questionnaire). Level of significance allowed for hypothesis testing is 0.05. Association between age, gender, BMI, ethnicity, diet, anxiety level and ON was calculated using Chi-square.

Ethics:

Ethical approval for the study was approved by the Research Ethics Committee, Faculty of Medicine Melaka Manipal Medical College (Malaysia Campus). An informed consent will be prepared and given where the participants will sign as evidence of voluntary participation upon distribution of questionnaires. The participants have the authorities to withdraw from the study. The collected data will remain confidential and anonymous and is used genuinely for research study purpose only.

RESULTS:

Table1: Association between risk factor of socio-demographic characteristics and ON

Socio-demographic characteristic	Frequency (%)
Semesters:	
6	101(50.00%)
7	80(39.60%)
8	13(6.44%)
9	4(1.98%)
10	4 (1.98%)
Age:	
≤ 22 years	86 (42.57%)
> 22 years	116 (57.43%)
Mean (SD)	22.391(1.282)
Minimum- maximum	19-28
Ethnicity:	
Chinese	51(25.25%)
Malay	39 (19.31%)
Indian	73(36.14%)
Others	39(19.31%)
Gender:	
Female	108(53.47%)
Male	94(46.53%)
Diet:	
Non-vegetarian	189(93.6%)
Vegetarian	13(6.44%)
BMI:	
18.5-24.9 desirable weight	126(62.38%)
<18.5 underweight	24(11.88%)
>25.0 overweight	52(25.74 %)

Table 2: Anxiety and ON

Characteristic	Frequency (%)
Anxiety:	
Minimal	71(35.15%)
Mild	56(27.72%)
Moderate	33(16.34%)
Severe	42(20.79%)
Mean (SD)	15.233(13.322)
Minimum-maximum	0-59
ON:	
Present	135(66.83%)
Absent	67(33.17%)
Mean	37.822(3.778)
Minimum-maximum	27-47

Table 3: Risk factors of ON

Independent variables	Orthorexia Nervosa		OR (95%CI)	Chi-square	P value
	Present n (%)	Absent n (%)			
Age: ≤ 22 years >22 years	72(62.07%) 63(73.26%)	44(37.93%) 23(26.74%)	1(Reference) 1.674 (0.912-3.072)	2.788	0.095
Ethnicity: Chinese Malay	31(60.78%) 25(64.10%)	20(39.22%) 14(35.90%)	1(Reference) 1.152 (0.486-2.730)	0.104	0.748
Indian	49(67.12%)	24(32.88%)	1.317 (0.626-2.774)	0.583	0.468
Others	30(22.22%)	9(23.08%)	2.151 (0.846-5.468)	2.636	0.104
Gender: Female Male	68(62.96%) 67(71.28%)	40(37.04%) 27(28.72%)	1(Reference) 1.460 (0.806-2.642)	1.567	0.211
Diet:					

Vegetarian	8(61.54%)	5(38.46%)	1(Reference)		
Non-Vegetarian	127(67.20%)	62(32.80%)	1.280 (0.4022-4.0753)	0.176	0.675
BMI: 18.5-24.9 desirable weight	86(68.25%)	40(31.75%)	1(Reference)		
<18.5 underweight	14(58.33%)	10(41.67%)	0.651 (0.266-1.592)	0.893	0.345
>25.0 overweight	35(67.31%)	17(32.69%)	0.958 (0.480-1.910)	0.015	0.902
Anxiety: Minimal	48(67.61%)	23(32.39%)	1(Reference)		
Mild	38(67.86%)	18(32.14%)	1.012 (0.478-2.140)	0.001	0.976
Moderate	19(57.58%)	14(42.42%)	0.650 (0.279-1.523)	0.989	0.320
Severe	30(71.43%)	12(28.57%)	1.198 (0.520-2.758)	0.180	0.671

Table 4: Multiple Logistic Regression analysis of risk factors of ON.

Socio-demographic characteristic	OR	95% C.I.	P-value
Age:			
≤ 22 years	1(Reference)		
> 22 years	1.836	0.945-3.570	0.073
Ethnicity:			
Chinese	1(Reference)		
Malay	1.005	0.930-2.590	0.991
Indian	1.488	0.687-3.224	0.314
Others	2.483	0.973-6.337	0.057
Gender:			
Female	1(Reference)		
Male	1.587	0.855-2.944	0.143
Diet:			
Vegetarian	1(Reference)		
Non-vegetarian	1.249	0.616-2.530	0.538
BMI:			
18.5-24.9 desirable	1(Reference)		

weight <18.5 underweight	0.692	0.271-1.765	0.441
>25.0 overweight	0.791	0.383-1.635	0.526
BAI:			
Minimal	1(Reference)		
Mild	0.822	0.378-1.789	0.621
Moderate	0.513	0.207-1.272	0.150
Severe	1.183	0.506-2.766	0.699

DISCUSSION

Our study design was cross-sectional study and the objective of our study was to find the prevalence of ON and its risk factors among the undergraduate medical students in a private medical college, Malaysia. We studied the relation between semesters, age, gender, ethnicity, diet, BMI and anxiety level to the prevalence of ON among the undergraduate medical students. In our study, 66.83% of the undergraduate medical students were found to be having ON while 33.17% of the undergraduate medical students were absent from ON. The result showed that there was a high tendency of ON among undergraduate university students and it was also supported by some of the previous studies. A cross-sectional study was done among the resident medical doctors in Turkey showing that there was 45.5% of the resident medical doctors were found to be having ON [4]. Besides that, a study in Italy showed, with cut-off of 35 for ORTO-15, 34.9% of the students in University of Pisa were presumed to have ON. [6] In a study of prevalence of ON in Erzurum, Tukey, it showed that there is a 43.6% prevalence rate of ON among the medical students [14]. In Malaysia, a study done by Universities Teknologi MARA showed that there was 67.4% of the prevalence of ON among undergraduate health students [11]. In addition, there was a study on prevalence of ON done among the university students in Spain. In that study showed that, 17% of the university students were at risk of ON which was significant among other eating disorders [15]. A study done among college students in the United State also showed that there was a prevalence rate of 71% of ON in their sample [16]. In Australia, a study done by Sydney University showed that the prevalence rate of ON among the Australian adults was 21% when the cut-off score for ORTO-15 is 35 whereas the prevalence rate of ON was 66% when using the cut-off of 40 for ORTO-15 [17].

There were many risk factors of ON being studied. According to a study done among the resident medical doctors in Ankara, Turkey, female are more careful on food selection compared to male [4]. In Italy, a study was done among the students in University of Pisa showed that female (37.8%) was having higher tendency to ON compared to male (30.7%) and vegetarian (56.3%) was higher than those who practiced standard diet (32.2%) which the results were significant. However, in that study, there was no significant result found in ORTO-15 total score in spite of the prevalence of ON among those who had low BMI (42.8%) was higher compared to those who had normal or high BMI (34.2%) [6]. Besides that, a study done among the universities of Polish found that 68.55% of the female students met the criteria for high levels of ON compared to male students which was 43.18%. In the study, they found that, women with ON were less likely to regularly incorporate exercise activities into their lifestyles, concentrate on dieting, eating restraints and weight vigilance, pay attention to their appearance and lead a physically healthy lifestyle [18]. In the study among the medical students in Erzurum, Turkey, the prevalence of ON among the male students was higher compared to the female students. They found a negative correlation between BMI and orthorexia scores because being overweight and obese may expose the individual to humiliation and force him or her to diet and consume healthy foods [14]. In addition, a study of association between ON and anxiety among the medical students in Lebanese universities showed that an increase in the anxiety total

score was significantly associated with higher ORTO-15 scores [10]. In a study done among the students in Castilla-La Mancha University, the location parameters of age and BMI were found to be no significant correlation with ON. However, in this study, it showed that there was a significant differences for the mean score on the ORTO-11-ES scale in the female population [15]. Unfortunately, in our study, we do not find any correlation between the risk factors such as anxiety level, age, gender, diet, ethnicity, BMI and ON.

The response rate in this study was 91.0% in which 89.6% were from semesters 6 and 7. Because of clinical posting in different hospitals and university examination during our data collection, we could not recruit many participants from semesters 8,9 and 10. Besides that, this study is conducted at one medical school in Malaysia. Therefore, the results cannot be generalized to other institutions or at different time. Due to the limitation of cross-sectional study, a temporal relationship between ON and its risk could not be established. The study on ON was done using questionnaire and self-administered method, the participants might have given a desirable answer to the researchers.

Future research on ON should be carried out at larger population of different medical institutions. This can be achieved by conducting the study in more than one medical schools. The study also should include more variables associated with ON. This is to rule out confounding factors which might play an important role in the study. Since our study has shown 66.83% of the students are suffering from ON, we believe that we should increase the study population awareness regarding ON by more publications made available to the general public, statistics of health indicators up to date and campaigns. Healthy and balanced diet should be advised to further prevent the unhealthy eating habit of ON. Daily food intake according to the food pyramid, regular exercise and routine health checkup should be done. Future study should also include more associated risk factors of ON such as health professionals, level of education, broader range of age group, role of sports and exercise, alcohol and tobacco use, and psychiatric condition like obsessive-compulsive disorder (OCD), perfectionism, self-esteem and self-control and other eating conditions such as bulimia nervosa and anorexia nervosa.

CONCLUSION

In conclusion, our study shows that most of the medical student in our college are having ON. There was no significant association between age, gender, ethnicity, diet, anxiety level, BMI and ON. Awareness of ON should be created in the general population by social media and posters. To prevent ON, a healthy and balanced diet is encouraged. This can be done by regular talks and campaigns on healthy eating, conducting routine health screening and health-promoting programmes such as marathons.

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