

The relationship of body mass index, diet, and eating pattern with orthorexia nervosa amongst medical students

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ABSTRACT

Orthorexia nervosa (ON) is an obsessive behavior towards healthy food with more importance on the quality than the quantity of food. Medical students tend to experience ON. The prevalence of ON in the Faculty of Medicine, University of Tanjungpura (FK UNTAN) is around 56.1%. The study is conducted to assess the relationship between body mass index (BMI), diet, and eating patterns with ON indications for students of the Medical Study Program, FK UNTAN. This study uses mixed method (quantitative-qualitative), for 66 students (2020 and 2021 batches) through proportionate stratified sampling and 10 students with low and high ON indications with the convenience method. Analysis used Spearman's rho correlation test and contingency coefficient; qualitative analysis used descriptive inductive method. Bivariate analysis showed $p > 0.005$ for BMI ($p = 0.139$), diet ($p = 0.105$), and the results were invalid for dietary pattern. Qualitative analysis shows people with ON can be influenced by social media which is characterized by their habit of seeking inspiration for healthy eating behaviors. There is no statistically significant relationship between BMI, diet, and eating patterns with ON but still found in FK students because of their knowledge related to nutrition, health and the desire to avoid illness.

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1. INTRODUCTION

Orthorexia nervosa (ON) is an obsessive or monomaniacal behavior towards healthy food and the desire to continue to consume healthy food without artificial additives and be more concerned with food quality. The main psychological correlates of ON are perfectionism and obsessive-compulsive disorder [1]. The hallmark of this pathological fixation initially relates to the decision to undergo healthy eating on the basis of one's own decisions by spending a lot of time just planning, buying, preparing, and consuming food, which then transitions and there is an intensification in carrying out this behavior. So that healthy eating, which was initially considered positive, gradually turns negative, leading to obsessive behavior and ON [2]. Research that was conducted on students in Poland and Spain in 2019 using the ORTO-15 questionnaire showed a prevalence of 66.5% and 18.8% [3]. Meanwhile, research that was conducted in Indonesia in 2021, found a tendency for medical students to have a prevalence ON of 43% [4].

ON can be caused by various factors ranging from body mass index (BMI), diet, special diets, and the use of social media. A BMI that is normal and has a regular eating pattern and is on a special diet will have a predisposition risk ON is bigger because there is a desire to keep the body healthier by consuming

appropriate nutrition and being more interested in healthy eating. Moreover, with the use of social media, information about disease and/or health increases so that beliefs, perceptions, and awareness about health are also affected [4]. In addition, psychological factors can also cause ON which is related to depression problems, anxiety, and stress and social isolation to avoid exposure to what they perceive as impure nutrition [5]. In addition to these factors, the characteristics of the individual can also influence emergence ON which includes gender, age, and level of education [4].

Most studies show that the population to experience orthorexic tendencies is more in health professions such as doctors or nutritionists and medical students [6]. Students who study in the health department not only gain knowledge related to nutrition and health, but also have awareness within themselves so that they understand more about the relationship between healthy and balanced nutrition and its relation to health. So that students who pursue health-related majors in this case will be motivated to change their eating behavior because it is caused by concerns about their own health or the desire to keep it healthy [4].

Someone suffering from ON will focus on the quality of food. They will avoid foods that contain artificial additives and prefer natural foods that do not use excessive additives. Such a person avoids meeting friends, especially in places where food is eaten. The prevalence of orthorexia in the community ranges from 1% to 60% and is mainly related to lifestyle. Research conducted over the last 10 years shows that the number of people who are at risk for orthorexia is increasing. Some of these people are not even aware that they are experiencing ON [7]. Bratman said that orthorexic behavior will become pathological if obsessive thoughts, compulsive behaviors and dietary restrictions increase and hinder the person's life [8]. Research related to ON, especially among medical students, is still very limited, especially in Pontianak, West Kalimantan. This research has never been carried out before. The increase in cases of ON, especially among students, has not been accompanied by a large number of studies on ON, so researchers are interested in conducting this research with the title "The Relationship of BMI, diet, and eating patterns with ON for students of the Medical Study Program, Faculty of Medicine, Tanjungpura University (FK UNTAN)" to assess indications for ON in medical students and also the relationship between BMI, diet, and eating patterns with ON indications for students of the FK UNTAN medical study program.

2. METHOD

The design of the research is a mix method (quantitative-qualitative), conducted in November 2022 in medical students FK UNTAN. Thirty-three medical students from each batch year of 2020 and 2021 were voluntary involved in this research. This research has been ethical approved by Faculty of Medicine University of Tanjungpura No: 7674 /UN22.9/PG/2022. The quantitative study was carried out by filling out 3 questionnaires, Lie Minnesota Multiphasic Personality Inventory (L-MMPI) [9], ORTO-15 [10], and eating habits questionnaire (EHQ) [11]. Validity and reliability are taken out for the EHQ questionnaire, which was carried out on 82 students from batch of 2019. The Cronbach's alpha value (0.801) was obtained so that all components of the questions were reliable. Meanwhile, the ORTO-15 questionnaire was adopted from previous studies that had tested the validity and reliability at Gajah Mada University, Indonesia. The validity test used was the face validity test conducted on six students and the construct validity test conducted on 207 students [4].

Subjects who have the potential to enter the research are identified in the batch year of 2020 (98 people) and 2021 (100 people). After providing informed consent to all students from the batch year of 2020 and 2021, there were 80 students who agreed to take part in this research by signing informed consent. The total subject of this research was been measuring weight and height. The weight is measuring using digital bath scale and height using staturemeter. Weight and height measurements were taken in the morning before the respondent consumed food or drink. The next step is filling out the L-MMPI questionnaire. The L-MMPI is an instrument used to assess the honesty of the respondents in answering the questions in the research questionnaire. Respondents who did not take part in this study were respondents who had an L-MMPI score ≥ 10 [9]. Finally, there are 66 student fulfill the criteria for continued in the next step to filling the ORTO-15 and EHQ.

ORTO-15 is one of the assessments used to measure the tendency for ON in respondents. This questionnaire aims to determine the emotional with 4 questions, cognitive-rational with 6 questions, and clinical aspects with 5 questions. The answers to these questions that indicate ON will be given a score of 1 and those who are healthier will be given a score of 4 with the total number of tests being the final score of the test. The ORTO-15 score ranges from a minimum of 15 to a maximum of 60, with a cut-off value of <40 which indicates an ON indication [12], [13]. The EHQ consists of 21 items which are divided into three, to measure knowledge of healthy eating with 5 items, problems related to healthy eating with 12 items and positive feelings or emotions about healthy eating with 4 items. EHQ items are on a 4-point scale (wrong, not all right, right and very right) with a total score of up to 84 with a score higher than 50 indicating an ON tendency [14].

The last stage of this research is the interview stage. Interviews were conducted with 5 students (3 highest scores and 2 lowest scores) from each batch year of 2020 and 2021 as seen from the ORTO-15 questionnaire scores. At the interview stage, in-depth interviews were carried out with the researcher asking the respondents about the reasons that led them to adopt a healthy lifestyle, their perceptions of social media in their healthy lifestyle, and whether social media had an influence on ON tendencies that they have.

Data analysis that used in this study is univariate and bivariate analysis. Univariate analysis is used to describe the distribution of the variable characteristics such as BMI, diet, eating patterns, use of social media and ON. Meanwhile, bivariate analysis used Spearman's test to carried out the determine of respondents' characteristics (BMI and eating pattern) that influence the tendency of ON. Contingency coefficient test used for determined between variabel diet and ON. The descriptive inductive methods were used to analyzed the qualitative results on the perceptions of social media in healthy lifestyle. The reason and influence of social media between the lowest and highest ON score respondents.

3. RESULTS AND DISCUSSION

This research was conducted in two stages, quantitative using Google Form and qualitative through interviews. The number of respondents who took part for quantitative in this study were 66 people and were dominated by 41 women (62.1%) and 25 men (37.9%). The ages of the respondents who took part in this study were 18 years (six people), 19 years (29 people), 20 years (28 people), and 21 years (three people).

3.1. Body mass index, diet, eating pattern, and orthorexia nervosa

After conducting research on the 2020 and 2021 batches regarding BMI, eating patterns, and ON, the following results were obtained in Table 1. The majority of students are in the adolescent or young adult age range (18 to 24 years) which is a critical period for the development of eating behavior, which tends to pay attention to body image or shape by regulating the food consumed so that it affects BMI. In addition, eating behavior is also influenced by the psychological and cognitive state of the individual [15]. Medical students with higher health literacy who have knowledge about nutrition have an important role in shaping eating habits because it influences the choice of type and amount of food a person has which influences attitudes and behavior in choosing food which will affect a person's BMI [16].

The high prevalence of medical students causes medical students to study health-related majors, not only providing knowledge related to nutrition and health but also increasing the awareness of someone who is exposed to this information, so that they understand more about the importance of the relationship between healthy and balanced nutrition and health [17]. This is supported by research conducted in Lebanon, which showed that the prevalence of ON among medical students was 74.5% out of 627 students [18]. Meanwhile in Indonesia, journals that discuss ON are still very limited.

Table 1. BMI, diet, eating pattern, and on of medical students in the 2020 and 2021 batches

Demographic characteristics	Force		Total	
	2020	2021	N	%
BMI				
Underweight	6	4	10	15.2
Normal	15	22	37	56.1
Overweight	12	7	19	28.8
Diet				
Yes	0	2	2	3
No	33	31	64	97
Eating pattern				
Normal	33	33	66	100
Upnormal	0	0	0	0
ON				
Indication	17	20	37	56.1
No Indication	16	13	29	43.9

Adolescence is one of the most important phases in development of self-perception due to many experiences pubertal changes that can shape body image [19]. Adolescents that often feel dissatisfied with their body. The existence of adolescent dissatisfaction with their body shape is not always accompanied by high dietary behavior but is influenced by other factors such as health values (health belief), personality, the influence of family relationships, and family socioeconomic status [20]. Vegetarian and vegan diets provide health benefits, namely reducing the risk of chronic degenerative diseases, such as diabetes mellitus, coronary heart disease (CHD), cancer, and extending life expectancy so that it is dominated by the elderly

[21]. The Mediterranean diet is one of the most recommended diets in the world because it provides a lot of scientific evidence about its effects and uses [22]. The Mediterranean diet emphasizes the traditional, often homemade, foods and drinks that are characteristic of countries surrounding the Mediterranean Sea that are high in raw grains, fruits, vegetables, legumes, and olive oil [23].

Lifestyle habits among medical students are affected by stress that can affect their lifestyle. The tight schedule of lecture activities, discussions and organizational activities outside of lectures can lead to poor eating patterns of medical students so they tend to choose fast food and often skip breakfast, as well as consume snacks and coffee to accompany evening study time. Research that was conducted in Saudi Arabia in 2019 on medical students, around 40% of them usually or always skip breakfast, while 44% usually or always eat fast food. The cause of this habit is stress and busy activities that they do [24]. The high prevalence of medical students experiencing ON is due to health-related majors that not only provide knowledge related to nutrition and health but also increase the awareness of a person who is exposed to this information, so that they become more aware of the importance of the relationship between healthy and balanced nutrition and health [6]. The high prevalence of ON can be caused by various factors such as age, gender, level of education, psychological factors (depression, anxiety and stress), BMI, diet, special diet, and use of social media [25].

Individuals with ON have cognitive characteristics that are almost the same as those of individuals with obsessive-compulsive disorder (OCD) which have excessive perfectionism and anxiety. This is supported by qualitative analysis, the person with the highest ON score stated that it was very difficult to eat outside or receive food from other people for reasons of cleanliness and the content of the food. Based on the qualitative analysis, the person with the highest ON score said that one of the reasons for consuming vegetables was fear of experiencing a recurrence of the disease they had experienced, which motivated them to change their eating pattern. In addition, the presence of ON indications is also influenced by health pages on social media that are frequently visited causing student information about illness and/or health to increase, so that students' beliefs, perceptions, and awareness regarding health are also affected [6].

3.2. Qualitative analysis

In interviews that were conducted on 10 people with the highest and lowest ON scores. There are 4 things that make the difference between ON people and people who are not ON. So, we asked the following 4 questions to find out their healthy lifestyle, their perceptions of social media in their healthy lifestyle, and whether social media had an influence on ON tendencies that they have.

3.2.1. Reasons to eat healthy food and paying attention to the food

Based on the results of a qualitative analysis, the reason for people with ON to consume healthy food is fear of being exposed to disease. This is also the same reason as people who don't have ON. All respondents with the highest ON scores said that the reason for paying more attention to the food they consumed was for health reasons. There are respondents who consume vegetables and fruit more often due to previous illnesses they have experienced. So, there is a fear of disease if you eat unhealthy food.

“Fear of exposure to disease, and healthy food helps easy thinking and body immunity” (2020 B)

3.2.2. Difficulty choosing food when outside from the home

All respondents with the highest ON scores said it was difficult to choose food outside the home because they paid attention to the food content and the quality of the food consumed. Whereas people with the lowest ON score (not ON) said that they had no difficulty in choosing food when they were outside the home and did not have their own criteria for the food they would eat. This is a significant difference between people with the highest ON scores and people with the lowest ON scores.

“I find it difficult, because I think, about whether the food I eat has enough vitamins, such as fruits and vegetables.” (2021 A)

3.2.3. A separate standard in choosing a food to be consumed

All respondents with the highest ON score have their own standards in choosing food to be consumed. The standards in question are very diverse, starting from cleanliness, processing methods, composition and use of oil in the food, as well as the location and place of the food. There are certain standards in choosing the food to be consumed because fear of disease and keeping themselves healthy.

“Seeing the way of processing and composition of food and limiting oil.” (2020 C)

Meanwhile, the respondent with the lowest ON score answered that there was no specific standard in choosing the food to be consumed.

“Not really, it's easy for me to eat any food as long as it tastes good in my opinion.” (2020 Y)

3.2.4. The influence of social-media on the selection of food to be consumed

All respondents with the highest and lowest ON scores said that there was an influence of social media on the food they consumed. This is because respondents can see and search for recommendations for food to consume. Apart from that, respondents also said that the existence of social media also makes it easier to find references for healthy food to consume.

“Yes (social-media), for food recommendation.” (2021 A)

3.3. Relationship between body mass index, diet and eating pattern with orthorexia nervosa

A bivariate analysis of each variabls in Table 2, showed no significant relationship between BMI and ON because respondents with obese nutritional status have a tendency to experience higher indications of ON compared to respondents with thin or normal nutritional status. So, in this case it proves that people with ON who have an obsession with healthy eating do not have to have a normal body or be thin. Moreover, there also no significant relationship between diet and ON, because there were only two respondents who were on diet and the respondents' scores showed no indication of ON. Whereas the eating pattern and ON does not have valid results because the data obtained from eating patterns have uniform results, namely showing good eating patterns. So that when statistical bivariate analysis was carried out using contingency coefficient analysis, the significance value of the relationship between the two data did not appear.

Respondents with obese BMI have a tendency to experience higher ON indications compared to respondents with thin or normal BMI. This is due to their desire to lose weight or adjust their diet again. This behavior that is carried out continuously over time will lead to restrictive behavior that leads to ON [26]. People with obese BMI will try to lose weight by making changes in their physical activity, food consumption, and dietary recommendations [27]. From the results of the qualitative analysis, the person with the highest ON score is one who has ever followed a diet with a desire to lose weight. This behavior is also caused by social media pages that are always visited, which are diet and fashion. The general perception is that medical students are better informed about healthy lifestyle habits than non-medical students. This is due to the anxiety and stress that medical students feel can affect their lifestyle [24].

Characteristics of a person's nutrition will affect a person to lose, increase, or maintain body weight. People with overweight nutritional status will try to lose weight by making changes from physical activity, food consumed to following dietary recommendations. However, lifestyle modifications in this case are not always successful [27]. Results of the qualitative analysis, the person with the highest ON score is the one who has ever followed a diet with a desire to lose weight. This behavior is also due to social media pages that are always visited, namely regarding diet and fashion. This also happens to people with the lowest ON scores who also pay attention to the food consumed to maintain body shape. So, in this case, the feeling of negative body image is not only felt by people with the highest ON scores but also the lowest.

Table 2. Relationship between BMI, diet and eating pattern with ON

		ON				Total		p-value
		Indication		No indication				
		n	%	n	%	n	%	
BMI	Underweight	5	50	5	50	10	100	0.250
	Normal	19	51.35	18	48.65	37	100	
	Overweight	13	68.42	6	31.58	19	100	
Diet	Yes	0	0	2	100	2	100	0.105
	No	37	57.81	27	42.19	64	100	
Eating pattern	Good	37	56.06	29	43.94	66	100	-

Adolescence is a period that is vulnerable to negative body image related to behavioral changes. Orthorexia behavior is often associated with a person's dietary habits. The characteristic of people with ON is having a diet with very strict rules because it is often associated with anxiety and fear of disease. These dietary restrictions will increase over time [28]. Research that was conducted by Cicekoglu and Tunçay did not find any relationship between ON and individuals who decide to follow a type of vegan or vegetarian diet [29]. This can be caused by the application of a different diet for each person who adopts a vegetarian diet and the use of the instruments used to assess ON [30].

Based on the results of Brytek-Matera *et al.* [27] diets can cause ON if the diet that is being implemented is a strict and extreme diet that can trigger eating disorders. The Mediterranean diet is mostly practiced in the Mediterranean area, which is a culture and habit in that area which can cause ON if the diet is continued, causing a higher prevalence of ON in the Mediterranean area [12]. This is because people on the Mediterranean diet (MD) diet will focus on food purity, which consists of high consumption of olive oil, fruits, vegetables, nuts, cereals and legumes so that people on the MD diet have high risk factors for suffering from ON [31].

At this time, the concept of ON is always related to the concept of health culture that exists in western society such as in European countries, such as Italy, Hungary, Poland, Turkey, Germany, and Spain. Whereas in West and East Asia, ON is less studied, especially in Indonesia which has a variety of cultures. People in Indonesia have their own diet which can affect diet which also affects orthorexic attitudes [27]. A high EHQ (eating pattern) score can be characterized by individuals leaving the house less frequently since starting to eat healthily and spending more than three hours a day thinking about healthy food and following a rigid diet of healthy food [26] in this study, more than half of the respondents answered that the statement was wrong and not in accordance with the current situation. However, after conducting a qualitative analysis, people with the highest ON scores said it was difficult to eat and choose what to eat but not more than 3 hours a day (a characteristic of ON that leads to pathology) and said that their habits did not interfere with life as they should. states that this is not yet pathological.

ON has the same clinical manifestations as eating disorders, especially in anorexia nervosa, bulimia nervosa, and OCD accompanied by symptoms such as perfectionism [32]. The similarity regarding ON and OCD is related to disturbing repetitive thoughts about healthy food which causes anxiety to consume food, one of which is making individuals less likely to leave the house. However, this did not happen to the respondents of this study. The difference between ON and OCD is that the obsession with OCD usually extends beyond food and health in that the individual becomes aware of the excessive behavior and chooses to keep it a secret. Whereas in ON itself, subjects display limited behavior and insight about their own condition [33].

In someone with OCD it will trigger mental problems that can affect a person's eating behavior triggered by stress, depression and perfectionism. Conversely, someone with bulimia and anorexia will definitely experience ON as indicated by a high EHQ score [34]. However, after conducting research on students in the 2020 and 2021 medical study programs, there were no individuals who experienced eating disorders. The difference between OCD and ON is that the manifestation of ON is repetitive and disturbing thoughts about healthy food that cause anxiety to consume food, one of which is that it makes individuals less likely to leave the house. However, this did not happen to medical students in the 2020 and 2021 batches [32].

4. CONCLUSION





Undergraduate medical students in FK UNTAN mostly have a normal BMI, not following a vegan, vegetarian or Mediterranean diet, and have a good eating pattern. Furthermore, medical students have a tendency to experience indications of ON. In this study, there is no significant relationship between BMI and dietary behavior of the 2020 and 2021 medical undergraduate students of the FK UNTAN with a tendency to ON. Furthermore, there are no valid results between the eating patterns of students in the Medical FK UNTAN class of 2020 and 2021 with an ON tendency. But, ON is still found because there is knowledge related to nutrition, the desire to avoid disease, and the influence of using social media. Efforts to prevent eating disorders caused by the influence of social media, negative perceptions and behaviors about healthy eating can be done by providing nutrition education programs with the aim of increasing awareness of the importance of understanding eating patterns and habits to avoid eating disorders. It is hoped that future researchers can carry out further research on other factors that can cause ON.

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