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Prevalence of muscle dysmorphia symptomatology and related factors in male university students

Prevalencia de sintomatología de dismorfia muscular y factores asociados en estudiantes universitarios varones

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ABSTRACT

Muscle dysmorphia is an obsessive-compulsive disorder subcategorized as a body dysmorphic disorder. Studies in Latin America have assessed the prevalence of muscle dysmorphia in bodybuilders and gym users. Therefore, the purpose of this study was to evaluate the prevalence of muscle dysmorphia symptomatology (MDS) and associated factors in university male students in Lima, Peru. The participants ($N = 618$) had an average age of 21.0 years ($DS = 2.3$). We assessed MDS through the Muscular Appearance Satisfaction Scale (MASS) and obsessive-compulsive disorders through the Yale-Brown Scale Modified for Body Dysmorphic Disorders (BDD-YBOCS). We also tested participants on their food consumption and physical activity (PA) frequency. The prevalence of MDS was 1.3% ($IC\ 95\% = 0.4-2.2\%$). associated with factors such as intense PA defined as more than five hours per week ($PRa = 9.5$; $95\% CI = 1.1-84.4$) and a hyperproteic diet ($PRa = 1.3$; $95\% CI = 1.1-1.6$). Thirty-two percent of participants consumed protein supplements. Muscle dysmorphia is a disorder present in the general population. However, more research must be done to understand how this is an emerging problem in Latin America. Therefore, to influence its prevention and early identification among the university population, it is necessary to deepen the understanding.

Keywords. Body image; Muscle dysmorphia; Intake of foods; Exercise; Risk factors

RESUMEN La dismorfia muscular es un trastorno obsesivo-compulsivo subcategorizado recientemente como un trastorno dismórfico corporal. En Latinoamérica se ha estimado la prevalencia de sintomatología de dismorfia muscular (SDM), pero principalmente en usuarios de gimnasio o fisicoculturistas. Por tanto, el propósito de este estudio fue evaluar la prevalencia de SDM y factores asociados entre estudiantes universitarios de Lima, Perú. Participaron 618 varones con edad promedio de 21.0 años ($DE = 2.3$), quienes completaron la Escala de Satisfacción con la Apariencia Muscular (MASS) y la Escala Obsesiva-Compulsiva de Yale-Brown Modificada para Trastorno Dismórfico Corporal (BDD-YBOCS), y además fueron evaluados en cuanto a su consumo de alimentos y realización de actividad física. La prevalencia de SDM fue 1.3% ($IC\ 95\% = 0.4-2.2\%$), asociada a la realización de actividad física intensa ($PRa = 9.5$; $IC\ 95\% = 1.1-84.4$) y al seguimiento de una dieta hiperproteica ($PRa = 1.3$; $IC\ 95\% = 1.1-1.6$). Adicionalmente, 32% de los participantes indicó consumir suplementos proteicos. La DM es un trastorno emergente en Latinoamérica, por lo que es aún incipiente el conocimiento que se tiene sobre él. Por tanto, para poder incidir en su prevención e identificación temprana entre población universitaria, es necesario profundizar en su comprensión.

Palabras clave. Imagen corporal; Dismorfia muscular; Ingesta de alimentos; Ejercicio; Factores de riesgo.

Introduction

Muscle dysmorphia (MD) is an obsessive-compulsive disorder (OCD) characterized by the constant concern of insufficient muscle mass. In the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association [APA], 2013), MD is defined as a subcategory of body dysmorphic disorder (BDD). Nine percent of men with BDD have MD. However, the frequency of MD is increasing in people with and without BDD (Dos Santos, Pasarelli, Stefano, Touyz & Medeiros, 2016; Olivardia, 2001). MD affects young men concerned about their muscle mass, while women were found to be more conscious about losing weight than gaining muscle mass (Baile, González, Ramírez & Suárez, 2011; Cuzzolaro, 2018; Dos Santos et al., 2016). A study with Western men described the lack of body image satisfaction and BDD tendencies (Pope et al., 2000).

Latin American studies assessed the prevalence of MD symptomatology (MDS) on risk populations such as weightlifters in Brazil (Lima, Moraes & Kirsten, 2010) and gym users in Ecuador (González, 2015).

These studies found 17% and 35% MDS, using the Muscle Appearance Satisfaction Scale and the Drive of Muscularity Scale, respectively. A Mexican study used the Adonis Complex Questionnaire, yielding a prevalence of 43% of MDS in weightlifters (Escoto, Camacho, Alvarez, Díaz & Morales, 2012). An Italian study on university students associated the increased risk of MD with the faculty they belong to, using the Muscle Dysmorphic Disorder Inventory (Bo et al., 2014).

MD is related to specific characteristics executed as part of the obsessive-compulsive spectrum. Previous studies associated MD with a hypercaloric and hypoproteic diet, besides consuming protein supplements (Cuzzolaro, 2018; Martínez-Segura, Cortés, Martínez-Amorós & Rizo-Baeza, 2015; Murray, Maguire, Russell & Touyz, 2012;). MD is also associated with a strict long-hour regime, including intense physical activity (PA) to increase muscle mass faster (APA, 2013; Murray & Touyz, 2013; Phillips, 2015; Sardinha, Oliveira & Araújo, 2008). MD is related to body dissatisfaction in male university students and weightlifters, as has been determined in several

studies (Behar & Molinari, 2010; Cafri, Olivardia & Thompson, 2008; Devrim, Bilgic & Hongu, 2018; Lin & DeCusati, 2016; Peixoto, 2002).

MD is an emerging mental disorder (APA, 2013; Lopez, Pollack, Gonzales, Pona & Lundgreen, 2015; Pope et al., 2000). Mental issues are a health priority to the National Peruvian Health Institut since little research has been done in Peru (Alarcón, 2015; Caballero et al., 2010; Rondón, 2006). By studying a general population such as university students, we can determine the prevalence of MDS and factors associated. Latin American studies found focused on vulnerable populations (Caballero et al., 2010; González, 2015; Lopez et al., 2015; Pritchard, Parker & Nielsen, 2010), therefore it is necessary to understand the magnitude of the problem to propose strategies and solutions that may improve the quality of life of this population (Caballero et al., 2010). Therefore, the aim of this study was to determine the prevalence of MDS and related factors at a private university in Lima, Peru.

Method

Study design

A cross-sectional study was carried out during the first academic semester of 2015 at a private university in Lima (Peru), with over 30,000 undergraduate students, divided into four campuses.

Participants

This study included male students over 18 years old. Exchange and transgender students were excluded from this study. The sample size was calculated considering a MD prevalence of 5% (Bo et al., 2014), a confidence level of 95%, an absolute accuracy of 2%, and a sample correction factor of 1.32. We considered an additional 15% to the sample size consisting of 618 students excluding eight surveys (Figure 1).

A multistage probabilistic sampling was carried out. The first phase comprised stratified by faculties and the second phase was to consider each classroom

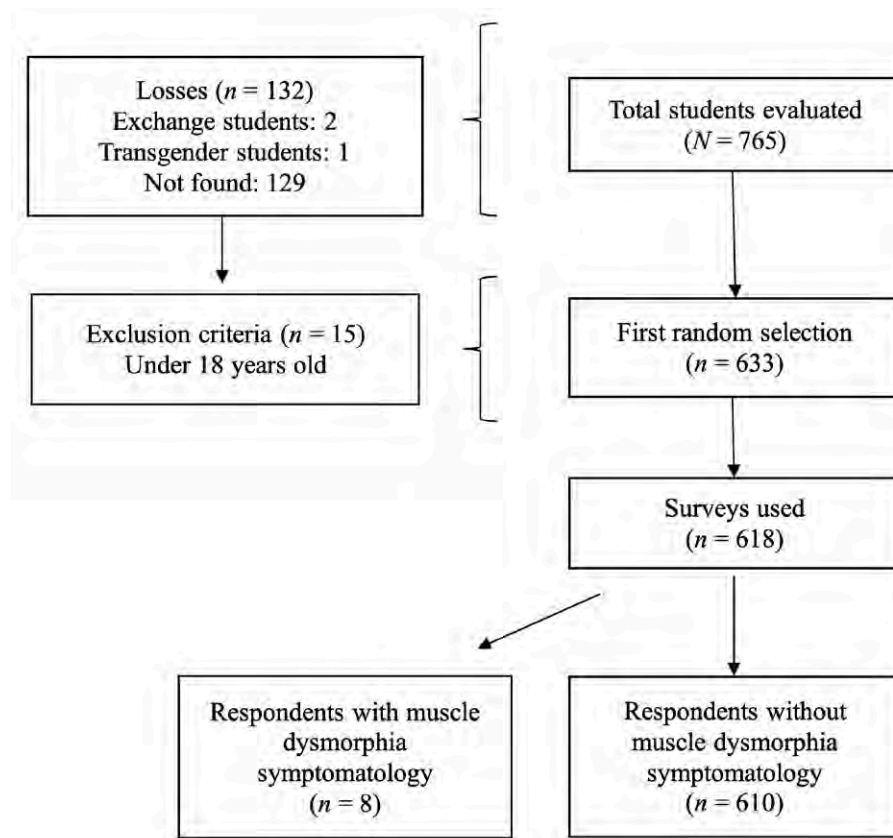


Figure 1. Selection process of respondents.

as a cluster. We randomly selected classrooms among every major. All male students were invited to take part of the study.

Ethical considerations

The study was approved by the Ethics Committee of the University and follows all the principles of the Declaration of Helsinki (World Medical Association, 2013). This study was performed with the written consent of all participants before the assessment.

Measures

Muscle dysmorphia symptomatology (MDS). We measured MDS with the Peruvian version of the Muscle Appearance Satisfaction Scale (MASS; Cook-del Aguila, Sanchez-Castro, Yacila, Bossio & Mayta-Tristán, 2016), which was adapted of the Mexican version used in a previous study (López, Vázquez, Ruíz & Mancilla, 2013). It has 19 graded items in the Likert scale from 1 (“strongly disagree”) to 5 (“strongly agree”), with a maximum score of 95. This questionnaire has five sub-scales which include Bodybuilding dependence, Muscle checking, Substance use, Injuries, and Muscle satisfaction (Mayville, Williamson & White, 2002). A cut-off score of 63 point was considered as it has a sensitivity of 89% and a specificity of 98% for MDS (Babusa, Czeglédi, Túry, Mayville & Urbán, 2015; López, Vázquez, Ruíz & Mancilla, 2013). The cut-off total score is used to describe MDS but cannot diagnose a disorder. For the analysis of related factors, MDS was categorized in tertiles. The MASS questionnaire has a Cronbach’s *alpha* of .82.

Obsessive-compulsive disorder (OCD). The Peruvian version of the Yale-Brown Obsessive-Compulsive Scale Modified for Body Dysmorphic Disorder (BDD-YBOCS) was used to determine OCD (Yacila, Cook-del Aguila, Sanchez-Castro, Bossio & Tejada, 2016). This scale has 10 items with five answer options, ranging from 0 (“no symptoms”) to 4 (“extreme symptoms”). The categories for the total score are (Phillips, Hart & Menard, 2001; Steketee, Frost & Bogart, 1996): “without clinical manifestations” (0-7), “mild” (8-15), “moderate” (16-23), “severe” (24-31), and “extreme” (32-40). For this study, moderated cases or over were grouped into one category. The BDD-YBOCS questionnaire has a Cronbach’s *alpha* of .90.

Physical activity. To classify PA, the participants were asked about gym frequency (*yes/no*), type of PA, and time spent in minutes of said activity. The time was categorized in tertiles.

Diet. We applied a modified consumption frequency questionnaire (Mazzeo, 2009). This questionnaire describes the frequency of consumption per week of 18 food items (milk, yogurt, cheese, red meat, chicken, fish, eggs, protein supplements, cereals, bread, jam, butter, dressing, oil, creams and sauces, sugar, sweeteners, and desserts). The response categories for each item were “always”, “almost always (5-6 times per week)”, “sometimes (3-4 times per week)”, “once a week (1-2 times per week)”, and “never”, and the number of times each food consumed per day. The questionnaire has a Cronbach’s *alpha* of .86.

A hyperproteic dieting was considered when any kind of protein source was consumed over four times a day (18 g of protein each time) or over 1.20 g/kg/day, considering an average weight of 60.60 kg (American Dietetic Association, 2009; Instituto Nacional de Salud, 2012; Rodriguez, Di Marco & Langley, 2009). A hypercaloric dieting was considered when carbohydrates (CHOs) were consumed over six times a day (62g of CHOs each time) or exceeding 60% of the total caloric value, based on a 2488 kilocalorie dieting (Instituto Nacional de Salud, 2012; Vargas-Zárate, Berra-Bulla & Prieto-Suárez, 2010), or when high-fat foods were consumed over three times a day (Lázaro & Domínguez, 2014). The frequency of protein supplements consumption was tested as a qualitative variable.

Other variables. We also considered general information such as age (divided into tertiles), school faculty, and academic semester year.

Procedure

Students who agreed to be part of the study signed the written consent form; afterward, they filled a 75-question survey for 10 to 15 minutes. All surveys were verified to be filled appropriately.

Data analysis

A database was created by double counting. We used STATA 14.0 program after the respective quality control, considering a value of $p \leq .05$ as significant. MDS

prevalence was calculated with a confidence interval of 95%. Numerical variables were expressed in mean and standard deviation and then categorized by tertiles. Categorical variables were described with relative and absolute frequencies. Variables associated with MDS were assessed with the Chi-squared test or Fisher's exact test, as appropriate. Adjusted and crude prevalence ratios were calculated based on Poisson regression models with robust variance, assessing MDS in two ways, one with a cut-off score of 63 points, and comparing the upper tertile with the two lower tertiles. The adjusted model included all related variables in the bivariate analysis.

Results

Mean age was 21.0 years ($SD = 2.3$), most of the sample was part of the Engineering Faculty, and most of the students were in their fifth semester. The most practiced PA was aerobic, for example: running (excluding athletics), cycling, and water-related sports. Thirty-three percent of the surveyed population had a high-protein diet. Of all students, 31.6% consumed protein supplements one or more times a week. Additionally, 10.2% had a moderate or severe risk of having OCD (Table 1).

Based on the cut-off score of 63 points, 1.29% of male students of a Peruvian private university had MDS ($CI\ 95\% = 0.40-2.20\%$). MDS associated factors had similar results based on the two assessments applied (Table 2). A hyperproteic diet and physical activity frequency were associated with MDS considering a cut-off score of 63 points. No association with age, faculty, academic semester, hypercaloric diet, gym frequency or OCD presence ($p > .05$) were found in the bivariate analysis. With the MASS upper tertile, faculty, hyperproteic diet, physical activity frequency and OCD was associated with MDS. No association with age, semester, and hypercaloric diet were found in the analysis.

We found an association between MDS and a hyperproteic diet ($P_{Ra} = 9.8$; $CI\ 95\% = 1.1-86.7$; $p = .04$) and performing PA over five hours a week ($P_{Ra} = 9.5$; $CI\ 95\% = 1.1-84.4$; $p = .04$) in the adjusted model (Table 3). Considering the MASS upper tertile, we found

Table 1. Characteristics of the population under study

Characteristics	N (%)
Age* (years)	21.0 (2.3)
Faculty	
Business	129 (20.9)
Engineering	268 (43.4)
Health sciences	56 (9.06)
Other	165 (26.7)
Semester	
1-5	416 (67.3)
≥ 6	202 (32.7)
Type of physical activity	
Aerobic	107 (25.0)
Soccer	87 (20.3)
Gym users	78 (18.2)
Team sports	24 (5.6)
Martial arts	12 (2.8)
Calisthenics	10 (2.3)
Cross-fit	3 (0.7)
Capoeira	1 (0.2)
Strength and potency	1 (0.2)
More than one	77 (18.0)
Other	28 (6.5)
Hyperproteic diet	
Yes	202 (32.7)
No	416 (67.3)
Hypercaloric diet	
Yes	415 (67.1)
No	203 (32.9)
Obsessive-compulsive disorder	
No clinical manifestations	366 (59.2)
Mild	189 (30.6)
Moderate or severe	63 (10.2)

Note. * Mean (SD).

an association of MDS with performing PA over five hours a week ($P_{Ra} = 1.8$; $CI\ 95\% = 1.4-2.3$; $p = .001$), gym frequency ($P_{Ra} = 1.9$; $CI\ 95\% = 1.5-2.3$; $p = .001$), hyperproteic diet ($P_{Ra} = 1.3$; $CI\ 95\% = 1.1-1.6$; $p = .01$), studying in a Engineering ($P_{Ra} = 1.5$; $CI\ 95\% = 1.1-1.9$; p

Table 2. Variables associated with muscle dysmorphia symptomatology with a cut-off point of 63 in the MASS and the upper tertile.

Variable	MDS (≥ 63)			MDS (upper tertile)		
	<i>n</i>	(%)	<i>p</i> *	<i>n</i>	(%)	<i>p</i> **
Age						
< 21 years	4	1.4	.99	94	33.8	.75
21-22 years	2	1.0		61	30.5	
> 22 years	2	1.4		45	32.1	
Faculty						
Engineering	2	1.6	.99	96	35.8	.001
Business	4	1.5		52	40.3	
Health Sciences	0	0		8	14.3	
Other	2	1.2		44	26.7	
Semester						
1-5	3	1.2	.99	87	33.5	.62
≥ 6	5	1.4		113	31.6	
Hyperproteic diet						
Yes	7	3.5	.002	86	42.6	.001
No	1	0.2		114	27.4	
Hypercaloric diet						
Yes	5	1.2	.72	124	29.9	.06
No	3	1.5		76	37.4	
Frequency of physical activity						
>5 hours	6	4.3	.003	73	52.5	.001
2.1–5 hours	1	0.7		44	31.7	
≤ 2 hours	1	0.3		83	24.4	
Gym users						
Yes	3	3.9	.07	50	64.1	.001
No	5	0.90		150	27.8	
Obsessive-compulsive disorder						
No	5	1.4	.88	93	25.4	.001
Mild	3	1.6		75	39.7	
Moderate or Severe	0	0		32	50.8	

Notes. MASS = Muscle Appearance Satisfaction Scale, MDS = Muscle dysmorphia symptomatology * Fisher's exact test, ** Chi-squared test.

= .005) or Business faculty ($PRa = 1.4$; $CI\ 95\% = 1.0-1.9$; $p = .03$), and presenting moderate-severe ($PRa = 2.2$; $CI\ 95\% = 1.6-2.9$; $p = .001$) or mild OCD ($PRa = 1.4$; $CI\ 95\% = 1.1-1.8$; $p = .002$).

Discussion

The prevalence of MDS in the present study was 1.29% in men students of a private university in Lima. We

Table 3. Variables associated with muscle dysmorphia based on a crude and adjusted model according to a cut-off point of 63 and the upper tertile.

	Crude model			Adjusted model		
	<i>PRc</i>	(95% CI)	<i>p</i>	<i>PRa</i>	(95% CI)	<i>p</i>
Cut-off point of 63 points						
Frequency of physical activity						
> 5 hours	14.68	(1.78-120.99)	.01	9.51	(1.07-84.45)	.04
2.1-5 hours	2.45	(0.15-38.92)	.53	2.13	(0.14-33.58)	.59
≤ 2 hours/Not performs	1.00	Reference		1.00	Reference	
Hyperproteic diet						
Yes	14.42	(1.78-116.58)	.01	9.83	(1.11-86.75)	.04
No	1.00	Reference		1.00	Reference	
Upper tertile						
Frequency of physical activity						
> 5 hours	2.15	(1.68-2.75)	.001	1.78	(1.37-2.31)	.001
2.1-5 hours	1.30	(0.95-1.76)	.10	1.19	(0.88-2.31)	.26
≤ 2 hours/Not performs	1.00	Reference		1.00	Reference	
Gym users						
Yes	2.31	(1.86-2.86)	.001	1.86	(1.48-2.35)	.001
No	1.00	Reference		1.00	Reference	
Hyperproteic diet						
Yes	1.55	(1.24-1.94)	.001	1.32	(1.07-1.65)	.01
No	1.00	Reference		1.00	Reference	
Faculty						
Engineering	1.34	(1.00-1.81)	.05	1.48	(1.13-1.95)	.005
Business	1.51	(1.09-2.10)	.01	1.40	(1.03-1.90)	.03
Health Sciences	0.54	(0.27-1.07)	.08	.63	(0.32-1.24)	.18
Other	1.00	Reference		1.00	Reference	
Obsessive-compulsive disorder						
Moderate or severe	2.00	(1.45-2.70)	.001	2.16	(1.61-2.90)	.001
Mild	1.56	(1.22-2.00)	.001	1.45	(1.14-1.84)	.002
No	1.00	Reference		1.00	Reference	

Notes. *PRc* = Prevalence ratio from de crude model, *PRa* = Prevalence ratio from de adjusted model.

have not found similar studies in Peru; however, a Mexican study reported a 1.3% of sedentary men have MDS, without being university students (Baile et al., 2011). The low prevalence of MDS found in male university students is specific to a group related to the faculty and PA frequency. Likewise, other studies used

different instruments to measure MDS (e.g., Muscle Dysmorphia Inventory), including other criteria for its diagnosis. Different studies using MASS used other cut-off points to determine MDS in specific populations rather than general ones (Cella, Iannaccone & Cotrufo, 2012; Chaney, 2008; Martínez, Cortés, Rizo

& Gil, 2015). A research carried-out on university men students in non-vulnerable careers, such as Medicine, or susceptible careers, such as Exercises and Sports Science, show a prevalence of 0% and 11%, respectively (Bo et al., 2014; Escoto et al., 2012).

A hyperproteic diet is associated to MDS. This result is similar to a previous study where a hyperproteic diet (> 2g/kg/day) and a normocaloric diet were associated to MDS using a 24 h food consumption frequency assay (Martínez et al., 2015). The same study also mentioned a normal intake of lipids. We also analyzed the protein supplementation, which is not associated with MDS in this study. However, people with MD often consume protein supplements. A study of weightlifters showed that 90% who had MD consumed protein supplements, 49% carbohydrates, and 49% creatine, which are popular supplements to build muscles (Martínez-Segura et al., 2015). Our results confirm that on a general population of college students consuming a hyperproteic diet is associated with MDS not considering the consumption of protein supplements.

An association between MDS and the frequency of PA over five hours a week was found. This finding supports a Mexican study showing that 68% of people with MDS went to the gym five or six days a week and 27% exercised two or three hours every day (Zepeda, Franco & Valdés, 2011). It resembles our findings of association between gym users and MD in our adjusted model. Researches described the practice of activities such as high-intensity weightlifting sessions and monitored walks to consume calories without affecting muscle mass (Murray et al., 2012; Murray, Rieger & Touyz, 2011). Our results show that MDS is associated with PA frequency in university men students.

By the analysis by tertiles, MDS and OCD are associated. This variable has been associated with body dissatisfaction. This last result supports a study which determined that 8% of weightlifters presented body dissatisfaction (Behar & Molinari, 2010), a characteristic also found in university students (Grieve & Shacklette, 2012). However, a study found no association between MDS and OCD in a population similar to ours (Grieve & Shacklette, 2012). MD has been associated with a sense of threat by a body-related negative comment in men university students

(Menees, Grieve, Mienaltowski & Pope, 2013), therefore body dissatisfaction may lead to a depressive disorder (APA, 2013). MD is a BDD where the creation of habits and routines develop muscle mass. Persons with MD are unaware of their condition, unlike a person with OCD. Although, MDS and OCD are not associated in our study (considering a cut-off score of 63 points), it is important to note it is a risk factor for men university students since body dissatisfaction might lead to the desire to make physical changes (Menees et al., 2013).

This study measured the prevalence of MDS using a self-applied assessment in a general university student population, regardless of the gym frequency and low-risk careers. The use of an assay instead of a clinical interview limits identifying MD as a clinical diagnosis and focuses only on symptomatology. Therefore, we recommend as a first step to screen potential candidates for clinical diagnosis in future studies. However, this survey is feasible to use for the general aim of the study. A self-applied instrument can bias by the presumed social desirability of what it is expected of them to be answered. However, this limitation has not invalidated our results since the questionnaire was anonymous.

This study did not measure the association between MDS and other factors such as the use of steroids or other psychosocial variables (e.g., depression, family environment, experiences and weight in childhood, and media). Further, we propose that future studies analyze the general population to determine MDS prevalence beyond specific populations, such as university students. We recommend using a detailed log of food consumption over a 24 h to analyze the diet of the assessed participants and the exact daily consumption of macronutrients. Research on dietary practices will allow formulating strategies for adequate future nutritional counsel for this group of people.

In conclusion, this study showed that 1.3% of men students in a private university displayed MDS. Also, there is an association between the practice of PA over five hours a week and a hyperproteic diet with MDS. MD is a frequent disorder, and it is present in the general population and needs to be investigated in depth to face this emerging problem.

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