ORIGINAL ARTICLE

Prevalence of metabolic syndrome and its relationship with nutritional status and sleep quality in the military forces

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Abstract

Background: It has been suggested that the quality of our sleep plays a significant role in developing Metabolic Syndrome (MetS). However, limited research is available on the association between sleep quality and MetS. *Aim and Objectives*: The objective of this study was to explore the prevalence of MetS and its relationship with nutritional status and sleep quality in the military forces. *Material and Methods*: A total of 190 people were surveyed using various questionnaires, including demographic, PSQI, DASS, and FFQ questionnaires. One-variable logistic regression, t-test, and Chi-square were used to analyze data. *Results*: The study included a total of 169 out of 190 individuals surveyed. The subjects' average age was 35.78 years, with a median sleep quality score of 6.61 (SD=3.0). No statistically significant relationship was found between MetS and biochemical components, macronutrient intake, and sleep quality. For every unit increase in protein and carbohydrate consumption, the likelihood of experiencing poor sleep quality increased by 2% and reduced by 1%, respectively ($p<0.05$). *Conclusion*: Our study found no significant relationship between sleep quality, MetS, biochemical components, or macronutrient intake. We recommend further research evaluating hormone levels or other factors affecting sleep quality and MetS.

Keywords: Metabolic Syndrome, Sleep Quality, Military Forces, Macronutrient Intake

Introduction

Metabolic Syndrome (MetS) is a condition where several known cardiovascular risk factors occur together [1-2]. According to the National Cholesterol Education Organization (NCEP-ATP III), MetS is identified by the presence of at least three out of five risk factors. These risk factors include abdominal obesity, high fasting blood glucose, low HDL-C, elevated blood triglyceride levels, and high blood pressure [1]. There are also other definitions; for instance, the International

Diabetes Federation (IDF) defines it primarily based on abdominal obesity and waist circumference [1].

MetS has become increasingly common in the United States since its introduction in the 1980s, according to the Centers for Disease Control and Prevention (CDC) [3]. By 2012, there was a 35% increase in prevalence, affecting approximately one-third of the American adult population [3]. In Iran, the overall incidence of MetS in adults aged 20 years and above was reported at 550.9 per 10,000 individuals [4]. However, there is limited information available on MetS in the military forces of Iran.

Recent studies have shown that modifiable lifestyle factors, particularly dietary habits, are associated with the incidence and prevention of MetS. A study reported the positive effects of different dietary approaches on MetS inflammatory markers [5]. Similarly, a meta-analysis demonstrated the preventive role of promoting healthy dietary patterns in reducing the prevalence of MetS [6]. In addition, some sub-studies from the PREDIMED-Plus cohort have shown that certain dietary components of the traditional Mediterranean Diet (MedDiet) are associated with improvements in MetS components [7-9].

Another important factor that affects health is the quality of sleep, a vital physiological process that profoundly affects mental and physical health [10]. A study conducted with the 2013-2014 NHANES of a population-level sample examined the association between sleep duration and MetS severity [11]. The study found that individuals who slept 7 to 7.5 hours per night had the lowest risk for MetS. The association between sleep duration and MetS was U-shaped, with those sleeping less than 7 hours or more than 7 hours being at higher risk than those sleeping 7 hours. Those sleeping for 5 hours or 9 hours showed similar risk [11].

Maintaining strong physical health is crucial for military personnel to meet the demands of their profession. Therefore, it is important to thoroughly investigate factors related to their health and implement effective interventions in the organizational programs of the military forces to improve their overall health. To achieve this goal, this study investigated the prevalence of MetS and its relationship with nutritional status and sleep quality among military personnel.

Material and Methods

Study design and participants

This study was approved by the Ethics Committee of Baqiyatallah University of Medical Sciences with the code of IR.BMSU.REC.1398.335. This cross-sectional study aimed to investigate the prevalence of MetS and its relationship with nutritional status and sleep quality among military personnel in Zanjan City in 2020. The purposive sampling technique was used to identify the subjects for the study. The study included staff and military personnel with health records selected based on the inclusion and exclusion criteria. Participants were briefed on the objectives and methodology, and their data confidentiality was ensured. They participated voluntarily and were asked to sign an informed consent form.

Inclusion and exclusion criteria

Individuals with diabetes, cardiovascular disease, cancer, hypertension, kidney disease, liver disease, hyperthyroidism, epilepsy, and inflammation were excluded. Additionally, we excluded those who were using any drug or tobacco, consuming alcohol at least once a week, or following a special diet such as a weight loss diet or vegetarian diet. Individuals who left at least seventy items blank on the questionnaire and those who were using any drug regularly to treat any diseases were also excluded. Overall, 190 participants were included in the study.

Demographic and food consumption record

We collected general and demographic information using the general profile questionnaire during a face-to-face interview. Additionally, we gathered food intake data for the past year using the Semi-Quantitative Food Frequency Questionnaire (FFQ) [12-13].

Anthropometric measurements and lab results

We measured various anthropometric indices, such as height, weight, abdomen and waist circumference. The subjects were instructed to maintain their regular diet and sleep patterns throughout the research project and avoid taking any supplements. Weight was measured using a falcon balance with the person wearing minimal clothing and no shoes. Standing height was measured using a wall height gauge while the person faced the wall without shoes or heels and looked straight ahead. Waist circumference was measured using a tape measure with an accuracy of 1 mm. Body Mass Index (BMI) was calculated using the relevant formula. Finally, information on MetS and biochemical tests were extracted from the health records of the study population using new tests available.

Pittsburg Sleep Quality Index (PSQI)

Pittsburgh Sleep Quality Index (PSQI) is a valuable tool for evaluating the patterns and quality of sleep for adults [14-15]. The index consists of 19 questions, each with seven items evaluated on a scale of 0 to 3. The PSQI score is obtained by adding up the scores of the seven items, ranging from 0 to 21, which assess the mental quality of sleep, delay in falling asleep, sleep time, sleep efficiency, sleep disorders, use of sleeping pills, and daily performance disorders [14]. The scores of these subscales are classified as no problem, medium problem, serious problem, or very serious problem. A score of 5 or more in the entire questionnaire indicates poor sleep quality [14].

Depression Anxiety Stress Scales (DASS) questionnaire

The Depression Anxiety Stress Scale (DASS) is a self-report tool consisting of 42 items that assess three negative emotional states: depression, anxiety, and tension/stress [16]. The questionnaire is divided into three subscales: Stress, Anxiety, and Depression [16]. The intensity of these subscales was measured using five classifications: normal, slight, medium, severe, and very severe.

Statistical analyses

The study presented quantitative data as average and standard deviation and qualitative data as frequency and percentage. Missing data were estimated using the missing data estimation method. The Kolmogorov-Smirnov test was used to determine whether the data was normal or abnormal. To examine the relationship between variables such as age, height, weight, BMI, and abdominal circumference with sleep status and healthy nutrition index, *t*-tests were used. Chi-square tests were used to examine the relationship between qualitative variables. One-variable logistic regression was used to analyze the data further. The data was analyzed using SPSS version 24, and a *p*-value of less than 0.05 was considered significant.

Results

The study included a total of 190 individuals. However, due to issues with 13 PSQI, 3 DASS, and 5 FFQ questionnaires, data from 21 individuals had to be excluded. Therefore, the analysis was conducted on data from 169 participants. Most participants, 89.9%, were married, and 63.3% were non-smokers. The average age, weight, and height of the participants were 35.78, 83.61, and 178.67, respectively. Table 1 provides a summary of the general characteristics of the study subjects.The PSQI questionnaire revealed that 91.0% of participants did not have any problems with their sleep time. However, 44.4% of participants experienced a medium problem with falling asleep. Despite this, our findings from Table 2 show that 62.1% of cases had poor sleep quality. According to the DASS questionnaire, most participants had normal emotional states. The mean values for FBS, HDL, TG, and systolic and diastolic blood pressure were 91.12, 54.57, 152.41, 117.4, and 77.42, respectively. The macronutrient levels are presented in Table 3.

Based on the MetS ATP-III criteria, 28 subjects had MetS (Table 4). Table 5 shows the descriptive statistics of macronutrient intake divided by obesity status. None of the participants had a BMI of less than 18.49. According to Table 6, carbohydrate consumption was significantly associated with sleep quality ($p = 0.02$), while calories and fat consumption did not show any significant association with sleep quality. However, calorie consumption showed a remarkable association with sleep quality ($p = 0.08$) (Table 6). The likelihood of experiencing poor sleep quality increased by 2% for each unit increase in protein intake (Table 6). Conversely, for every unit increase in carbohydrate intake, the chances of poor sleep quality were reduced by 1%. However, no statistically significant relationship was found between MetS and biometrical components, sleep quality, or macronutrient consumption (Table 6). Table 7 reports the following cut-off points for the respective nutrients: 55.35 for protein consumption, 52.48 for fat consumption, and 1346.50 for carbohydrate consumption. Additionally, we had set the cut-off point for calorie consumption at 179.10 and for all variables combined at 0.15. According to Table 7, out of the individuals who developed MetS, 20.2% had a protein consumption higher than 55.35, 18.9% had a fat consumption higher than 52.48, 19.0% had a carbohydrate consumption higher than 179.1, and 18.6% had a calorie consumption higher than 1346.50. On the other hand, for those who did not develop MetS, 90.0% had a protein consumption lower than 55.35, 85.3% had a fat consumption lower than 52.48, and 89.6% had a carbohydrate consumption lower than 179.1 (Table 7). The positive likelihood ratio indicates that when MetS is present compared to its absence, the chances of a positive test for protein, fats, carbohydrate, calorie consumption, and a linear combination of them are 2.02, 1.28, 1.82, 1.86, and 2.59 times higher, respectively (Table 7). On the other hand, the negative likelihood ratio shows that when the outcome is present compared to its absence, the chances of a negative test for protein, fats, carbohydrate, calorie consumption, and a linear combination of them are 0.89, 0.95, 0.90, 0.90, and 0.86 times higher, respectively (Table 7).

Table 1: Characteristics of study subjects

Variable	**Frequency (N)**	**Percentage (%)**
Marital Status		
Single	17	10.1
Married	152	89.9
Education		
Illiterate	0	0
High school	15	8.9
Diploma	96	56.8
Masters	55	32.5
Ph.D	3	1.8
Smoking status		
Non-smoker	107	63.3
Smoker	62	36.7
Age*	35.78 ± 5.914	
Weight*	83.61 ± 10.41	
Height*	177.11 ± 16.15	
Waist*	90.7 ± 27.43	
Systolic Blood pressure*	116.71 ± 11.47	
Diastolic Blood pressure*	77.42 ± 6.62	

Table 2: Frequency of PSQI and DASS questionnaire subscale

Variable	Severity	Frequency (N)	Percentage (%)
PSQI			
Mental quality of sleep	**No problem**	23	13.6
	Medium problem	93	55
	Serious problem	51	30.2
	Very serious problem	2	1.2
Delay in falling asleep	**No problem**	60	35.5
	Medium problem	75	44.4
	Serious problem	28	16.6
	Very serious problem	6	3.6
Sleep time	**No problem**	77	45.6
	Medium problem	61	36.1
	Serious problem	28	16.6
	Very serious problem	3	1.8
Sleep efficiency	**No problem**	154	91.1
	Medium problem	9	5.3
	Serious problem	5	3
	Very serious problem	1	0.6
Sleep disorder	**No problem**	10	5.9
	Medium problem	135	79.9
	Serious problem	22	13
	Very serious problem	2	1.2

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Variable	Severity	Frequency (N)	Percentage (%)
Use of sleeping pills	**No problem**	116	68.6
	Medium problem	34	20.1
	Serious problem	12	7.1
	Very serious problem	7	4.1
Daily performance disorders	**No problem**	43	25.4
	Medium problem	86	50.9
	Serious problem	34	20.1
	Very serious problem	6	3.6
Total (Sleep Quality)	**Good**	64	37.9
	Poor	105	62.1
DASS			
Stress	**Normal**	167	98.8
	Slight	2	1.2
	Medium	0	0
	Severe	0	0
	Very severe	0	0
Anxiety	**Normal**	148	87.6
	Slight	15	8.9
	Medium	5	3
	Severe	1	0.6
	Very severe	0	0
Depression	**Normal**	164	97
	Slight	3	1.8
	Medium	2	1.2
	Severe	0	0
	Very severe	0	0

Table 3: Summary of information on blood factors and macronutrients

Variables	Mean ± SD	Minimum	Maximum
Blood Parameters			
Fasting Blood Sugar (FBS)	93.10 ± 18.29	60	190
High Density Lipoprotein (HDL)	54.57 ± 14.88	28	138
Triglycerides (TG)	152.40 ± 74.20	50	462
Macronutrients			
Protein	78.34 ± 46.40	15.76	216.5
Fats	58.45 ± 34.41	10.4	177.1
Carbohydrate	228.0015 ± 95.38	541.6	228.001
Cholesterol	239.24 ± 140.16	38.06	604.2

Table 4: Information on metabolic syndrome

Variable	Frequency (N)	Percentage (%)
Weight status		
Normal	51	30.2
Overweight	102	60.4
Obese	12	7.1
Waist circumference 1		
⩾ 94 mg/dL	96	56.8
⩽ 94 mg/dL	73	43.2
Waist circumference 2		
⩾ 102 mg/dL	71	42
⩽ 102 mg/dL	98	58

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Variable	Frequency (N)	Percentage (%)
Triglycerides		
⩾ 150 mg/dL	77	45.6
⩽ 150 mg/dL	92	54.4
HDL Cholesterol		
⩾ 40 mg/dL	21	12.4
⩽ 40 mg/dL	148	87.6
Systolic BP		
⩾ 130 mmHg	20	11.8
⩽ 130 mmHg	149	88.2
Diastolic BP		
⩾ 85 mmHg	16	9.5
⩽ 85 mmHg	153	90.5
Fasting Glucose		
⩾ 100 mmHg	51	30.2
⩽ 100 mmHg	118	69.8
Metabolic syndrome IDF* Criteria		
Yes	27	16
No	142	84
Metabolic syndrome ATP-III Criteria		
Yes	28	16.6
No	141	83.4

Waist circumference 1: Waist classification for calculating metabolic syndrome with IDF Criteria
Waist circumference 2: Waist classification for calculating metabolic syndrome with ATP-III Criteria

Table 5: Macronutrients reception by numbinal status

Parameters		N	Minimum	Maximum	Mean ± SD
Missing Values	**Calorie**	4	1474.00	3721.00	2191.92 ± 1031.85
	Protein	4	22.20	164.20	70.94 ± 64.24
	Fat	3	22.08	138.20	72.20 ± 59.66
	Carbohydrate	4	96.56	470.10	229.01 ± 164.94
Normal	**Calorie**	51	1034.00	4133.00	2055.99 ± 843.48
	Protein	51	28.72	216.50	92.96 ± 55.13
	Fat	51	15.49	177.10	66.35 ± 41.31
	Carbohydrate	51	56.72	508.00	255.15 ± 95.27
Overweight	**Calorie**	102	1016.00	4371.00	1800.03 ± 677.63
	Protein	102	15.76	206.10	71.31 ± 40.42
	Fat	100	15.08	167.70	55.25 ± 35.30
	Carbohydrate	100	50.98	541.60	219.03 ± 90.18
Obese	**Calorie**	12	1079.00	3132.00	1798.23 ± 602.33
	Protein	12	34.00	164.30	78.43 ± 38.37
	Fat	12	27.88	111.70	59.52 ± 27.22
	Carbohydrate	12	81.08	377.20	218.81 ± 78.63

Table 6: Results of logistic regression for interested variables

Variables	B	OR	Lower	Upper	*p*
Metabolic versus biometrical components [1]					
Constant	36.10				0.53
Weight	0.22	1.25	0.65	2.42	0.50
Height	-0.25	0.78	0.41	1.46	0.43
Body Mass Index	-0.45	0.63	0.07	5.18	0.67
Metabolic versus sleep quality					
Constant	-1.79	0.17			<0.001
Had sleep disorder	0.42	1.53	0.67	3.46	0.31
Normal	Reference	-----	-----	-----	-----
Metabolic versus macronutrients [2]					
Constant	-1.89	0.15			0.01
Protein	-0.008	0.59	0.96	1.02	0.59
Fats	-0.001	0.93	0.97	1.02	0.92
Carbohydrate	0.005	0.31	0.99	1.01	0.31
Calorie	0.001	0.96	0.99	1.002	0.95
Obesity status versus macronutrients [3]					
Constant	1.38	3.99			0.03
Protein	-0.02	0.98	0.95	1.01	0.09
Fats	0.01	1.01	0.98	1.04	0.28
Carbohydrate	0.0001	1.00	0.99	1.02	0.91
Calorie	0.0001	1.00	0.99	1.01	0.76

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Variables	B	OR	Lower	Upper	*p*
Sleep quality versus macronutrients [4]					
Constant	2.24	9.44			0.001
Protein	0.024	0.99	1	1.05	0.49
Fats	0.008	1.02	0.99	1.03	0.46
Carbohydrate	-0.009	1.01	0.98	0.99	0.02
Calorie	-0.001	0.99	0.99	1	0.08
Sleep quality versus biometrical components					
Constant	20.94	$12.4*10^8$			0.64
Weight	0.16	1.17	0.68	2.01	0.56
Height	-0.13	0.88	0.54	1.44	0.62
Body Mass Index	-0.45	0.64	0.11	3.57	0.61
Waist circumference	0.005	1.005	0.99	1.01	0.43

OR: Odds ratio; Lower: Lower Bound for 95% C.I. for OR; Upper: Upper Bound for 95% C.I. for OR; Hosmer and Lemeshow Test showed an acceptable of model fit for all models and its value for each model is as follows:1- Chi-square (7) = 10.72, p = 0.15; 2- Chi-square (8) = 9.40, p = 0.31;3- Chi-square (8) = 2.11, p = 0.98; 4- Chi-square (8) = 7.52, p = 0.48

Table 7: Results of Receiver Operating Characteristic (ROC) analysis and optimum cut-offs for macronutrients and all 4 variables (Total)

Variables	Cut off point	AUC (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	LR^+ (95% CI)	LR^- (95% CI)
Protein	55.35	0.55 (0.50-0.60)	20.2% (13.1-28.9)	90.0% (79.5-96.2)	78.6% (59.0-91.7)	38.3% (30.2-46.9)	2.02 (0.87-4.70)	0.89 (0.78-1.01)
Fats	52.48	0.52 (0.46-0.58)	18.9% (10.7-29.7)	85.3% (76.5-91.7)	50.0% (30.6-69.4)	57.4% (48.8-65.7)	1.28 (0.65-3.00)	0.95 (0.83-1.09)
Carbohydrate	179.10	0.54 (0.49-0.60)	19.0% (12.4-27.1)	89.6% (77.3-95.5)	82.1% (63.1-93.9)	30.5% (23.0-38.8)	1.82 (0.74-4.52)	0.90 (0.79-1.03)
Calorie	1346.50	0.54 (0.49-0.60)	18.6% (12.3-26.4)	90.0% (76.3-97.2)	85.7% (67.3-96.0)	25.5% (18.6-33.6)	1.86 (0.69-5.04)	0.90 (0.79-1.03)
Total	0.15	0.56 (0.51-0.61)	20.3% (13.5-28.7)	92.2% (81.1-97.8)	85.7% (67.3-96.0)	33.3% (25.6-41.8)	2.59 (0.95-7.09)	0.86 (0.77-0.98)

AUC, area under the curve; CI, confidence interval; LR^+, positive likelihood ratio; LR^-, negative likelihood ratio; NPV, negative predictive value; PPV, positive predictive value

Discussion

Our study found no significant relationship between sleep quality, MetS, biochemical components, or macronutrient intake. However, we discovered a significant relationship between sleep quality and the consumption of protein and carbohydrates. In contrast, there was no significant relationship between sleep quality and calorie or fat intake. Specifically, an increase in protein consumption led to a 2% increase in the risk of poor sleep quality, while an increase in carbohydrate consumption resulted in a 1% decrease in the risk of poor sleep quality.

Sleeping habits are a complex concept that can be classified in various ways [17]. According to reports, sleep quality is one of the most critical elements in assessing sleep health [17]. Poor sleep quality has been associated with an increased risk of obesity, type 2 diabetes, hypertension, and dyslipidemia [17]. These are all symptoms of MetS, so it is logical to assume that poor sleep quality would be linked to the disease. However, our research did not support this theory.

A study conducted by Chang *et al*. demonstrated that sleep disruptions are associated with a higher prevalence of MetS and abdominal obesity among police officers [18]. However, no significant relationship was found between the global PSQI and MetS and its components, consistent with the existing evidence [18]. In addition, Yoo *et al*. conducted a similar study and found no significant relationship between MetS, sleep quality, and its components [19]. They suggested that sleep duration was a more critical factor than sleep quality in determining MetS or glucose intolerance and that sleep quality did not affect the relationship between sleep duration and MetS [19].

In some studies, it has been found that poor sleep quality is associated with higher BMI, waist circumference, and fasting blood glucose levels in the general population [20-21]. Jennings *et al*. found that in Caucasian adults, for every 2.6-point increase in the global PSQI score, the likelihood of meeting the diagnostic criteria for MetS increased by 1.44 times [22].

The exact reason for the relationship between metabolic syndrome and poor sleep quality is not yet known. However, it has been found that an overactive Hypothalamic-Pituitary-Adrenal (HPA) axis is associated with the development of metabolic syndrome, and stimulation of the HPA axis can lead to insomnia [23]. Additionally, some short-term studies have demonstrated that sleep fragmentation or restriction can cause insulin resistance, which appears to be a crucial factor in the development of MetS [24-25].

There are also other potential mechanisms. For instance, long-term sleep deprivation can have adverse effects on glucose metabolism and raise the risk of developing MetS [26]. It can also lead to poor sleep quality and trigger sleep disturbances [26] Hung *et al*. found that hyperglycemia is an independent factor determining the global PSQI score [27]. Jennings *et al.* also reported the similar results [22]. Recent studies suggest that sleep deprivation reduces insulin sensitivity, but sleep and glucose metabolism have bidirectional connections [24, 26]. There is a link between sleep restriction, higher levels of cortisol and ghrelin, and a sympathetic reaction [28]. Additionally, sleep restriction can lead to lower levels of leptin, which can encourage the development of an atherogenic lipid profile [28]. However, the exact mechanism responsible for the relationship between sleep quality and dyslipidemia is still unclear. Investigations by Hung *et al.* found that low HDL-C is an early indicator of overall PSQI score and poor sleep quality [27]. However, there was no relation between hypertriglyceridemia and PSQI score. Jennings *et al*. found no relation between HDL-C or triglyceride levels and global PSQI scores [22].

Moreover, according to studies by Hung *et al*. and Jennings *et al*., there is no connection between high blood pressure and the overall PSQI score [22, 27]. However, in patients with stage 1 hypertension, global PSQI scores were higher in non-dippers than dippers [22, 27].

Inflammation also has a role in this story. A study by Irwin *et al.* revealed a link between sleep disruption and markers of systemic inflammation, including interleukin-6 and C-reactive protein [29]. It is hypothesized that elevated inflammation markers may play a critical role in the development of chronic diseases such as diabetes and dyslipidemia [29]. Sleep deprivation impacts the immune system by altering monocyte production of pro-inflammatory cytokines, such as tumor necrosis factor and interleukin-6 [30]. Obesity, on the other hand, triggers a low-grade inflammatory response that may interrupt sleep [30].

This study has some strengths and limitations. The strengths were measuring stress, anxiety, and depression among military forces. However, it did not explore the psychological stress unique to the profession. This study also used the PSQI to assess the overall sleep quality. It is highly reliable and valid, considering many factors affecting sleep quality. There are some limitations to the current study that need to be addressed. Firstly, the study was cross-sectional, so it was impossible to establish a causal relationship. Secondly, the study did not use objective sleep measurement techniques such as actigraphy or polysomnography. This means that participants with undiagnosed Obstructive Sleep Apnea (OSA) may not have been excluded from the study. It is important to note that self-reports of sleep quality are taken in informal settings and generally provide a general overview of sleep quality rather than measuring it on specific nights. Furthermore, we did not consider obstructive sleep apnea, which can cause poor sleep quality and is a risk factor for metabolic syndrome. Lastly, we did not measure the effect of other factors, such as insulin resistance, sympathoadrenal activity, and leptin, on sleep quality and metabolic syndromes.

Conclusion

Our study found that there was no significant relationship between sleep quality, MetS, biochemical components, or macronutrient intake. However, we did observe a significant relationship between sleep quality and the consumption of protein and carbohydrates. Nonetheless, we did not assess hormone levels or other factors such as insulin resistance, sympathoadrenal activity, ghrelin, and leptin, which are known to play a role in sleep quality and MetS. Future research should consider these factors to gain a better understanding of the relationship between sleep quality and MetS.

Acknowledgement

The authors are thankful to Baqiyatallah University of Medical Sciences for financial support.

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How to cite this article:

Rasouli A, Sharif N, Parsamanesh N, Nazari S, Khederlou H, Zareie S, Esrafili M, Karimi H, Parastouei K. Prevalence of metabolic syndrome and its relationship with nutritional status and sleep quality in the military forces. *J Krishna Inst Med Sci Univ* 2023; 12(4):27-42

Submitted: *10-July-2023* ***Accepted:*** *10-Sep-2023* ***Published:*** *01-Oct-2023*