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ORIGINAL ARTICLE

Relationship between Blood Magnesium Level, Physical Fitness and Stress Level in Online Driver

Hubungan Kadar Magnesium dan Kebugaran dengan Tingkat Stress pada Pengemudi Ojek Online

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ABSTRACT

Background

Most countries around the world suffered from the high-level transmission COVID-19. Thus, the government enforced a policy for the citizens to work from home. These restrictions impact the mental health of the citizens, and the prevalence of stress increases. Some of the factors that affect stress are magnesium intake and physical fitness. The study found that magnesium levels and fitness are correlated with stress levels. But some studies got different results. Thus, learning more about the relationship between magnesium level, fitness, and stress level is necessary.

Methods

This is a cross-sectional design study with consecutive non-random sampling methods. This study involving online drivers was held in Kampus B, Fakultas Kedokteran Universitas Trisakti, in September 2022. The inclusion criteria are aged 15-64 years, willing to sign the informed consent, can communicate well, while the exclusion criteria are in the therapy of anti-depressant or anti-anxiety drugs, and has a history of heart attack within one month.

Results

Based on the data, it can be concluded that most respondents are male, from the middle-aged group, and suffer from obesity, and about 50% of the respondents suffer from high blood pressure. Most respondents have normal blood-magnesium levels and medium levels of stress, while all the respondents have poor or very poor physical fitness. On the Chi-square test between age, sex, body mass index, blood pressure, physical fitness and stress level, the level of significance consecutively are 0.645; 0.208; 0.364; 0.451 and 1.000. While on the Fisher test, the significance level between blood magnesium level and stress level is 0.099.

Conclusions

Based on the bivariate test, it can be concluded that there is no significant relationship between age, sex, body mass index, blood pressure, physical fitness and blood magnesium level with the stress level.

Keywords: fitness; magnesium; stress level

ABSTRAK

Latar Belakang

Penyakit COVID-19 memiliki tingkat penyebaran yang sangat tinggi sehingga pemerintah negara di dunia memberlakukan pembatasan aktivitas bagi penduduknya dengan memberlakukan kebijakan *work from home.* Hal ini berdampak bagi kesehatan mental masyarakat ditandai dengan peningkatan kejadian stres secara bermakna. Salah satu faktor yang mempengaruhi terjadinya stres adalah asupan magnesium. Kadar magnesium tubuh mempengaruhi ketahanan seseorang terhadap stres, namun ada penelitian lain yang mendapatkan hasil berbeda. Faktor lain yang mempengaruhi stres adalah tingkat kebugaran, meskipun juga masih terdapat penelitian yang menyatakan tidak ada hubungan yang bermakna antara kebugaran dan stres. Perbedaan hasil ini membuat peneliti tertarik untuk meneliti hubungan kadar magnesium dan kebugaran dengan stres.

Metode

Penelitian ini adalah studi analitik observasional dengan desain *cross-sectional* dengan pengambilan sampel secara *consecutive non-random sampling*. Penelitian dilakukan di Kampus B, Fakultas Kedokteran Universitas Trisakti pada September 2022 dengan melibatkan pengemudi ojek online. Kriteria inklusi penelitian ini adalah berusia 15-64 tahun, bersedia menjadi responden dan menandatangani informed consent dan mampu berkomunikasi dengan baik. Kriteria eksklusi pada penelitian ini adalah sedang dalam terapi obat anti-depresan atau obat anti ansietas, memiliki riwayat angina dan serangan jantung dalam waktu 1 bulan sebelum pemeriksaan.

Hasil

Berdasarkan data diketahui responden terbanyak berusia setengah baya, berjenis kelamin laki-laki, dan tergolong dalam kelompok obesitas. Jumlah responden yang mengalami hipertensi dan tidak memiliki jumlah hampir sama yakni berkisar 50%. Sebagian besar responden memiliki kadar magnesium darah yang normal dan tingkat stres sedang, dan seluruh responden memiliki kebugaran yang kurang dan kurang sekali. Dari uji Chi square antara variabel usia, jenis kelamin, IMT, tekanan darah, kebugaran dengan tingkat stres didapatkan nilai p berturut-turut adalah 0.645; 0.208; 0.364; 0.451; dan 1.000. Pada uji Fisher antara variabel kadar magnesium darah dan tingkat stres didapatkan nilai p=0.099.

Kesimpulan

Tidak terdapat hubungan yang bermakna secara statistik antara usia, jenis kelamin, indeks massa tubuh, tekanan darah, kebugaran, kadar magnesium darah dan tingkat stres.

Kata Kunci: kebugaran; magnesium; tingkat stres

INTRODUCTION

In 2019 there was a rapid spread of COVID-19 disease transmission in all countries in the world. To overcome this, the governments of almost all countries impose activity restrictions. This turned out to have another impact on the population's mental health.[1] It is known that the imposition of long-term activity restrictions has increased the incidence of mental disorders. In Indonesia, there has been an increase in the prevalence of depressive emotional disorders in the Indonesian population along with increasing age, namely in the population aged 15-24 years by 6.2% and in the population aged over 75 years by 8.9%.[2] Study by Lusida MAP et al in East Java showed that after the COVID-19 pandemic, the prevalence of depression, anxiety, and stress respectively are 3.6%, 14.3%, and 7.9%.[3] Another study by Sutarto AP, et al. on Indonesian workers showed an even higher prevalence for those cases with the prevalence of depression being 18.4%, anxiety is 46.4% and stress is 13.1%.[4]

A study by Salari et al. al found that the prevalence of stress during a pandemic was 29.6%, while a study by Setyavari in Iran found an increase in stress events reaching 51.7%.[5,6] Stress is a person's adaptation mechanism in dealing with changes in the surrounding environment.[7] Several factors affect stress levels, and one of them is magnesium levels. Magnesium levels are associated

with various diseases, such as mental disorders, cardiovascular disease, and diabetes mellitus.[8] Magnesium plays a role in maintaining electrolyte balance and calcium, plays a role in DNA and RNA synthesis and cell respiration, and plays a direct role as an enzyme activator.[9,10] Another factor that can affect stress levels is fitness. In an unfit body condition, a person becomes more susceptible to suffering from stress and depression, which will ultimately affect the quality of health and quality of life.[11,12] Based on meta-analyses conducted on studies that assessed the relationship between fitness and stress, some state that there is a relationship between fitness and stress. In contrast, some studies get the opposite result.[13] The study by Mok et al. found a relationship between fitness and stress, while another study by Cooper et al. got the opposite result.[14,15] This difference in results made researchers interested in learning more about magnesium levels, fitness, and stress levels, and the objective of this study was to assess the relationship between magnesium levels, fitness, and stress levels in online drivers.

METHODS

Research design

This research is an observational analytic study with a cross-sectional design using a consecutive non-random sampling method. The research involving online motorcycle taxi drivers was conducted at Campus B, Faculty of Medicine, Trisakti University, in September 2022. The inclusion criteria for this study were 15-64 years old, willing to be a respondent, signing informed consent, and communicating well. Exclusion criteria in this study were respondents who were on anti-depressant or anti-anxiety medication and had a history of angina and heart attack within one month before the examination. The data will be processed by bivariate analysis with a chi-square test with a significance limit (α <0.05).

Data collection

The magnesium blood level was analyzed from the blood sample obtained by vein puncture, fitness level was assessed using a 6-minute walk test, and stress level was assessed using the PSS - 10 questionnaire. The blood sample obtained by vein puncture was analyzed for magnesium level by Prodia laboratory. The fitness level of the respondent was assessed using a 6-minute walk test and the result of the distance was calculated into a formula that predicts the VO2 max of the respondent. The PSS-10 questionnaire consists of 10 questions, and the resare ults then classified based on the score into 3 categories: low stress level (score 0-13), moderate stress level (score 14-26), and high stress level (score 27-40).

Statistical analysis

Data analysis was performed using Statistical Package for Social Sciences (SPSS) for Windows 20.0 version with univariate and bivariate analysis. In univariate analysis, the description of the participants was tabulated regarding age, gender, blood pressure, body mass index, blood magnesium level, fitness, and stress level. The bivariate analysis was done using Chi-square and Fisher test with p-value <0.05. There were six bivariate tests done in this study. The tests analyzed the relationship between age and stress level, gender and stress level, body mass index and stress level, blood pressure and stress level, blood magnesium level, and stress level, and the last one was to analyse the relationship between fitness and stress level.

Ethical approval

This research received ethical approval from the Medical Research Ethics Commission of the Faculty of Medicine, Universitas Trisakti, with an ethical clearance letter number 174/KER/FK/VIII/2022.

RESULTS

Table 1. Sociodemographic Characteristics of Respondents

Variable	N	Percentage
Age		
Young adult	18	21.2
Middle aged	58	68.2
Old aged	9	10.6
Gender		
Male	69	81.2
Female	16	18.8
Blood pressure		
Not hypertension	43	50.6
Hypertension	42	49.4
Body Mass Index		
Underweight	8	9.4
Normal	23	27.1
Overweight	13	15.3
Obese	41	48.2
Magnesium Levels		
Normal	74	87.1
Abnormal	11	12.9
Fitness		
Very low	83	97.6
Low	2	2.4
Good	0	0
Very good	0	0
Stress Level		
Low	33	38.8
Moderate	52	61.2
High	0	0

Based on the data obtained, most respondents were middle-aged, and more than 80% were male. The physical examination found that the number of respondents who had hypertension and those who did not were almost the same, namely around 50% for each group. From the assessment of body mass index, it was found that most respondents belonged to the obese group. For the independent variable in this study, namely magnesium levels, it was found that 87% of respondents had blood magnesium levels within normal limits. In contrast, for the fitness variable, it was found that all respondents had less and significantly less fitness. For the stress variable, it appears that more than 60% of respondents have a moderate stress level (Table 1).

Table 2. Relationship between blood magnesium level, fitness, and stress level

	Stress Level			
	Not Stress	Stress	Total (n)	p
Age				
Young adult	15 (41.7)	21 (58.3)	36	0.645*
Middle – Old aged	18 (36.7)	31 (63.3)	49	
Gender				
Male	29 (42.1)	40 (57.9)	69	0.208*
Female	4 (25)	12 (75)	16	
Body Mass Index				
Underweight-normal	14 (45.2)	17 (54.8)	31	0.364*
Overweight-obese	19 (35.2)	35 (64.8)	54	
Blood Pressure				
Not Hypertension	15 (34.9)	28 (65.1)	43	0.451*
Hypertension	18 (42.9)	24 (57.1)	42	
Magnesium Level				
Normal	26 (35.1)	48 (64.9)	74	0.099^
Low	7 (63.6)	4 (36.4)	11	
Fitness				
Moderate-low	32 (38.5)	51 (61.5)	83	1.000^
Very Low	1 (50)	1 (50)	2	

*Chi square test, p>0.05

^Fisher test, p>0.05

Based on the bivariate analysis table with the Chi-square test, the results showed no statistically significant relationship between age and stress levels or between gender and stress levels with p values respectively 0.645 and 0.208. Likewise, in the chi-square test between body mass index and blood pressure with stress levels obtained p values of 0.364 and 0.451 it can be concluded that there is no statistically significant relationship between the two variables. The relationship between magnesium levels and stress levels and between fitness and stress levels was analyzed using Fisher's test, and the p values were 0.099 and 1.000, respectively, so it can be concluded that there was also no significant relationship between the two variables.

DISCUSSION

In the bivariate analysis for age and stress level variables, even though there was no statistically significant relationship, it was known that the number of respondents who experienced stress was higher in middle-old respondents compared to young adult respondents. Yunitri et al. obtained similar results, stating that the incidence of stress disorders due to the COVID-19 pandemic was more youthful than old age. In theory, it was stated that older adults were considered more vulnerable to stress disorders. However, a different conclusion was obtained in a study by Fiske et al., which said that although the incidence of stress in old age was lower, the consequences and the tendency to develop suicidal ideation were higher in older adults due to several stress-triggering factors and depression in old age such as changes in cognitive function, neurobiological changes, other events that can cause stress in life, and lack of interaction with the environment other than genetic factors.[16,17]

In the analysis of the relationship between gender and stress levels, there was also no statistically significant relationship between the two. Still, if seen from the distribution of the data, it appears that the number of stress events is higher in women than men. The same results were obtained in studies by Fiske et al., Pappa et al., and Du et al., which stated that the incidence of anxiety disorders, stress, and depression was higher in women than men.[17-19]

Based on the results of bivariate tests between body mass index and stress levels, no significant relationship was found between the two. However, if you look more closely, the respondents with underweight-normal BMI, the number of respondents who suffer from stress disorders compared to those who do not have results that are not much different, while the respondents with overweight-obese BMI, the number of stress events is much higher, reaching more than 64 %. Similar results were obtained in the study by Du et al., which stated no significant relationship between stress and body mass index. Still, both variables were significantly influenced by the intermediate variable, namely emotional eating.[18] Different results were obtained in the study by Lin et al., who stated that there is a correlation between stress events and body mass index. This difference in results could be due to the large number of samples where Lin et al.'s study involved 1700 respondents, while this study only involved 85 respondents.[20]

The analysis of the relationship between blood pressure and stress levels obtained results that were not significant. If examined further, it can be seen that the number of stress events was found more in respondents who did not have hypertension. Similar results were obtained by Agyei et al., who, in their study, stated that there was no significant relationship between psychosocial stress and blood pressure. Different results were obtained in research by Al-Isawi, where it was said that respondents who suffered from stress disorders had a relatively high incidence of hypertension, namely as much as 47%, but further studies were needed to assess the relationship between the two variables. In the study by Al-Isawi, there were 500 male respondents involved, while in this study only 85 respondents were involved and the respondents were both male and female. The differences in gender and number of respondents involved can be the cause of the differences in results.[21,22]

In the analysis of the relationship between magnesium levels and stress levels, results were not statistically significant, where 64.9% of respondents with normal magnesium levels experienced stress levels, while only 36.4% of respondents with low magnesium levels experienced stress. This insignificant result could be due to the homogeneous characteristics of the respondents, where 87% of the respondents had normal blood magnesium levels. Different results were obtained from the study of Noah et al., which stated that the administration of magnesium could improve depression and anxiety scores and changes in mood related to stressful conditions.[23] A study by Macian et al. in fibromyalgia patients with mild-moderate stress disorder and Allaert et al. also found a significant relationship between giving magnesium and reduced stress and fatigue levels.[24,25] Studies by Kozin et al. in vitro also found that there was the effect of giving magnesium comenate before and during three days of exposure to stress will reduce the oxidative damage that occurs in these nerves. A study by Noah and Macian was a prospective double-blind randomized controlled trial and used DASS-42 to assess stress, while this study was a cross-sectional study and used a PSS-10 questionnaire to assess stress. The differences in methods and tools can cause the differences in the result.[26]

The tests on the variables of fitness and stress also found no statistically significant relationship between the two. However, from the distribution of respondent data, it can be seen that as many as 61.5% of respondents with low fitness experienced stress. However, for respondents with very low fitness, the number of those who were stressed and those who were not stressed was the same number. This can be caused by an uneven distribution of data. In the initial data, no respondents had good or very good fitness. After cell merging, almost all respondents were included in the moderate-low fitness category, while the very low fitness category was only found in 2 respondents. The existence of this homogeneous data can be one of the causes of not obtaining a meaningful relationship between the two variables. Similar results were obtained in a study by Schilling, who found that increased fitness was related to the incidence of metabolic syndrome and blood pressure but not significantly related to levels of work stress.[27] The results of the analysis between fitness and stress differed from those obtained in the study by Maran et al.,

which states that physical exercise reduces stress levels so that, in the end, it increases the welfare of life in the police. The difference in the results can be caused by the different tools used to measure the stress. Maran et al used the General Health Questionnaire-12 and Distress thermometer, while this study used the PSS-10 questionnaire to assess the stress level. Besides, this was a cross-sectional study in which the respondents' fitness was only assessed without analyzing the type of physical activity they did before, while in the study by Maran et al the respondents could choose one of the available courses and participate in the course for 7 months.[28]

The limitation of this study is that measurements were made only on variables of blood magnesium levels, fitness, and stress levels. This study does not measure other factors that can cause stress, such as social relations and economic factors. Suggestions for further research are to measure different variables that trigger stress so that it can be determined which factors most influence stress events other than magnesium levels and fitness.

CONCLUSION

From the statistical tests that have been carried out, it is known that there is no statistically significant relationship between the variables age, gender, BMI, blood pressure, magnesium levels, and fitness with stress levels. As for the BMI variables, although there is no statistically significant relationship the stress level was higher in overweight-obese respondents.

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AUTHORS CONTRIBUTION

Study conception and design: FC, EM; data collection: FC, EM, AH, JC, EES; analysis and interpretation of results: AH, JC; draft manuscript preparation: FC. All authors reviewed the results and approved the final version of the manuscript.

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CONFLICT OF INTEREST

"Competing interests: No relevant disclosures".

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