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Correlation between phq-9 score and physical activity level, risk factors and non-communicable diseases in patients in family medicine clinic

Research Article

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Abstract: The work of physicians in primary health care is essential in prevention and early detection of health risk factors. To determine the incidence of depression among patients in family medicine clinics, as well as the correlation between depression, risk factors and NCDs, and to determine correlation between depression (PHQ-9 score) and the level of physical activity. The pilot study was conducted from January to March 2010 on 100 patients using the Patient Health Questionnaire (PHQ-9) and the International Physical Activity Questionnaire (IPAQ). The family doctor randomly interviewed and measured patients' weight, height, blood pressure, fasting blood glucose and cholesterol and noted the presence of earlier diagnosed non-communicable diseases. The data for 92 patients were processed according to PHQ-9 and IPAQ guidelines. Out of 92 patients, 59 (64,1%) had PHQ-9 score ≤ 4 which suggests the absence of depression. The PHQ-9 score median was within normal limits, therefore, treatment was not required and there was no difference in PHQ-9 score median between patients with respect to age and sex. The level of physical activity was moderate in 39,1%, heavy in 35,9% and walking as physical activity in 25,0% of patients. Correlation coefficient between PHQ-9 score and MET score ($r=-0,241$) was statistically significant ($p<0,05$), as well as between PHQ -9 score and anxiety ($r=0,27$; $p<0,01$). Most studies show a correlation between depression and physical activity. It is essential to promote physical activity in order to prevent anxiety, depression and non-communicable diseases.

Keywords: *Depression • Physical activity • Family medicine • PHQ-9 score • MET score*

1. Introduction

The work of physicians in primary health care is essential in prevention and early detection of health risk factors. In today's society, leading risk factors such as: smoking, poor eating habits, hypercholesterolemia, hyperglycemia, hypertension, physical inactivity ,stress, and depression are all very significant in terms of maintenance and perseveration of personal health.

Family physicians in primary care have more of an opportunity to see a patient with depression than with any other disorder, except with hypertension.

Depression is marked as a leading cause of disability and premature death in persons aged 18-44 years worldwide and it is expected to be the second leading cause of disability in persons of all age in 2020 [1,2].

Depression can occur at any time during a lifetime, but it usually occurs in the mid- twenties. A depressive mood in young persons is a risk factor for depression that occurs later in life [3]. Depression among elderly persons becomes a serious health problem as well. It occurs mainly in those with chronic diseases and cognitive disabilities, causing family problems, disability and an increased mortality rate. Its incidence and prevalence doubles in persons 70 to 85 years of age. Based on the high rate of relapses, depression is widely characterized as a chronic disorder along with diabetes, hypertension and asthma.

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Approximately one half of depressive patients have a relapse within two years, and more than 80% within 5-7 years. Relapse is the major reason of increased mortality in depression [4-6].

Out of 12 million depressive persons in the USA, only 46%-57% is treated and only 18%-22% is treated properly [7].

According to data from several surveys conducted in Europe and worldwide, currently the prevalence of depression is 5%-10%, depending on the definition of depression and on the surveyed population. It is estimated that lifetime prevalence of depression in adults is 18%, and the lifetime risk of incidence of depression is 20%-30%. Major depression has higher prevalence in women than in men, but is also more severe and complex clinical features, as well as more complicated progression of disease and worse recovery. In countries with a stable economy, it is estimated that 15% of the general population has significant symptoms of depression, while 10% of visits in primary care are associated with depressive disorders [8].

1.1. Objective

Patients in family medicine in our country are exposed to various risk factors, as well as the occurrence of depression with low levels of physical activity. So the objective of our study was:

- Determine the frequency of depression among patients in family medicine clinics, as well as the correlation between depression and risk factors (increased fasting blood glucose and serum cholesterol level, body mass index (BMI), systolic and diastolic blood pressure).
- Determine the correlation between the PHQ-9 score with diseases that were previously detected in the examined patient.
- Determine whether there is a correlation between PHQ-9 score for depression and MET score for physical activity level.

2. Material and Methods

A thorough pilot study was conducted in Family medicine clinics in Banjaluka from January to March 2010. Family doctor interviewed randomly 100 patients using Patient Health Questionnaire (PHQ-9) which is used for screening of patients with depression symptoms and International Physical Activity Questionnaire (IPAQ), used for physical activity measurement. International Physical Activity Questionnaire (IPAQ) is designed to assess the level of physical activity for persons 18-69 years old [9]. Both categorical and continuous indicators of physical activity are possible from both IPAQ forms. However, given the non-normal distribution of energy expenditure in many populations, it is suggested that the continuous indicator be presented as median minutes/week or median MET–minutes/week rather than means (such as mean minutes/week or mean MET-minutes/week). The IPAQ Research Committee propose that these data are reported as comparisons of median values and inter quartile ranges for different populations. There are three levels of physical activity proposed to classify populations: Low, Moderate and High [9]. The selected MET values were derived from work undertaken during the IPAQ Reliability Study undertaken in 2000-2001. [10]. Using the Ainsworth et al. Compendium (*Med Sci Sports Med* 2000) an average MET score was derived for each type of activity. For example; all types of walking were included and an average MET value for walking was created. The same procedure was undertaken for moderate-intensity activities and vigorous-intensity activities. The following values continue to be used for the analysis of IPAQ data: Walking = 3.3 METs, Moderate PA = 4.0 METs and Vigorous PA = 8.0 METs [9].

Patient Health Questionnaire (PHQ-9) is an excellent screening tool for depression in primary health care [11-13]. The Patient Health Questionnaire (PHQ-9) developed by Pfizer Inc. has proven to be an excellent means of monitoring levels of severity of depression over time. During the course of monitoring, patient adherence to depression treatment plans, care managers utilize a variety of forms that both assist in the collection and summarization of information about individual patient status. These forms also provide an essential means of coordinating communication for care managers and clinicians.

The patients weight and height, blood pressure and fasting blood glucose and cholesterol levels were measured and the presence of existent non-communicable diseases registered. Collected data were processed according to PHQ-9 [11-13] and IPAQ [9]. Eight patients were excluded from the analysis as they achieved more than 960 MET minutes on IPAQ.

Statistics parameters used in the study were: frequencies, percentages, mean, standard deviation and standard error, chi-square (χ^2) test, Pearson's correlation coefficient, F-test, with statistical significance level of 95%. For data processing analysis we used SPSS software program.

Table 1. Distribution of the sample, by sex, age and employment status.

	Frequency f	Percentage %
Total	92	100
Sex		
-Male	45	48.9
-Female	47	51.1
Age range		
19-24	6	6.5
25-34	28	30.4
35-44	29	31.5
45-54	8	8.7
55-64	12	13.0
≥ 65	9	9.8
Employment status		
-employed	53	57.6
-unemployed	10	10.9
-student	11	12.0
-retired person	18	19.6

3. Results

Out of 92 patients, 47 (51.1%) were female and 45 (48.9%) male. Patients were divided into following age groups: 19-24 years (6.5 %), 25-34 (30.4%), 35-44 (31.5%), 45-54 (8.7%), 55-64 (13.0%) and ≥65 (9.8%). Considering employment status, the majority of patients, 57.6% were employed, 19.6% retired, 12.0% students and 10.9% unemployed (Table 1).

The mean value PHQ-9 score was 1.40 for male and 1.43 for female, with no statistically significant difference with respect to gender. Considering age, the mean value was < 4 and there was no statistically significant difference with respect to age groups. (Table 2) Out of 92 examined patients, in 64.1% PHQ-9 score was ≤ 4 which was suggestive of absence of depression, with statistically significant difference ($p<0.05$) compared to 30.4% with 5-14 score, which required further clinical assessment for depression and 5.4% with ≥15 score which required further treatment. The values of correlation between the results level of physical activity and depression was $r = -.241$, with statistical significance $p <0.05$, that suggest values of PHQ-9 score in patients whose score on the PHQ-9 senior scala ie those patients who need therapeutic treatment significantly less time spent in various physical activities (Table 3).

In Table 4, there are correlations between PHQ-9 score ≥15 and fasting blood glucose, serum cholesterol level, body mass index, systolic and diastolic blood pressure, but without of statistical significance.

Regarding correlation between PHQ-9 score ≥15 and diseases in our patients, there was a statistically significant correlation only in anxiety - F41 ($r=0.27$; $p=0.01$), but correlation between PHQ-9 score and hypertension (I10), coronary disease (I25), diabetes mellitus (F14), hypercholesterolemia (E78), headaches (G44) and low back pain (M47) there was no statistical significantly (Table 5).

4. Discussion

Considering the fact that many diseases are related to a sedentary lifestyle, as well as risk factors for non-communicable diseases, physical activity appears to be a major factor in prevention of these diseases in primary

Table 2. Values PHQ-9 score in relation to sex and age of the patients.

	PHQ-9 scor					
	Frequency	M	Mean SD	Mean SE		
Sex					t-test	-.204
-Male	45	1.40	.65	.097	df	90
-Female	47	1.43	.54	.079	p	.839
Age range						
19-24	6	1.33	.52	.21		
25-34	28	1.29	.53	.10	F-test	1.44
35-44	29	1.41	.68	.13	df	91
45-54	8	1.75	.71	.25	p	.22
55-64	12	1.67	.49	.14		
≥ 65	9	1.22	.44	.15		

M-arithmetic mediana
SD-standard deviation
SE-standard error

Table 3. Frequency of score gained on PHQ-9 and IPAQ in interviewed patients and correlation coefficient.

	frequency			frequency	
Variable PHQ-9 scor	f	%	Variable IPAQ	f	%
≤4No depression	59	64.1	Vigorous	33	35.9
5-14Clinical assessment of depression is needed	28	30.4	Moderate	36	39.1
≥15Depression	5	5.4	Low	23	25.0
Total	92	100	Total	92	100
χ^2	47.891		χ^2	3.022	
df	2		df	2	
p	.000		P	.221	
PHQ-9 scor			MET scor		
			R	-.241	
			P	.021	

χ^2 -Chi-square test
r - Pearson's correlation coefficient
df - degree of freedom
p - statistical significance level

Level of physical activity in MET minutes
Vigorous > 3000 MET minutes per week
Moderate 600 - 3000 MET minutes per week
Low < 600 MET minutes per week

Table 4. Correlation coefficient of depression (PHQ-9 ≥15) and increased fasting blood glucose and serum cholesterol level, BMI, systolic and diastolic blood pressure.

		PHQ-9 score
Fasting blood glucose	r	.267
	p	.080
	N	44
Serum cholesterol level	r	.047
	p	.772
	N	41
BMI (body mass index)	r	.176
	p	.097
	N	90
Systolic blood pressure	r	-.024
	p	.825
	N	91
Diastolic blood pressure	r	.057
	p	.588
	N	92

r - Pearson's correlation coefficient
df - degree of freedom
p - statistical significance level
*** - statistical significant correlation on the level 0,01*
** - statistical significant correlation on the level 0,05*

Table 5. Correlation coefficient of present NCDs and depression (PHQ-9 ≥15).

		PHQ-9 score
Hypertension (I 10)	r	.007
	p	.948
	N	92
Coronary disease (I 25)	r	.113
	p	.283
	N	92
Diabetes mellitus (E 14)	r	.110
	p	.295
	N	92
Hypercholesterolemia (E 78)	r	.113
	p	.283
	N	92
Headaches (G 44)	r	.189
	p	.071
	N	92
Anxiety (F 41)	r	.266(*)
	p	.010
	N	92
Low back pain (M 47)	r	.165
	p	.115
	N	92

r - Pearson's correlation coefficient
df - degree of freedom
p - statistical significance level
*** - statistical significant correlation on the level 0,01*
** - statistical significant correlation on the level 0,05*

care. Physical activity has a key role in preventive and therapeutic strategies in guidelines for clinical practice in family medicine. We can consider it an important aspect of management of depression.

In our sample, there is statistically significant correlation ($p<0.01$) between the time that patients spend sitting and depression ($r=0.328$), which suggests that those who gain higher score on PHQ-9 spend more time sitting.

Other researchers have found similar correlation between depression and physical activity in their surveys [14,15].

There is inverse correlation between the time that patients spend walking and depression (r=-0.226; p<0.05) which means that persons who spend more time walking have less incidence of depression.

Considering moderate physical activity and depression, correlation the coefficient is not statistically significant. Considering vigorous physical activity and depression, the statistical significance level comes close to 0.05, and therefore we could assume by increasing the number of interviewed patients, that those who spend less time doing vigorous physical activity are prone to depression.

The study on correlation between physical activity and lifestyle conducted in Estonia showed that 92% of interviewed female family doctors do moderate to vigorous physical activity and that the level of physical activity was not related to age, BMI, living area and time they spent sitting [14]. The survey that compared BMI, blood pressure and waist circumference with the level of physical activity, using IPAQ among students in Brazil found sedentary lifestyle in 52% of students. Therefore, should be performed assessment of the cardiovascular risk and preventive activities [15].

Research is needed to better elucidate the relationship between obesity and depression, which has been most consistently demonstrated for women, but not for men. We examined exclusively a population-based sample of US women who participated in the 2005 or 2006 National Health and Nutritional Examination Survey. A total of 10,348 individuals of all ages were included in NHANES 2005–2006. BMI was positively correlated with probability of moderately/vigorous symptoms of depression (score ≥ 10) (r = 0.49, p = 0.03) and major depression (r = 0.72, p <0,0001) on PHQ-9 [16].

In our sample, there was no statistically significant difference of correlation coefficient between risk factors for non-communicable diseases (fasting blood glucose, serum cholesterol levels, BMI, systolic and diastolic pressure) and depression.

The correlation coefficient values between fasting blood glucose level (and partly BMI) and PHQ-9 score come close to statistical significance level of 0.05.

The results of the study conducted in the USA [17] reported no correlation of average HbA1c, systolic blood pressure, serum LDL cholesterol level and the incidence of depression. The study about relation between physical activity and mental health conducted in 15 countries of European Union included 16230 persons. The conclusion of the study is that those who are physically more active, are in general of better mental health [18]. The importance of physical activity as a therapy for clinical or subclinical depression or anxiety and improvement of life quality through enhanced self-esteem, improved mood, reduced stress and anxiety, resilience to stress, or improved sleep is reported in the study conducted in the UK. Regular moderate training should be considered an important part of treatment of depression and anxiety, as well as improving mental health in general population [19].

5. Conclusion

Results of our survey indicate that there a correlation coefficient between depression and risk factors of non-communicable diseases (body mass index, fasting blood glucose, serum cholesterol, systolic and diastolic blood pressure), but with no statistical significance. But the correlation between depression and the level of physical activity is significant. On the hand, the correlation between depression and the level of physical activity is significant. Our pilot study should serve as the basis for the use of PHQ-9 questionnaire in primary health care for rapid assessment of depression in patients. A determination of need and level of physical activity to promote the same is also necessary.

Family doctors should encourage lifestyle changes in a sense of increasing the level of physical activity in their patients. It is essential to make additional efforts to promote physical activity especially among those who are physically inactive and to include the local community and authorities in promotion of physical activity as a healthy lifestyle. Also, local community should be encouraged to create healthy environment and recreation centers for promotion of physical activity in order to prevent anxiety and depression, as well as other non-communicable diseases related to this risk factor. Undertaking these activities, family doctors should play a major role in promoting healthy lifestyle and the prevention of diseases. Likewise, the family doctor should recognize depression symptoms in his patients and adequately treat them in order to promote mental health.

References

[1] Murray CJL, Lopez AD, eds. The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability From Diseases, Injuries, and Risk Factors in 1990 and Projected to 2020. Cambridge, MA: Harvard University Press; 1996

[2] Murphy JM, Laird NM, Monson RR, Sobol AM, Leighton AH. A 40-year perspective on the prevalence of depression: the Stirling County Study. Arch Gen Psychiatry. 2000;57(3):209-215

[3] Hankin BL. Adolescent depression: description, causes, and interventions. Epilepsy Behav. 2006 Feb; 8(1):102-114. Epub 2005 Dec 13

[4] Alexopoulos GS. Depression in the elderly. Lancet. 2005;365(9475):1961-1970

[5] Kates N, Mach M. Chronic disease management for depression in primary care: a summary of the current literature and implications for practice. Can J Psychiatry. 2007;52(2):77-85

[6] Whooley MA, Simon GE. Managing depression in medical outpatients. N Engl J Med. 2000;343(26):1942-1950

[7] Kessler RC, Berglund P, Demler et al. The epidemiology of major depressive disorder: results from the National Co morbidity Survey Replication NCS-R). JAMA. 2003;289(23):3095-3105

[8] Sadock BJ, Sadock VA, Kaplan. National Comorbidity Survey: Comphrensive Textbook of Psychiatry, UK, 2000

[9] Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ). Short and Long Forms. Revised November 2005. http:// www.ipaq.ki.se

[10] Craig CL,Marshall A , Sjostrom M et al. International Physical Activity Questionnaire: 12 country reliability and validity Med Sci Sports Exerc 2003

[11] Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001 Sep;16(9):606-13

[12] Dietrich AJ, Oxman TE, Burns MR et al. Application of a depression management office system in community practice: a demonstration. J Am Board Fam Pract. 2003 Mar-Apr; 16 (2):107-14

[13] Pinto-Meza A, Serrano-Blanco A, Penarrubia MT et al. Assessing depression in primary care with the PHQ-9: can it be carried out over the telephone? J Gen Intern Med. 2005 Aug; 20 (8):738-42

[14] Suija K, Pechter U, Maaroos J, Kalda R, Ratsep A, Oona M, Maaroos HI. Physical activity of Estonian family doctors and their counseling for a healthy lifestyle: a cross-sectional study. BMC Fam Pract. 2010 Jun 18;11(1):48

[15] Martins MD, Ricarte IF, Rocha CH, Maia RB, Silva VB, Veras AB, Souza Filho MD. Blood pressure, excess weight and level of physical activity in students of public university. Arq Bras Cardiol. 2010 Jun 18. pii: S0066-782X2010005000069

[16] Jun Maa, Lan Xiao. Obesity and Depression in US Women: Results From the 2005–2006 National Health and Nutritional Examination Survey Obesity (2010) 18 2, 347–353. doi:10.1038/oby.2009.213

[17] Heckbert SR, Rutter CM, Oliver M, Williams LH, Ciechanowski P, Lin EH et al. Depression in relation to long-term control of glycemia, blood pressure and lipids in patients with diabetes. J Gen Intern Med. 2010 Feb 24

[18] Abu-Omar K, Rutten A, Lehtinen V. Mental health and physical activity in the European Union. Soz Praventivmed. 2004;49(5):301-9

[19] Fox KR. The influence of physical activity on mental well-being. Public Health Nutr.1999 Sep;2(3A):441-8