

FACTORS ASSOCIATED WITH OCCURRENCE OF DEPRESSIVE SYMPTOMS AMONG PATIENTS UNDERGOING MAGNETIC RESONANCE IMAGING

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ABSTRACT

A lot of serious diseases can have depression as the comorbidity. The aim of this study was to inspect the socio-demographic factors and factors related to the MRI procedures, and their influence on the occurrence of depressive symptoms among patients undergoing the magnetic resonance imaging. This research was conducted as a cross-sectional study at the University Clinical Center in Kragujevac in the Department of Radiological Diagnostics. The questionnaire consists of socio-demographic characteristics, but also the questions about data relevant to the MRI. The questionnaire used to assess the presence of depressive symptoms and the degree of depression was Beck Depression Scale, which was validated and had strong internal consistency. The manifestation of symptoms of depression, looking at the sociodemographic factors, depended only of marital status. The analysis showed statistically significant differences for all variables related to radiological procedures (time running MRI scans, type of MRI scans, duration of waiting, disease type). Post-hoc analysis revealed that depressive symptoms were more common among patients undergoing MRI for the first time compared to those having it for the second time, among patients having MRI of the thorax and pelvis compared to MRI of the extremities, among oncology patients compared to orthopedic and neurological patients, and among widowed individuals compared to other marital status groups. Depression is comorbidity to a lot of diseases. This research has brought a lot of significance among the depression and examined factors, which should be acknowledged by radiologists when patient have an appointment for MRI in order to reduce the possibility of people start or continue expressing symptoms.

Keywords: Depression, MRI, sociodemographic factors, radiology.



INTRODUCTION

Depression is a mood disorder that causes a persistent feeling of sadness and loss of interest and can impact daily life of person (1). Physical symptoms of depression are manifested in changes in flow, sleep disturbances, fatigue and loss of energy followed with daily mood swings (1). Depression is considered as a significant public health problem and it may occur as comorbidity in a lot of difficulty diseases.

Diseases that patients suffer from, as well as diseases that are suspected but are still being diagnosed, can affect the patient's mental state and the appearance of symptoms of depression (2). Emphasis should be placed on patients who suffer from, and are in the treatment, of oncological diseases, as well as patients who are suspected of the possibility of malignant diseases. A scientific study has shown that 10% more people with malignant diseases have symptoms of depression compared to those who are healthy (2). It has also been proven that there are symptoms of depression not only in patients but also in their family members and spouses (3).

When we talk about patients diagnosed with oncological disease, attention should be drawn to the effectiveness of treatment of the first stage of the disease in which these patients are found as one of the main influences on the occurrence of depression (4). A MRI (Magnetic Resonance Imaging) scan provides them with an insight into the current state of their primary disease (regression or remission of the disease). In the case of patients who are under suspicion, magnetic resonance imaging is one of the relevant methods for diagnosing the disease (2). For this reason, the length of waiting for a MRI examination is very important, even regardless of the diagnostic suspicion. The longer the period from the establishment of suspicion and the initial medical examination to the MRI examination, patients inevitably spend this period in anticipation of receiving the diagnosis (5). In addition to depression, anxiety is also very common (6). A study conducted in Mostar proved a higher level of depression in outpatients compared to those who were examined during hospitalization (7). In addition, some studies show a close connection between the occurrence of anxiety and depression in patients waiting for a MRI scan (8). Magnetic resonance imaging (MRI) is something new and foreign to patients who encounter this type of examination for the first time (9). However, the length of the examination, the noise of the device, the small space can contribute to the feeling of discomfort and anxiety. The problem is also patients with claustrophobia in whom magnetic resonance imaging very often cannot be performed, or due to the movement results with poor-quality imaging (10).

The most common MRI scans performed are spinal imaging. Patients who suffer of pain in the cervical and lumbar part of the spine for many years are more often older patients. Magnetic resonance imaging in this case shows a better visualization of all muscle and nerve structures that are not covered by CT and radiography (11). Patients, after many years of problems and pain, most often in the cervical and lumbar

part of the spine, undergo examination by magnetic resonance imaging. In a high percentage MRI scans are done when drug therapy and physical therapy no longer have an effect, and there is a progression of symptoms (12). In such patients, there is already a diagnosis formed on the basis of a clinical examination, either by a general practitioner or a neurologist. Magnetic resonance imaging of the spine can show some anatomical damage that is an indication for an operative solution to the problem (11).

A number of scientific studies have shown that there is a difference in occurrence of depression in the genders, and that women are more likely to manifest symptoms of depression. A scientific study has shown and proven a number of factors of epigenetic nature and neurotransmitters and hormones that make women more susceptible to the manifestation of symptoms of depression (13). The hormonal basis for the manifestation of depressive symptoms in women immediately after childbirth has been demonstrated, and that the percentage of depressive symptoms in postpartum women is increasing (14).

The study also proved a greater prevalence of the presence of symptoms of resemblance in women suffering from breast cancer. This is one of the indicators that patients suffering from oncological diseases are more likely to exhibit symptoms of depression. In such patients, magnetic resonance imaging is one of the possible ways to establish or confirm the diagnosis (15). There is also an inevitable connection between depression and oral health, so the impact of personal hygiene and the onset of depressive symptoms are closely related and very common among younger people (16, 17).

The aim of this study was to inspect the socio-demographic factors and factors related to the MRI procedures and their influence on the occurrence of depressive symptoms among patients undergoing the magnetic resonance imaging.

MATERIAL AND METHODS

Study Procedure and Participants

This research was conducted as a cross-sectional study in accordance with the rules of good clinical practice and the recommendations of the Declaration of Helsinki.

The research was conducted at the University Clinical Center in Kragujevac in the Department of Radiological Diagnostics. The duration was 3 months, from December 2024 to February 2025. For the conduction of this research, the Ethical approval of the University Clinical Center in Kragujevac was obtained, and registered under the number 17987/2024.

Participants were eligible for inclusion in the study if they met all of the following criteria:

1. Adults aged 18 years or older
2. Referred for magnetic resonance imaging (MRI) during the study period



3. Able to provide informed consent and participate voluntarily
4. Completed the questionnaire in full
5. Declared the presence of any known diseases as part of the questionnaire

Participants were excluded from the study based on any of the following criteria:

1. Patients who declined to participate voluntarily
2. Incomplete or partially filled-out questionnaires
3. Patients with a previously diagnosed psychiatric disorder (e.g., depression, anxiety, psychosis)
4. Patients under the age of 18

All patients participated voluntarily and anonymously, with signed consent. To conduct this research, paper questionnaires were used, which the respondents filled out in the Department for Magnetic Resonance Imaging examinations immediately before the examination. The total number of respondents is 120. Final number of participant included was 118.

Applied Questionnaires

A) Socio-Demographic Data

The questionnaire consists of socio-demographic characteristics that the respondents independently declared such as gender, age, level of education, marital status, but also the questions about the magnetic resonance like the length of waiting for the examination, the number of performed MRI in case of individual respondent, diseases they suffer from, and type of MRI referring to the body part.

The age of the patients ranged from 18 to 78 years.

Patients were divided into two groups: those who undergo a MRI scan for the first time, as well as those for whom this was at least the second time they had a MRI scan.

All patients reported the length of wait for a MRI examination, which ranged from 5 days to 16 months. The waiting time is divided into periods of 1-15 days, 15-30 days, 1-3 months, 3-6 months, 6-9 months, 9-12 months, as well as those who have waited for more than a year.

Patients were also divided accordingly to the level of their education into six groups, as follows elementary, high school, higher school, faculty, master, and PhD.

A questionnaire was also filled out about the type of examination that patients do MRI of the head, MRI of the neck, MRI of the chest, MRI of the abdomen, MRI of the small pelvis, MRI of the spinal column, MRI of the upper and lower extremities.

B) Symptoms of Depression

The questionnaire used to assess the presence of depressive symptoms and the degree of depression was validated by

the Beck Depression Scale. The BDI-II scale was used to assess symptoms of depression. This scale consists of 21 questions, where each one is graded between 0 and 3 points. Intention was to record a range of depression symptoms, the person has encountered throughout the previous week. The rating scale was as follows: 0–13: no/minimal symptoms; 14–19: mild depressive symptoms; 20–28: moderate depressive symptoms; 29–63: severe depressive symptoms.

The questionnaire were validated and used in the Serbian language. Reliability and internal consistency of a scale BDI expressed by Cronbach's alpha coefficient was assessed as excellent ($\alpha = 0.91$) (18).

Statistical Analysis

Data was analysed using the Statistical Package for Social Sciences Software, version 21 (SPSS, Chicago, Illinois, version 21.0). Number of cases and frequency were generated for the descriptive data. A chi-square test was used to assess the correlation between categorical variables. Due to structure of contingency tables and presence of small expected cell counts for certain variables, the assumptions for traditional Person chi-square test were not fully met. While Fisher's Exact Test was suitable for small samples it was less practical for multi-category tables. Therefore, the Monte Carlo simulation method was selected as more appropriate alternative. We assessed impact of sociodemographic characteristics and factors related to the radiology diagnostic procedures with occurrence of depression symptoms. The level of significance was measured as $p < 0.05$. Post-hoc analysis – Bonferroni analysis, was performed for the categorical variables that showed significance, to determinate precise significance between investigated groups. Bonferroni use adjusted p value, where 0.05 is divided by the number of performed tests.

RESULTS

Of the 120 total participants, 2 participants were excluded from the study due to a previously known psychiatric diagnosis among men, the largest percentage did not show the presence of depressive symptoms, namely 62.3%, while in women the percentage that did not show symptoms of depression was slightly lower, and it amounted to 50.9%. Statistically, there was no significant difference between the genders in this study.

The age distribution of respondents was determined by age groups 18-24 years, 25-34 years, 35-44 years, 45-54 years, 55-64 years, and older than of 65 years. Among all age groups, the highest percentage of respondents did not show symptoms of depression. The age group 18-24 year showed the highest percentage of respondents who did not show symptoms of depression (71.5%). The largest number of subjects with mild symptoms of depression is represented among patients aged 55-64 years (35.5%) Subjects with mild depressive symptoms are most prevalent among patients over 65 years of age (6.95%), Based on the statistical data that can be seen in Table 1, it has been proven that there is no statistically significant difference between age groups and the manifest-

Descriptive statistics			Depressive symptoms			Monte Carlo Sig. 2 tailed	
Variables	Frequency	Percentage	No symptoms	Weak symptoms	Weak to moderate	Pearson X ² value	Significance CI (lower and upper bound)
Gender							
Male	61	51.7	38 62.3%	21 34.4%	2 3.3%	1.623	0.529 (0.516 – 0.542)
Female	57	48.3	29 50.9%	25 43.9%	3 5.3%		
Age groups							

* Significant level, p less than 0.05

Descriptive statistics			Depressive symptoms			Monte Carlo Sig. 2 tailed	
Variables	Frequency	Percentage	No symptoms	Weak symptoms	Weak to moderate	Pearson X ² value	Significance CI (lower and upper bound)
Time running scans							
First time	60	50.8	27 45.0%	29 48.3%	4 6.7%	7.421	0.016* (0.013 – 0.020)
Second time	58	49.2	40 69.0%	17 29.3%	1 1.7%		
Type of MRI scan							



Descriptive statistics			Depressive symptoms			Monte Carlo Sig. 2 tailed	
Variables	Frequency	Percentage	No symptoms	Weak symptoms	Weak to moderate	Pearson X ² value	Significance CI (lower and upper bound)
Head	23	19.5	15 65.2%	8 34.8%	0 0.0%	44.941	0.002* (0.001 – 0.003)
Neck	5	4.2	4 80.0%	1 20.0%	0 0.0%		
Thorax	1	.8	0 0.0%	0 0.0%	1 100.0%		
Abdomen	12	10.2	7 58.3%	5 41.7%	0 0.0%		
Pelvis	27	22.9	6 22.2%	18 66.7%	3 11.1%		
Vertebral column	31	26.3	21 67.7%	9 29.0%	1 3.2%		
Upper/lower limbs	15	12.7	12 80.0%	3 20.0%	0 0.0%		
Breast	4	3.4	2 50.0%	2 50.0%	0 0.0%		
Duration of waiting						24.992	0.018* (0.015 – 0.022)
1-15 days	3	2.5	1 33.3%	1 33.3%	1 33.3%		
16-30 days	9	7.6	6 66.7%	3 33.3%	0 0.0%		
1-3 months	28	23.7	9 32.1%	19 67.9%	0 0.0%		
3-6 months	34	28.8	21 61.8%	11 32.4%	2 5.9%		
6-9 months	28	23.7	19 67.9%	8 28.6%	1 3.6%		
9-12 months	9	7.6	8 88.9%	1 11.1%	0 0.0%		
1+ year	7	5.9	3 42.9%	3 42.9%	1 14.3%		
Disease type						39.009	0.006* (0.004 – 0.008)
cardiovascular	2	1.7	2 100.0%	0 0.0%	0 0.0%		
endocrinological	8	6.8	3 37.5%	5 62.5%	0 0.0%		
urological	7	5.9	2 28.6%	4 57.1%	1 14.3%		
rheumatological	4	3.4	4 100.0%	0 0.0%	0 0.0%		
gastroenterological	9	7.6	4 44.4%	5 55.6%	0 0.0%		
oncological	23	19.5	4 17.4%	17 73.9%	2 8.7%		
orthopedic	18	15.3	14 77.8%	3 16.7%	1 5.6%		
neurological	36	30.5	29 80.6%	7 19.4%	0 0.0%		
gynecological	11	9.3	5 45.5%	5 45.5%	1 9.1%		

* Significant level, p less than 0.05



Table 3. Post-hoc analysis of variables that showed statistical significance observing the levels of depression, Bonferroni test

Variable 1 (V1)	Variable 2 (V2)	Mean Difference (V1-V2)	Sig. (Adjusted p values)	95% CI	
				Lower bound	Upper bound
MR thorax	MR upper/lower limb	1.79	0.046*	0.02	3.55
MR pelvis	MR vertebral column	0.58	0.009*	0.10	1.06
MR pelvis	MR upper/lower limb	0.71	0.007*	0.14	1.28
Widow	Single	0.95	0.001*	0.39	1.52
Widow	Married	0.98	0.000*	0.47	1.48
Widow	Divorced	0.93	0.001*	0.36	1.50
Oncological	Orthopaedic	0.39	0.011*	0.10	1.26
Oncological	Neurological	0.47	0.002*	0.18	1.18

* Significant level, p less than 0.05

DISCUSSION

Depression is a disease that permeates all aspects of life and many factors can affect the appearance of symptoms of depression, even in people who have not had a tendency to manifest these symptoms before. Every examination of the patient and going to the doctor is a type of stress that people face, and depression and anxiety are often connected (19). However, the occurrence of depression is more common in people who have a health problem compared to people who are healthy (20). It is inevitable that people suffering from severe incurable diseases show more frequent symptoms of depression compared to patients who face health problems who have a better outcome and solution. For this reason, the onset and manifestation of symptoms of depression has been extensively investigated in many populations as well as among patients (13). Research that has been done so far has determined an increased manifestation of depression in women compared to men, as well as the reasons that can lead to it, hormonal, neurotransmitter, epigenetics, and physiological period characteristic for women (21). Within the context of our investigation, gender was not significant factor in occurrence of depressive symptoms when undergoing the MRI.

One of the most important factors in the research conducted at KBC Mostar, was the length of waiting for a MRI examination and patients who waited longer for a MRI examination were more likely to show symptoms of depression (7). More precisely, patients who had an outpatient examination had symptoms in a higher percentage compared to those who were examined in a hospital setting. Patients who were ordered to undergo an examination on an outpatient basis (and patents like this were more common) waited longer for the examination itself and waited for a longer period of time for information about the diagnosis or evaluation of the disease, as well as about the continuation of treatment and possible recurrent challenges (7). However, this was not the case in our study, and we found that waiting time for an

examination was not important factor in decreasing symptoms of depression after Bonferroni analysis.

In people of different marital status, we found that there is a significant difference in the manifestation of symptoms of depression and that people who are widowed are more likely to exhibit symptoms of depression compared to single married and divorced people. In previous studies, different results have been obtained (20). People who are divorced are more likely to show symptoms of depression than people who are married. It is important to note that marital status is a major factor in the manifestation of symptoms of depression. People who are widowers have experienced the pain of losing a partner, and for this reason they are more sensitive to other factors that can lead to the manifestation of symptoms of depression. Depression is a disease that occurs both at all ages and in people of all educational levels (22). In our research, we proved that neither age nor levels of educations were significant factors influencing the manifestation of depressive symptoms among participants undergoing the MRI. A study conducted on young adolescents showed a rapid increase in the prevalence of depressive symptoms, mostly in women (23).

We must not forget that the MRI examination itself is extremely uncomfortable in terms of narrow space, duration, sound, which is a real problem, especially for patients who have claustrophobia. When we talk about patients who underwent magnetic resonance imaging for the first time, they showed symptoms of depression in this study compared to those who underwent this minimum for the second time on a MRI examination. We can relate this to the fact that these patients are encountering this type of examination for the first time and are exhibiting such symptoms, or that they are going for the first time for this type of examination that can diagnose their suspected disease (24). While people who have been repeatedly examined by magnetic resonance imaging (MRI) have significantly fewer symptoms of depression, with the assumption that they have already encountered this



type of examination, and the MRI examination was not something new to them.

Rapid, real-time magnetic resonance imaging is very important, especially for the formation of the diagnosis of the disease, monitoring the effect of therapy, and monitoring the state of the disease, i.e. their phase, regression, progression of remission. When we talk about patients, it is inevitable that the percentage of people suffering from malignant diseases is on the rise in Serbia (25). The percentage of patients suffering from oncological diseases who are treated is extremely high. Numerous studies have shown that these patients are more likely to exhibit symptoms of depression compared to patients who do not suffer from malignant diseases (26). Women with breast cancer show a higher prevalence of depressive symptoms, underscoring the increased risk of depression among oncology patients. MRI can aid in confirming such diagnoses (15). Depression is also closely linked to oral health, with poor hygiene and depressive symptoms frequently co-occurring, especially in younger populations. Oncology patients are faced with such a diagnosis, which is often life-threatening, or disrupts the quality of life to a large extent or even shortens life expectancy (16, 17). Our study showed high occurrence of depressive symptoms among oncological patients. While in patients being treated for neurological or orthopedic diseases, this was not the case. Breast cancer is leading cause of mortality among women and women with breast cancer are more likely to exhibit symptoms of depression than those who are healthy (27). Orthopedic patients are faced with diseases that can often be easily diagnosed and then cured, and do not show symptoms of depression in a high percentage as is the case with oncology patients. In this study, we proved that oncology patients are more likely to suffer from symptoms of depression compared to other patients.

When we talk about the type of examination that patients do, we have proven that patients who do a chest and small pelvic examination are more likely to show symptoms of depression compared to patients who have an examination of the upper and lower extremities and spinal column. We can assume that there is a correlation between these results and diseases that patients suffer from and for which they have undergone magnetic resonance imaging. We can assume that people suffering from prostate cancer, rectal bladders, as well as women suffering from malignant diseases of the uterus and ovaries were more likely to do magnetic resonance imaging, and the percentage of depression in these patients is higher. Or is it possible to prescribe this examination due to the evolution of the disease. So these examinations are more common in patients in whom there may be a clinical suspicion of the presence of secondary deposits in the pelvis. However, in examinations that perform imaging of the spinal column and upper and lower extremities, these are most often orthopedic conditions or possibly neurological conditions that do not greatly impact the length of life, but can certainly affect the quality of life. There is close correlation between the disease on which patient is suspected to have prior to the MRI scanned and the occurrence of depressive symptoms. In

our case, oncological patients expressed more depressive symptoms in comparison to the orthopedic and neurological patients.

Limitations of our study were that we have conducted research only in one center (unicentric study), and we had a relatively small sample size. Also, we consider that our limitation may also be that we did not include the precise diagnosis of the respondents and the stage of their diseases. This can influence the expression of depressive symptoms in patients. We think that this aspect should also be included in future research.

CONCLUSION

The analysis showed statistically significant differences for all variables related to radiological procedures (time running MRI scans, type of MRI scans, duration of waiting, disease type) as well as for marital status. Post hoc analysis revealed that depressive symptoms were more common among patients undergoing MRI for the first time compared to those having it for the second time, among patients having MRI of the thorax and pelvis compared to MRI of the extremities, among oncology patients compared to orthopedic and neurological patients, and among widowed individuals compared to other marital status groups.

- This research has brought a lot of significance among the depressive and examined factors that should be considered when patient have appointment for MRI in order to reduce the possibility of people continue expressing symptoms. Radiologists and medical staff should be more patient and kind towards the individuals seeking for help and diagnostics.

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CONFLICT OF INTEREST

Authors declare no conflict of interest exists.

REFERENCES

1. Chand SP, Arif H. Depression. [Updated 2023 Jul 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK430847/>
2. Smith HR. Depression in cancer patients: Pathogenesis, implications and treatment (Review). *Oncol Lett*. 2015;9(4):1509-1514. doi: 10.3892/ol.2015.2944.
3. Lim SM, Kim HC, Lee S. Psychosocial impact of cancer patients on their family members. *Cancer Res Treat*. 2013;45(3):226-233. doi:10.4143/crt.2013.45.3.226
4. Rosenstein DL. Depression and end-of-life care for patients with cancer. *Dialogues Clin Neurosci*. 2011;13(1):101-8. doi: 10.31887/DCNS.2011.13.1/drostein.



5. Nieto Alvarez I, Madl J, Becker L, Amft O. Patients' Experience to MRI Examinations-A Systematic Qualitative Review With Meta-Synthesis. *J Magn Reson Imaging*. 2025;61(1):480-493. doi:10.1002/jmri.29365
6. Masalma R, Zidan T, Amasheh S, Maree M, Alhanbali M, Shawahna R. Predictors of anxiety in patients undergoing magnetic resonance imaging scans: a multicenter cross-sectional study. *BMC Psychiatry*. 2024;24(1):633. doi: 10.1186/s12888-024-06091-6.
7. Bagaric M, Babic D, Pavlovic M. Anksioznost I depresija kod pacijenata kojima je ordiniran pregled magnetnom rezonancom. *Zdravstveni glasnik*. 2018;4(1):33-39. doi:10.47960/2303-8616.2018.7.33
8. De La Rosa JS, Brady BR, Ibrahim MM, Herder KE, Wallace JS, Padilla AR, Vanderah TW. Co-occurrence of chronic pain and anxiety/depression symptoms in U.S. adults: prevalence, functional impacts, and opportunities. *Pain*. 2024;165(3):666-673. doi: 10.1097/j.pain.0000000000003056.
9. Madl JEM, Sturmbauer SC, Janka R, Bay S, Rohleder N. Preparing patients according to their individual coping style improves patient experience of magnetic resonance imaging. *J Behav Med*. 2022;45(6):841-854. doi: 10.1007/s10865-022-00361-y.
10. Munn Z, Moola S, Lisy K, Riitano D, Murphy F. Claustrophobia in magnetic resonance imaging: A systematic review and meta-analysis. *Radiography*. 2015;21(2):e59-e63. doi:10.1016/j.radi.2014.12.004
11. Jensen MS, Olsen KR, Morsø L, Søndergaard J, Schjøttz-Christensen B. Does changed referral options affect the use of MRI for patients with low back pain? Evidence from a natural experiment using nationwide data. *BMJ Open*. 2019;9(6):e025921. doi:10.1136/bmjopen-2018-025921
12. Suckling J, Nestor LJ. The neurobiology of addiction: the perspective from magnetic resonance imaging present and future. *Addiction*. 2017;112(2):360-369. doi: 10.1111/add.13474.
13. Albert PR. Why is depression more prevalent in women? *J Psychiatry Neurosci*. 2015;40(4):219-21. doi: 10.1503/jpn.150205.
14. Barnes J, Theule J. Maternal depression and infant attachment security: A meta-analysis. *Infant Ment Health J*. 2019;40(6):817-834. doi:10.1002/imhj.21812
15. Javan Biparva A, Raoofi S, Rafiei S, et al. Global depression in breast cancer patients: Systematic review and meta-analysis. *PLoS One*. 2023;18(7):e0287372. doi:10.1371/journal.pone.0287372
16. Janicijevic N, Dimovic T, Stajic D, et al. Correlation between the Oral and Mental Health of University Students in Serbia-A Cross-Sectional Study. *Healthcare (Basel)*. 2024;12(14):1431. doi:10.3390/healthcare12141431
17. Thapar A, Eyre O, Patel V, Brent D. Depression in young people. *Lancet*. 2022;400(10352):617-631. doi:10.1016/S0140-6736(22)01012-1
18. Beck AT, Steer RA, Brown GK. *Bekov Inventar Depresije—Drugo Izdanje [Beck Depression Inventory—Second Edition]*: BDI-II: Edicija Sinapse; Beograd, Serbia: 2019. 63p.
19. McGraw, Mark. Stress, Anxiety Affect MRI Patients' Experience, Imaging Workflow. *Oncology Times*. 2022;44(6):33. doi: 10.1097/01.COT.0000824736.71989.2e
20. Mössinger H, Kostev K. Depression Is Associated with an Increased Risk of Subsequent Cancer Diagnosis: A Retrospective Cohort Study with 235,404 Patients. *Brain Sci*. 2023;13(2):302. doi:10.3390/brainsci13020302
21. Martin LA, Neighbors HW, Griffith DM. The Experience of Symptoms of Depression in Men vs Women: Analysis of the National Comorbidity Survey Replication. *JAMA Psychiatry*. 2013;70(10):1100-1106. doi:10.1001/jamapsychiatry.2013.1985
22. Pilmeyer J, Huijbers W, Lamerichs R, Jansen JFA, Breeuwer M, Zinger S. Functional MRI in major depressive disorder: A review of findings, limitations, and future prospects. *J Neuroimaging*. 2022;32(4):582-595. doi: 10.1111/jon.13011.
23. Keyes KM, Gary D, O'Malley PM, Hamilton A, Schulenberg J. Recent increases in depressive symptoms among US adolescents: trends from 1991 to 2018. *Soc Psychiatry Psychiatr Epidemiol*. 2019;54(8):987-996. doi: 10.1007/s00127-019-01697-8.
24. Zhang FF, Peng W, Sweeney JA, Jia ZY, Gong QY. Brain structure alterations in depression: Psychoradiological evidence. *CNS Neurosci Ther*. 2018;24(11):994-1003. doi: 10.1111/cns.12835.
25. Stepovic MM, Stajic D, Sekulic M, Rajkovic Z, Djonovic N. Analysis of Mortality from Carcinomas Primary Localized in Region of Lip, Oral Cavity and Pharynx in Central Serbia, 1999-2015. *Iran J Public Health*. 2020;49(2):274-282.
26. Smith HR. Depression in cancer patients: Pathogenesis, implications and treatment (Review). *Oncol Lett*. 2015 Apr;9(4):1509-1514. doi: 10.3892/ol.2015.
27. Rancic N, Todorovic M, Stepovic M, Vekic S, Kostic D, Ratkovic M, Radevic S, Simic R and Dragojevic Simic V (2024) Medical cost of breast cancer services in Serbia between 2010 and 2019: national data report. *Front. Public Health* 12:1378886. doi: 10.3389/fpubh.2024.1378886