

Original Article:



Investigation of Depression Prevalence in Slow Coronary Artery Patients

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Abstract

Introduction: There is limited information about the association between Coronary Slow Flow (CSF) phenomenon and depression. This study aimed to investigate the prevalence of depression in slow coronary artery patients in compression of patients with normal coronary artery and those with significant coronary stenosis under angiography at Shafa hospital of Kerman in 2018.

Materials and Methods: This was a cross-sectional study that was performed on 180 people. All participants were divided into three groups (60 patients with CSF diagnosed by elective Coronary Angiography (CAG), 60 people with Coronary Normal Flow (CNF), and 60 patients with significant coronary artery diseases (CAD) who were referred to Shafa hospital of Kerman in 2018. The data collection tool was a questionnaire that included two parts: demographic information and Beck Depression Scale. Data were analyzed by using SPSS 24 software.

Results: The results showed that 55 % of the sample were male and the incidence of mild, moderate, and severe depression is significantly higher among patients with CSF in compromising with normal and coronary stenosis group ($P < 0.0001$).

Conclusion: Due to the significant association between depression and CSF, it is necessary for people with cardiovascular disease to be screened for psychiatric problems.

Keywords: Coronary stenosis, Depression, Prevalence, Slow coronary artery flow

1. Introduction

In selective Coronary Angiography (CAG) of some patients with anginal chest pain, slow contrast agent passage

is seen in the epicardial coronary arteries, (yet no stenosis is observed). This phenomenon is called slow coronary flow (CSF) [1].

The CSF phenomenon was first proposed by

Beltrame et al [2] and seen in about 6 % of patients during CAG (the only diagnostic method) [3]. The exact mechanism of CSF is also unknown, but the most probable underlying mechanism is related to microvascular dysfunction [4].

The results showed that CSF can lead to myocardial ischemia, prolonged QT interval, and ventricular tachycardia (VT). Nevertheless, no guidelines exist for the better management of that [5, 6].

The impact of psychological and psychiatric diseases on the prevalence of the cardiovascular disease has been evaluated in many studies. The results showed that mental illness increased the mortality and morbidity rate of cardiovascular diseases [7,8].

One of the most important mental illnesses affecting cardiovascular diseases is depression, which has a prevalence of 35% [9] in the general population and 30% in people with coronary artery disease (CAD) [10]. However, limited data exist about the association between the CSF phenomenon and depression [11-13]. Against this backdrop, the present study was designed and performed.

2. Materials and Methods

This was a cross-sectional study aimed to investigate the prevalence of depression in CSF patients in comparison with coronary normal flow (CNF) patients and significant coronary stenosis patients

Study patients

In this study, all participants were divided into three groups, i.e., 60 patients with CSF diagnosed by elective Coronary Angiography (CAG), 60 people with Coronary Normal Flow (CNF), and 60 patients with significant Coronary Artery Diseases (CAD); CAD was defined as $\geq 50\%$ narrowing of the diameter of the lumen of the left main coronary artery or $\geq 70\%$ narrowing of the diameter of the lumen of the left anterior descending coronary artery, left circumflex artery or right coronary artery [14] referred to Shafa hospital of Kerman in 2018 (Consecutive sampling).

Patients with major psychiatric disorders and a history of admission to the psychiatric hospital and patients who had been treated with psychiatric medicines were excluded.

Study protocol

At first, patients were informed of how the plan was performed and written consent was given to them. Then, demographic information including age, gender, occupation, history of previous illnesses, education, and the number of previous admissions were collected in the checklist.

Beck depression questionnaire [15] was used to measure depression. The questionnaire has 21 multiple choice questions, each question has a score between 0 and 3, then the total scores are calculated. Scores below 10 indicate no depression; those between 11 to 15 are considered as borderline. Scores between 16 to 20, 21 to 30, and 31 or higher indicate mild, moderate, and severe depression, respectively.

Statistics

Categorical data were expressed as frequency (percentage). All statistical analyses were conducted using SPSS, version 24 (IBM Inc., Chicago, IL, USA). The Chi-Square test and Fisher Exact Test were used for categorical data.

3. Results

The analyses showed that 99 people were male (55 %) and 81 people were female (45 %). The incidence of mild, moderate, and severe depression among CSF patients is significantly higher than the CNF and CAD group, ($P < 0.0001$) (Table 1).

The results showed that 82.8% of the men in the CNF group and 67.5% of them in the CAD group had no depression, while only 20% of the CSF patients were not depressed.

There was also a significant difference between the male gender and severity of depression ($P < 0.0001$) (Table 2). 48.8 % of the women in the CNF group and 25 % of women in the CAD group had no depression, while only 13.3 % of the CSF patients were not depressed. There was also a significant difference between the female gender and severity of depression in the studied groups ($P = 0.011$) (Table 2).

49 people were under the age of 45, of which 27 were CNF and 66.7 % of them were not depressed. 14 people had CSF; 35% of them had borderline depression and 8 people had CAD, of which 62.5% had borderline depression.

Table 1. Comparison of the prevalence of depression among participants

Groups	Depression					Total	P.V
	No depression	Borderline	Mild	Moderate	severe		
CNF	39	11	6	4	0	60	*<0.001
	65.0%	18.3%	10.0%	6.7%	0.0%	100.0%	
CSF	10	17	14	12	7	60	
	16.7%	28.3%	23.3%	20.0%	11.7%	100.0%	
CAD	32	17	2	9	0	60	
	53.3%	28.3%	3.3%	15.0%	0.0%	100.0%	

There were 105 patients between the ages of 45 to 65 years old, of whom 32 people were CNF where 62.5% of them were not depressed, 37 people of them had CSF that 27% had borderline depression; 36 people had CAD among whom 85.5 % had no depression. A significant difference exists between age (45 to 65

years) and severity of depression

Finally, 24 patients were over 65 years old. One of them was CNF without any depression; eight cases with CSF and 15 people with CAD had no depression (45.8 %) (Table 3).

Table 2. Comparison of prevalence of depression among groups based on gender

Gender	Groups	Depression					Total	P.V
		No depression	Borderline	Mild	Moderate	severe		
Male	CNF	24	2	2	1	0	29	*<0.001
		82.8%	6.9%	6.9%	3.4%	0.0%	100.0%	
	CSF	6	9	7	5	3	30	
		20.0	30.0%	23.3%	16.7%	10.0%	100.0%	
	CAD	27	9	1	3	0	40	
Female	CAD	67.5%	22.5%	2.5%	7.5%	0.0%	100.0%	0.011*
		57	20	10	9	3	99	
	Total	57.6%	20.2%	10.1%	9.1%	3.0%	100.0%	
		39	11	6	4	0	60	
	CNF	65.0%	18.3%	10.0%	6.7%	0.0%	100.0%	
		10	17	14	12	7	60	
	CSF	16.7%	28.3%	23.3%	20.0%	11.7%	100.0%	
		32	17	2	9	0	60	
	CAD	53.3%	28.3%	3.3%	15.0%	0.0%	100.0%	
		24	25	12	16	4	24	
	Total	29.6%	30.9%	14.8%	19.8%	4.9%	29.6%	

Table 3. Comparison of prevalence of depression among groups based on the age

Age	Group	Depression					Total	P.V
		No depression	Borderline	Mild	Moderate	severe		
Under 45 Y/O	CNF	18	6	2	1	0	27	0.063
		66.7%	22.2%	7.4%	3.7%	0.0%	100.0%	
	CSF	3	5	2	3	1	14	
		21.4%	35.7%	14.3%	21.4%	7.1%	100.0%	
	CAD	2	5	0	1	0	8	
		25.0%	62.5%	0.0%	12.5%	0.0%	100.0%	
	Total	23	16	4	5	1	49	
		46.9%	32.7%	8.2%	10.2%	2.0%	100.0%	

Table 3. Continued

Beet win 45-65 Y/O	CNF	20 62.5%	5 15.6%	4 12.5%	3 9.4%	0 0.0%	32 100.0%	0.0001*
	CSF	5 13.5%	10 27.0%	9 24.3%	8 21.6%	5 13.5%	37 100.0%	
	CAD	21 58.3%	8 22.2%	1 2.8%	6 16.7%	0 0.0%	36 100.0%	
	Total	46 43.8%	23 21.9%	14 13.3%	17 16.2%	5 4.8%	105 100.0%	
	CSF	1 100.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 100.0%	
Over 65 Y/O	CNF	2 25.0%	2 25.0%	2 25.0%	1 12.5%	1 12.5%	8 100.0%	0.701
	CAD	8 53.3%	4 26.7%	1 6.7%	2 13.3%	0 0.0%	15 100.0%	
	Total	11 45.8%	6 25.0%	3 12.5%	3 12.5%	1 4.2%	24 100.0%	

The results showed that there was a no significant difference between the severity of depression and DM, HTN, or both of them among CSF CNF and CAD groups (Table 4).

According to Table 5, 64 people use opium

(addicted), among them 15 people with CNF had no depression (66.7 %); 27 people with CSF had a high percentage of borderline depression (29.26%), whereas 22 cases with CAD had no depression (54.5%).

Table 4. Comparison of prevalence of depression among groups based on diabetic Mellitus and Hypertension

Group		Depression					Total	P.V
		No depression	Borderline	Mild	Moderate	severe		
Diabetic Mellitus	CNF	2	1	0	1	0	4	0.847
		50.0%	25.0%	0%	25.0%	0%	100.0%	
	CSF	2	1	1	1	0	5	
		40.0%	20.0%	20.0%	20.0%	0%	100.0%	
	CAD	5	4	0	2	0	11	
45.5%		36.4%	0.0%	18.2%	0%	100.0%		
Total	9	6	1	4	0	20		
	45.0%	30.0%	5.0%	20.0%	0%	100.0%		
Hyper tension	CNF	2	0	0	0	0	2	0.226
		100.0%	0.0%	0.0%	0.0%	0%	100.0%	
	CSF	0	1	1	1	0	3	
		0.0%	33.3%	33.3%	33.3%	0%	100.0%	
	CAD	0	1	0	1	0	2	
0.0%		50.0%	0.0%	50.0%	0%	100.0%		
Total	2	2	1	2	0	7		
	28.6%	28.6%	14.3%	28.6%	0%	100.0%		
DM and HTN	CNF	0	1	1	0	1	3	0.261
		0%	33.3%	33.3%	0.0%	33.3%	100.0%	
	CSF	0	0	0	1	0	1	
		0%	0.0%	0.0%	100.0%	0.0%	100.0%	
	CAD	0	1	1	1	1	4	
0%		25.0%	25.0%	25.0%	25.0%	100.0%		
Total	0	1	1	0	1	3		
	0%	33.3%	33.3%	0.0%	33.3%	100.0%		

Table 5. Comparison of prevalence of depression among groups based on opium addiction

	Group	Depression					Total	P. V
		No depression	Borderline	Mild	Moderate	severe		
Addicted	CNF	10 66.7%	2 13.3%	2 13.3%	1 6.7%	0 0.0%	15 100.0%	0.0004*
	CSF	3 11.1%	8 29.6%	7 25.9%	6 22.2%	3 11.1%	27 100.0%	
	CAD	12 54.5%	7 31.8%	0 0.0%	3 13.6%	0 0.0%	22 100.0%	
	Total	25 39.1%	17 26.6%	9 14.1%	10 15.6%	3 4.7%	64 100.0%	
	CNF	29 64.4%	9 20.0%	4 8.9%	3 6.7%	0 0.0%	45 100.0%	
	CSF	7 21.2%	9 27.3%	7 21.2%	6 18.2%	4 12.1%	33 100.0%	
Non - Addicted	CAD	20 52.6%	10 26.3%	2 5.3%	6 15.8%	0 0.0%	38 100.0%	0.0002*
	Total	56 48.3%	28 24.1%	13 11.2%	15 12.9%	4 3.4%	116 100.0%	

4. Discussion

This was the first study in Iran that investigated the association between CSF and depression. The frequency of depression in the CSF group was higher than that in other groups; this finding is consistent with the results of Yalvac et al. [16], Karatas et al. [17], and Durmaz et al. [13]. The study by Yalvac et al. showed that people with CSF had a higher rate of depression than the NCF group. This may be explained by the similarity of mechanisms that affect the pathogenesis of CSF and depression such as inflammation, microvascular abnormalities, endothelial dysfunction, and anatomical factors of epicardial arteries.

Kim et al. showed that depression is associated with coronary endothelial dysfunction in normal people and thus suggested that depression may act as a cardiovascular risk factor [19].

Autonomic regulation of the cardiovascular system in depression has been modulated by activation of the sympathetic nervous system, withdrawal of vagal tone to the heart, elevations in heart rate, reductions in heart rate variability, and altered baroreceptor reflex function [20].

The result of Dormaz et al. showed that patients with depression have a high sympathetic tone, increased cortisol and catecholamine levels, and abnormal platelet activation that increases the risk of CSF.

However, the results of the present study were not in line with the findings of Yavuz et al (Turkey). [18]. They showed that people with NCF were more

depressed than the CSF group.

One reason for the difference in the results of this study with those of Yavuz et al [18] may be related to socio-cultural and environmental differences between Iranians and Turkey (risk factors) that caused depression.

Another reason is related to the difference between data collection tools. In the present study, we used the Beck Depression inventory while Yavuz et al and other studies used the General Health Questionnaire (GHQ), Spielberg questionnaire, and Hamilton Depression Rating Scale.

The Beck questionnaire is a self-report data collection tool, while questionnaires such as the Hamilton Depression Scale should be completed under the supervision of a psychiatric team.

Another reason for this difference has to do with the non-uniform distribution of participants in the CSF and NCF in the study of Yavuz et al, which was considered in the present study.

The results showed that there is no significant association between the two risk factors (diabetes mellitus and hypertension) and the frequency of depression similar to the studies of Yalvac et al. [16], Karatas et al. [17], Yavuz et al. [18] and Durmaz et al. [13]. They did not find any significant association between the frequency of depression in CSF patients with diabetes mellitus and hypertension. For hypertension, this may be explained by the similar rate of its frequency in the three groups. Yet some studies have shown an association between diabetes and hypertension with

depression [21-23]. According to the results, additional research on this issue is recommended.

The results showed a significant association between gender (in both men and women) and the frequency of depression in people with CSF, while in studies of Yalvac et al. [16], Karatas et al. [17], Yavuz et al there were no significant associations between gender and depression in people with CSF.

The frequency of depression in the CSF group among the 45 to 65 participants was significantly higher than that in other groups. We should pay more attention to the mental health of middle-aged people with cardiovascular diseases.

However, in studies by Yalvac et al. [16], Karatas et al. [17], Yavuz et al. [18], and Durmaz et al. [13], no significant associations were found between the incidence of depression in the CSF group and age.

5. Conclusion

In conclusion, we have demonstrated that patients with CSF are more depressed than those other groups; gender, age group (45-65 y/o), and addiction were found to be influential. More studies are needed to investigate the association between patients' emotional status and the CSF phenomenon. The most important limitations of the present study were the small sample size and lack of follow-up studies which could affect the results.

Ethical Considerations

Compliance with ethical guidelines

The study protocol was approved by the institutional review board of the medical ethics committee of Kerman University of medical sciences (IR.KMU.REC.1396.321). Written informed consents were obtained from participating patients or legal representative

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Author's contributions

HS conceived of the present idea; EB developed the idea and written informed consents from the patient, and NS wrote the manuscript. HG helped to conduct

the literature review, verified the analytical methods and wrote the manuscript. SF also helped to conduct the literature review. SD performed the experiments, whereas MASBG contributed in analysis and wrote the manuscript. KH helped with the analyses and wrote the manuscript. All authors reviewed the results and approved the final version of the manuscript.

Conflict of interest

The authors declare that they have no competing interests.

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