Clinical Investigations

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Depressive Symptoms and Risk Factors in Chinese Patients with Premature Ventricular Contractions Without Structural Heart Disease

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ABSTRACT

Hypothesis: Our objective was to study depressive symptoms and potential risk factors in Chinese persons with premature ventricular contractions (PVCs) without structural heart disease.

Methods: The Zung self-rating depression scale (ZSDS) was used to assess depressive symptoms. Correlations between depressive symptoms and sociodemographic and medical factors were analyzed by logistic regression.

Background: Prevalence of depressive symptoms in coronary heart disease (CHD) is higher that in the general population and those for the majority of other chronic symptoms in patients with premature ventricular contractions (PUCS).

Results: Of 1,144 patients with PVCs (488 males, 656 females), age 51 ± 23 years, disease duration 1 mo -23 y, a total of 309 (27%) patients were categorized as having depressive symptoms. Depressive symptoms increased with age, income, education level, nationality, PVC count/24h, society support, and settlement type ($p < 0.05$). Univariate logistic regression showed that being female, level of education, age, settlement type, and PVC count/24h significantly correlated with depressive symptoms ($p < 0.05$). Multivariate logistic regression indicated that 5 variables — female sex, education level, settlement type, age, and PVC count/24h significantly and independently related with depressive symptoms ($p < 0.05$).

Conclusions: In the Chinese population, depressive symptoms in subjects with PVCs were frequent. The village settlement type, female sex, age, PVC count/24h, and education level were independent risk factors for depressive symptoms. Further research on the relationship between PVCs and depressive symptoms in China is necessary.

Key words: premature ventricular contractions, depressive symptoms, risk factor

Introduction

Previous studies have shown that patients with chronic diseases are more susceptible to psychological disorders.[1] In Western countries, depressive symptoms are particularly prevalent among patients with coronary heart disease (CHD). Prevalence of depressive symptoms in CHD is higher than that in the general population and those for the majority of other chronic physical diseases.[2–4] In patients with CHD, depression is associated with poor outcomes, including recurrent cardiac events, mortality, and low functional status or quality of life.[3,4]

Despite the fact that depressive symptoms may precede the onset of CHD and play an important role in the development of CHD,[5] little is known about the prevalence of depressive symptoms in Chinese patients with PVCs. Many Chinese physicians and patients with PVCs are unfamiliar with depressive symptoms and treatments. When

depressed, patients generally seek treatments from primary-care doctors and report their physical symptoms; this results in under-recognition and under-treatment of depressive symptoms. Although there are a few studies on depressive symptoms in the Chinese CHD population,[6] these were based on Chinese individuals residing overseas or were mainly focused on general psychological disorders. No study has explored risk factors of depressive symptoms in people with PVCs. Due to this current limited understanding of the interaction between PVCs and depressive symptoms, further studies on its importance should be undertaken.

In this study, a group of patients with PVCs in the People's Republic of China were investigated using the Zung self-rating depression scale (ZSDS).[7] This scale has been commonly used to discern depressed from nondepressive participants.[8,9] To evaluate the prevalence of depressive symptoms and potential risk factors, sociodemographic and medical data were collected. Sociodemographic data

included: gender, age, income, education level, nationality, social support, and settlement type. Medical data included PVCs duration, 24 h number of PVCs, the percentage of PVCs in 24 h beats, and total cholesterol (TC).

Materials and Methods
Subjects

A total of 1,200 consecutive patients with PVCs were recruited into the study as they attended 12 hospital clinics in 5 provinces across China, from January 2005 to December 2006. The hospitals are all university-affiliated public facilities that serve a population of people with different socioeconomic backgrounds.

The selection criteria included[10,11]: (1) frequent PVC occurrence as documented by average PVC counts from 24-hour ECG (Holter) and not on antiarrhythmic medication, (2) normal life influence, (3) no evidence of structural heart disease.

Exclusion criteria included: (1) asthma, (2) active hyperthyroidism, (3) heart block, (4) congestive heart failure, (5) patients on cardiac stimulant medication, (6) bleeding tendency, (7) currently taking antiarrhythmic medication, and (8) refusal to participate in this study.

Assessment Protocol

Patients were given a Chinese version of ZSDS, a useful and well-validated questionnaire commonly recognized by Chinese psychiatrists.[12] Sensitivity was 85%–90%, while specificity was 90%–95% for Clinical or Diagnostic and Statistical Manual of Mental Disorders (DSMD-IV) in diagnosis of depressive symptoms when a ZSDS score of 40 was used as a cutoff. This is a 20 item, self-report measurement of symptoms of depression. Every question in the ZSDS had four choices and 1 point was assigned for "a," 2 points for "b," 3 points for "c," and 4 points for "d."[13,14] Subjects rated each item according to how they felt during the preceding week. The sum of these 20 items produced a score ranging from 20 to 80. The cutoff score on the Chinese version of ZSDS was 40 in detecting depressive symptoms; 39 or less was regarded as normal. Questionnaires were collected when subjects were interviewed at a later time.

Definitions Used in the Study: Education level: (1) Primary school; (2) Junior high school; (3) Senior high school; (4) Undergraduate; (5) Postgraduate.

The patients were divided into 3 groups according to the percentage of the PVCs, per 24 hours: lower group (L) <10% extrasystoles; middle group (M) 10%–20% extrasystoles; and upper group (U) $\geq$20% extrasystoles (grossly $\geq$20,000 beats/d). And according to the total of ventricular extrasystoles, they were divided into 3 groups: lower group <10,000 beats/d, middle group 10000–20000 beats/d, upper group grossly $\geq$20,000 beats/d.[15]

Settlement types were grouped according to where the participants lived.

Social support and interpersonal relationship status were grouped according to whether the participants had a good social support system or interpersonal environment. Having 1 or several friends and a good relationship with family members, leaders, and comrades reflect good social support or interpersonal environment.

Income level (yuan/year): (1) <10, 000, (2) 10,000–30,000, (3) 30,000–50,000, (4) >50, 000.

Total cholesterol (TC): <5.2 (mmol/l) was the reference range at our laboratory, $\geq$5.2 (mmol/l) was over the reference range.

Statistical Analysis

Statistical analysis was achieved using SPSS 11.5 software (SPSS Inc. USA). Sociodemographic and medical characteristics of participants were summarized by descriptive statistics. Different characteristics of participants were compared by chi-square or Fisher exact test for categorical data. Logistic regression was used to calculate odd ratios (OR) and 95% confidence intervals (CIs) of risk factors. All sociodemographic and medical data were scaled as independent variables. All categorical variables such as education level, nationality, and social support. For multicategory variables, lowest rate of disturbance was chosen as a reference category. Patients whose 95% CI did not include zero were regarded as significantly different from the reference category. Presence and absence of depressive symptoms according to the ZSDS cutoff score were used as dependent variables (absence = 0, presence = 1). A conventional threshold (p<0.05) was used for significance.

Results
Participant Characteristics

A total of 1,144 participants (488 males, 656 females) aged 51$\pm$23 years, with a disease duration of 1 mo $-$23 y completed the questionnaire. Response rate was 95.33%. The remaining 56 patients (26 males, 30 females) aged 49$\pm$19 years, with a disease duration of 3 mo $-$21 y, were lost to this study. Thirty-six of the 56 patients were lost because of incomplete questionnaires, 20 patients did not return the questionnaire. There were no significant differences among demographic characteristics between patients who completed the study and those lost to the study.

Sociodemographic characteristics were summarized. Of 11 variables, 8 related significantly (p<0.05) with depressive symptoms in patients with PVCs and 3 variables did not relate (p>0.05; Tables 1 and 2).

Percentage of Depressive Symptoms: Among the 1,144 participants, a total of 309 (27%) patients were categorized as having depressive symptoms. Percentage of depressive symptoms was higher in the old than in the young (19.67% versus 7.34%, χ^2 = 123.588, p<0.001). For those with lower income levels, lower education levels, who were minorities, had bad society support, and were from village settlements,

Table 1. Percentage of depressive symptoms and sociodemographic and medical data significantly related to depressive symptoms in Chinese patients with PVCs

variable	Proportion (n,%)	Percentage of depressive symptoms(n,%)	X²	p
Age(years)			123.588	<0.001
≤45	619 (54.1)	84 (7.34)		
>45	525 (45.9)	225 (19.67)		
Income(yuan/year)			92.147	<0.001
<10000	426 (37.3)	171 (14.9 5)		
10000–30000	525 (45.9)	131 (11.45)		
30000–50000	163 (14.2)	7 (0.61)		
>50000	30 (2.6)	0		
Education level			138.694	<0.001
Primary school	201 (17.57)	104 (9.09)		
Junior high school	382 (33.39)	131 (11.45)		
Senior high school	217 (18.97)	46 (4.02)		
Undergraduate	338 (29.55)	28 (2.45)		
Postgraduate	6 (0.52)	0		
Nationality			159.116	<0.001
Han Nationality	1088 (95.10)	253 (22.12)		
Minority	56 (4.90)	56 (4.90)		
Society support			42.182	<0.001
Good	1126 (98.43)	292 (25.52)		
Bad	18 (1.57)	17 (1.49)		
Settlement type			54.694	<0.001
City	707 (61.80)	137 (11.98)		
Village	437 (38.20)	172 (15.03)		
Duration			9.767	0.002
≤12 month	710 (62.06)	169 (14.77)		
>12 month	434 (37.94)	140 (12.23)		
PVC percentage			9.127	0.010
<10%	405 (35.4)	92 (8.04)		
10%–20%	445 (38.90)	120 (10.49)		
>20%	294 (25.70)	97 (8.48)		

Table 2. Percentage of depressive symptoms and sociodemographic and medical data not related to depressive symptoms in Chinese patients with PVCs

variable	Proportion (n,%)	Percentage of depressive symptoms(n,%)	X^2	p
Gender			1.106	0.313
Male	488 (42.5)	124 (10.9)		
Female	656 (57.5)	185 (16.1)		
PVC count(24h)			4.532	0.104
<10000	428 (36.2)	101 (8.6)		
10000–20000	430 (38.5)	129 (11.5)		
>20000	286 (25.3)	79 (6.9)		
TC(mmol/l)			2.512	0.132
<5.20	1000 (88.5)	278 (21.8)		
≥5.20	144 (11.5)	31 (5.2)		

the percentage of depressive symptoms increased (Table 1). Patients with higher income levels, higher education levels, who were of the Han nationality, had good society support, and were from cities had a lower percentage of depressive symptoms compared with those without (p<0.05).

Risk Factors

Univariate logistic regression showed that female sex, education level, age, settlement type, and PVC count/24h significantly correlated with depressive symptoms (p<0.05) (Table 3). Multivariate logistic regression indicated that 5 variables—female sex, education level, settlement type, age, and PVC count/24h significantly and independently related with depressive symptoms (p<0.05; Table 4).

Patients with PVCs ≥10% had 2.223 (95% CI: 1.196–4.129) times more potential risk to develop depressive symptoms than patients with PVCs<10%. In patients living in village settlements, potential risk of depressive symptoms was 2.271 times (95% CI: 1.536–3.359) more than those living in cities. Older patients had 8.088 (95% CI: 5.524–11.842) times more potential risk to develop depressive symptoms than younger patients.

Discussion

Premature ventricular contractions (PVCs) are frequently encountered in clinical practice, and the majority of patients who have this arrhythmia have no structural heart disease. Although characteristically not associated with sudden cardiac death, frequent PVCs can cause severe symptoms such as dyspnea or palpitations and may even be incapacitating in some patients.[16]

In this study, depressive symptoms in patients with PVCs were identified by ZSDS. It was necessary to consider special issues in the diagnosis of depressive symptoms in Chinese patients. These patients sometimes reported somatized symptoms, were often stigmatized, and there was a lack of widely applied screening methods in China.[17,18] In fact, certain useful instruments such as the Beck Depression Inventory could be used for investigating depressive symptoms in a population.[19,20]

There were several reasons for us to choose ZSDS. First, several studies established ZSDS as a reliable and valid instrument for measuring depressive symptoms.[9,12] Second, a self-reported scale could imply anonymity and render us immune to somatized symptoms. Third, because part of our initiative was to improve detection and treatment of depressive symptoms we focused on developing a practical, short, and inexpensive screening method. Scores on ZSDS did not yield a clinical diagnosis of depression, but rather indicated levels of depressive symptoms that might be of clinical significance.

Our results indicated that depressive symptoms existed among present-day patients with PVCs in China. Chen et al.[20] did a meta-analysis focusing on the epidemiology of depression in the People's Republic of China in 1999. Through the analysis of 8,476 subjects with depressive moods in 10 cross-sectional studies, results showed that prevalence of depressive mood was 14.81% (14.20%–15.64%) in these persons. Comparing the rate in our study with this figure, our findings were higher (27% versus 14.81%, p<0.05).

These results would also be of interest to the Chinese psychiatric audience: it would serve as a lens to update our understanding of depression in Chinese society. With regard to investigation in the People's Republic of China in the 1980s, prevalence of depressive symptoms in the general population was low,[18,20] this was different from our findings. After 2 decades of profound socioeconomic transformation, depressive symptoms might no longer be rare. Similar to

Table 3. Risk factors of depressive symptoms in patients with PVCs by univariate unconditional logistic regression

	P	OR	95%CI(OR)
Gender			
Male	1		
Female	0.032	0.66	0.460–0.965
Income(yuan/year)	0.563		
<10000	1		
10000–30000	0.154	0.744	0.496–1.117
30000–50000	0.484	0.774	0.378–1.585
>50000	0.998	0	0
Education level	0.004		
Primary school	1		
Junior high school	0.919	1.025	0.638–1.645
Senior high school	0.330	0.738	0.400–1.360
Undergraduate	0.001	0.307	0.153–0.613
Postgraduate	1.000	2.733	0
Nationality			
Han nationality	1		
Minority	0.996	0	0
Society support			
Good	1		
Bad	0.998	0	0
TC(mmol/l)			
<5.20			
≥5.20	0.824	0.946	0.577–1.549
Settlement type			
City	1		
Village	0.001	2.268	1.529–3.363
Age(years)			
≤45	1		
>45	0.001	8.032	5.433–11.874
Duration			
≤12 month	1		
>12 month	0.503	0.889	0.629–1.256
PVC count(24h)	0.038		
<10000	1		
10000–20000	0.010	2.238	1.208–4.146
>20000	0.997	0	0
Percentage of PVC	0.726		
<10%	1		
10%–20%	0.424	0.774	0.412–1.452
>20%	0.997	0	0

Table 4. Risk factors of depressive symptoms in patients with PVCs by multivariate unconditional logistic regression

	P	OR	95%CI(OR)
Gender			
Male	1		
Female	0.018	0.649	0.453–0.928
Income(yuan/year)	0.538		
<10000	1		
10000–30000	0.143	0.741	0.496–1.107
30000–50000	0.443	0.759	0.374–1.538
>50000	0.998	0	0
Education level	0.004		
Primary school	1		
Junior high school	0.934	1.020	0.635–1.637
Senior high school	0.276	0.715	0.392–1.307
Undergraduate	0.001	0.308	0.154–0.615
Postgraduate	1.000	2.393	0
Nationality			
Han nationality	1		
Minority	0.996	0	0
Society support			
Good	1		
Bad	0.998	0	0
Settlement type			
City	1		
Village	0.001	2.271	1.536–3.359
Age(years)			
≤45	1		
>45	0.001	8.088	5.524–11.842
PVC count(24h)	0.041		
<10000	1		
10000–20000	0.012	2.223	1.196–4.129
>20000	0.997	0	0
Percentage of PVC	0.747		
<10%	1		
10%–20%	0.445	0.782	0.416–1.470
>20%	0.997	0	0

our study, more and more small-scale studies of the Chinese population have revealed that the prevalence of depressive symptoms is increasing.[21,22] These results suggest that a new wave of population-based psychiatric epidemiologic investigations would be in order.

Results of this study regarding nondisease factors showed that female sex was a risk factor, a relationship already disclosed.[23] This study also showed that age was related with depressive symptoms. Highest percentage in these patients was between 40 and 65 years of age. Patients at these ages might confront additional social and financial stress and more persons were likely to experience psychological problems in society.

In China, the people living in villages receive a lower education than that of city dwellers. It gives an illustration of the close relationship between depressive symptoms and the degree of understanding that sufferers have of disease. Possible reasons are listed as follows: firstly, due to the relatively lower level of livelihood, a deficiency in education, and a lack of information about disease could be a hindrance, physically and mentally, even leading to depressive symptoms. Secondly, in the previous documents and reports, sex is viewed as a precarious element. However, the reason for the possibility of absence of the above fact might enjoy little relationship with the occurrence rate and sex. Thirdly, it also may be due to the small size of the sample. Fourth, with the extending of medical duration, it is possible for a phenomenon similar to "enduring" to show itself reflected in patients, while the clinical symptom is not that obvious.

Differences observed in this study of the prevalence of depressive symptoms among those with different settlement types and different levels of education raise the idea of instituting some precautions during PVC, patients from cities or towns, that have a higher level of education (high school graduates and junior high school) and preparation of the PVCs for decrease the ZSDS scores.[24] The results showed that patients having an education duration equal to or less than 9 years had an increased risk of anxiety symptoms.[6]

On the other hand, there are 56 documented nationalities in China, but only Chuang, Uigur, Tujia (as a minority), and Han nationality was included. We carried out logistic regression of these variables in an attempt to provide useful information for on-going study of this topic in China.[25]

Review of Chinese literature shows little research investigating the relationship between depressive symptoms and PVCs. This paucity of studies pointed to a gap in our understanding of the impact of PVCs and depressive symptoms on psychological adjustment for these patients and also was responsible for the limitations to this study.

In conclusion, we found that the prevalence of depressive symptoms in Chinese patients with PVCs is high, with independent risk factors of depressive symptoms being female sex, education level, settlement type, age, and PVC count/24h. However, this problem needs to be further elucidated in a bigger study.

Limitations

The major limitations to this study were that although the study was based on a large sample it was not carried out on a general PVC population in China. Due to limitations, the relationship between PVCs and depressive symptoms in China could not be further ascertained.

Acknowledgements

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