Journal of Aging Research & Clinical Practice© Volume 1, Number 1, 2012

SMOKING, ALCOHOL CONSUMPTION, TEA CONSUMPTION, EXERCISE AND RISK OF DEPRESSION AMONG CHINESE NONAGENARIANS

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Abstract: *Objective:* Depression symptom was common among the oldest-old people and there is no study to observe the association of depression with habits of smoking, alcohol consumption, tea consumption and exercise among very old people. The present was conducted to analysis the association of depression with these habits. *Design, Setting, Participants:* A cross-sectional study conducted in Dujiangyan Sichuan China, 692 unrelated Chinese nonagenarians and centenarians (67.34% women, mean age 93.50 years) resident in Dujiangyan. *Measurements:* A brief 23-item geriatrics depression scale Chinese-edition (GDS-CD) test was used to diagnose depression and these habits were collected. *Results:* In the whole population, compared subjects with depression, participates those without depression had significantly higher prevalence of exercise habit. However, in women, there was no significant difference in prevalence of these habits between subjects with and without depression except the habit of former alcohol consumption. After adjustment for age, gender, educational levels, religion habits and cognitive function and BP levels and BMI, we found that current habit of exercise had a significant odds ratio (OR=0.31 95% CI (0.11, 0.83)) for depression in oldest old men. *Conclusions:* Among Chinese Nonagenarians/Centenarians, among habits (current and former) of smoking, alcohol consumption, tea consumption and exercise, there seems to be significant association of depression only with exercise and former habits of alcohol consumption in women might be associated with a greater risk of depression, but exercise habit in men might be associated with a lower risk of depression.

Key words: Habits, depression, cross-sectional study, oldest-old, risk factors.

Introduction

Depression is a major contributor to healthcare costs associated with older populations, and is projected to be the leading cause of disease burden in older populations by the year 2020 (1-3). The prevalence of depression in patients aged 65 and older may be as high as 40% in hospitalized and nursing home patients, and 30% in community settings (4). As in the young, the symptoms of major depressive disorder in older people include depressed mood, markedly diminished interest or pleasure in usual activities, disturbances in sleep, concentration and appetite, psychomotor agitation or retardation, fatigue, feelings of worthlessness and guilt, and suicidal thoughts (5, 6). The condition can be longstanding, or symptoms may present acutely. The acute condition is associated with high levels of medical morbidity (7), which includes both physical and mental

Received August 9, 2011 Accepted for publication September 5, 2011

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morbidity, together with increased use of medical services (5, 6). This reflects the high costs imposed on health services in treating depression in older populations. Depression in this age group is associated with a high mortality rate and is one of the leading causes of suicide (8, 9). There have been adequate studies confirmed that life habits, e.g habits of smoking, alcohol consumption, tea consumption and exercise, are common and potentially modifiable risk factors for depression (10-17). Depression is a major component of age-related deterioration. Common to each of these studies, however, was the relatively young age of the participants. The average age of each population was under 80 years, only a few of studies included subjects aged 90 years or above and there is no study in which all subjects are aged 90 years or above.

As the population of older persons increase, the number of depression older individuals can be expected to rise (18, 19). To the best of our knowledge, no study has explored whether depression were associated with habits of smoking, alcohol consumption, tea consumption and exercise among very old people aged 90 or above or not. In this study, we aimed to observe the association of depression with habits of smoking, alcohol consumption,

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tea consumption and exercise among very old people using a cohort of Chinese aged 90-108 years.

Methods

Study Subjects

It is the part of Project of Longevity and Aging in Dujiangyan (PLAD). The methods were reported previously (20). In brief, PLAD was performed in Dujiangyan (>600,000 inhabitants, 870 aged 90 years or more, 32.6% was men, 67.4% was women; located outside the urban area of Cheng Du). In April 2005, 870 persons aged 90 years or more were collected from the population. The study protocol was approved by the Research Ethics Committee of the Sichuan University. Informed consent was obtained from all participants (as well as their legal proxies). Trained personnel visited all study participants at their homes for data collection, biological specimen collection, and anthropometric measurements. Sociodemographic characteristics and lifestyle habits were collected by using a general questionnaire. Subjects with end-stage disease, cancer, missing information on the geriatrics depression scale or missing information on habits of smoking, alcohol consumption, tea consumption and exercise were excluded. Finally, we included 692 participants (226 men, 466women) in the analysis.

Assessment of depression

In the present study, brief 23-item geriatrics depression scale Chinese-edition (GDS-CD) as a screening tool and its diagnostic criteria was used to diagnose the depression, which is recommended by the Chinese Geriatrics Society. GDS-CD includes 23 "yes" or "no" questions to measure the depression symptom in the old people. "Yes" indicate 1 score and "no" indicate 0 score in 17 items, whereas "yes" indicate 0 score and "no" indicate 1 score in other 6 items. The higher the score the depression symptom was more serious. GDS-CD used very common as a depression screening tool in Chinese older people and a score >10 is usually defined as depression (21). In previous studies, the questionnaire was shown to be both 85% sensitive and specific (22-24). The participants were categorized to depression and normal, according to the scores: scores > 10 and scores < 10 respectively. To decrease methodological faults and assure methodological reliability, the organizer performed the following: 1) reviewed the questionnaire's procedure and grading system outlined in a short booklet 2) observed an investigator conduct on residents not part of the study; 3) supervised when conducting the questionnaire on residents not part of the study. All the subjects were informed consent, before the questionnaire

was conducted.

Collection of information on habits of smoking, alcohol consumption, tea consumption and exercise

Habits of smoking, alcohol consumption, tea consumption and exercise, which included former and current, were collected by using a general questionnaire. In the questionnaire, every item has two options (yes or no). To assure reliability of this information, we defined subjects with such current habit as doing it almost every day and defined subjects with such former habit as doing it almost every day kept on ten years twenty years ago or more. Moreover, the filled questionnaire was checked by the family member who usually lived with the participant.

Assessment of Covariates

The baseline examination included information on age (years), gender, systolic blood pressure (SBP), diastolic blood pressure (DBP), cognitive function (MMSE score), educational levels (Illiteracy, primary school, secondary school or more), weight, height, religion (yes or no). Body mass index (kg/m2, BMI) was calculated as body weight in kilograms divided by height in meters squared. The covariates were collected by using a general questionnaire.

Statistical Analysis

All of the statistical analyses for this study were performed with the SPSS for Windows software package, version11.5 (SPSS Inc, Chicago, Illinois, USA). Baseline characteristics were described by mean ± Standard deviation (SD) for normal distribution continuous variables, median (range) for ranked variables (for example GDS and MMSE) and the rate of the habits was given as fraction form. The characteristics were compared between those with and without depression using chisquare or Fisher's exact test (where an expected cell count was < 5) for categorical variables, the non-parametric approach (Man-Whitney test) for ranked variables and unpaired Student's t test for continuous variables. The prevalence of these habits was tested between with and without depression using chi-square or Fisher's exact test (where an expected cell count was < 5). When the chisquare or Fisher's exact test show P value <0.10, binary logistic regression was used to estimate the odds ratio (OR) and 95% confidence interval (CI) of habits of smoking, alcohol consumption, tea consumption and exercise as a function of increased depression in comparison to "never" status. P value <0.05 was considered to be statistically significant, and all of the P values have two sides.

Results

Prevalence rates of depression and habits of smoking, alcohol consumption, tea consumption and exercise

Among the 692 volunteers, mean age was 93.50±3.33 (range 90 to 108 years) and 466 (67.34%) were women, including 48 centenarians. Ninety percent of subjects lived in the countryside. The median score of depression (measured with GDS-CD) was 6.00 (range 0 to 21). The depression scores between men and women had not significantly difference (P=0.054). In the oldest-old population, the total prevalence rate of depression was 24.13%, the prevalence rate among males was 18.58% and among females was 26.82% (P=0.02). Baseline characteristics of participants were showed in the table 1. The prevalence rates (In the males and in the females) of current and former habits of smoking, alcohol consumption, tea consumption and exercises showed in the table 2. The prevalence rates of smoking (current and former), alcohol consumption (current and former) and tea consumption (current and former) and current habits of exercise were all higher among males than that among female.

In the oldest-old population, compared with subjects with depression, those without depression had significantly higher prevalence rate of former and current exercise habit and the prevalence of current excise habit was also significantly higher in male. However, in the females, compared with subjects without depression, those with depression only had significantly higher prevalence rate of former alcohol consumption habit. There were no significant differences in the prevalence rates of other habits. According to the P value, among habits (current and former) of smoking, alcohol consumption, tea consumption and exercise, only exercise habits, alcohol consumption and former habit of smoking were included in the binary logistic regression to estimate the odds ratio (OR) and 95% confidence interval (CI) as a function of increased depression. (See table 2).

Odds ratio (OR) of habits of smoking, alcohol consumption, tea consumption and exercise as factor increased depression

We assessed whether the include habits of former smoking, alcohol consumption, and exercise was factors increased risk for depression. After adjustment for age, gender, educational levels, religion habits and cognitive function and BP levels and BMI, in oldest old men, we found that current habit of exercise had a significant odds ratio (OR=0.31 95% CI (0.11, 0.83)) for depression. None of other habits had a significant OR for depression. (See table 3)

Baseline characteristics in other covariates according to depression

In the oldest-old population, subjects with depression had lower education level than those without depression.

Baseline Characteristics according to Depression (n=692)									
Characteristics	Depression n=167	Total Non- depression n=525	P value	Depression n=42	Men Non- depression n=184	P value	Depression n=125	Women Non- depression n=341	P value
Age (years)	93.61±3.29	93.47±3.35	0.64	92.24±2.50	93.14±3.06	0.08	94.07±3.40	93.65±3.49	0.25
Gender(female/male)	125/42	341/184	0.02 +						
Cognitive function score	16.00(0-28)		< 0.01†	19.00(2-28)		0.01+	15.00(0-28)		< 0.01†
Depression score	6.00 (0-21)		< 0.01†	5.50(0-19)		< 0.01†	6.0(0-28)		< 0.01†
Weight	40.45±6.99	41.40 ± 8.41	0.21	44.47±4.90	46.62±7.476	0.09	39.08±7.08	38.63±7.52	0.58
Height	145.61 ± 8.78	146.71±11.87	0.21	153.47±6.73	154.60 ± 11.94	0.58	143.05±8.11	142.51±9.44	0.58
$BMI(kg/m^2)$	19.11±3.61	19.19±3.54	0.81	$18.64{\pm}4.01$	19.51±3.58	0.19	19.27±3.47	19.02±3.51	0.52
Systolic BP, mm Hg	141.04 ± 24.46	140.51±22.71	0.80	137.03±22.98	138.92 ± 20.34	0.61	142.35 ± 24.88	141.35±23.87	0.70
Diastolic BP, mm Hg	73.24±12.69	72.85±11.71	0.73	71.79.24±9.79	73.47±11.23	0.40	73.72±13.51	72.53±11.96	0.38
Educational levels									
Illiteracy	136/167	369/523	0.01†	19/42	69/182	0.38	117/125	300/341	0.08
Primary school	29/167	138/523	0.02†	22/42	101/182	0.72	7/125	37/341	0.09
Secondary school or more	6/167	16/523	0.73	1/42	12/182	0.29	1/125	4/341	
Religion	49/167	125/524	0.16	5/42	34/183	0.30	44/125	91/341	0.07

Table 1

Baseline characteristics were described by mean ±SD for normal distribution continuous variables, median (range) for ranked variables (GDS and MMSE) and the rate of the habits was given as fraction form. The characteristics were compared between those with and without depression using chi-square or Fisher's exact test (where an expected cell count was <5) for categorical variables, the non-parametric approach (Man-Whitney test) for ranked variables and unpaired Student's t test for continuous variables. In the testing, a P value < 0.05 was considered to be statistically significant (†). BMI: body mass index.

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 Table 2

 With and without Habits of Smoking, Alcohol Consumption, Tea Consumption and Exercise according to Depression (n=692)

		Total			Men			Women	
Habits	Depression	Non-	P value	Depression	Non-	P value	Depression	Non-	P value
		depression			depression			depression	
	n=167	n=525		n=42	n=184		n=125	n=341	
Smoking									
Former	102/167	321/525	0.99	38/42	145/184	0.08	64/125	106/341	0.94
Current	72/167	233/525	0.77	32/42	127/184	0.36	40/125	176/341	0.85
Alcohol consumption									
Former	72/167	209/525	0.45	26/42	119/184	0.74	46/125	90/341	0.03†
Current	44/167	140/525	0.94	11/42	74/184	0.09	79/125	66/341	0.10
Tea consumption									
Former	71/167	238/525	0.35	32/42	142/184	0.89	39/125	96/341	0.52
Current	66/167	229/525	0.52	28/42	135/49	0.38	38/4125	94/341	0.55
Exercise									
Former	42/162	186/520	0.02†	11/42	77/184	0.06	31/120	109/336	0.18
Current	55/165	221/522	0.04†	11/42	88/184	0.01†	44/123	133/338	0.49

These habits were compared between those with and without depression using chi-square or Fisher's exact test (where an expected cell count was < 5) for categorical variables. In the testing, a P value < 0.05 was considered to be statistically significant (†).

Table 3

Binary Logistic Regression was used to Estimate the Odds Ratio (OR) and 95% Confidence Interval (CI) of Habits of Smoking, Alcohol Consumption, Tea Consumption and Exercise as a Function of Increased Depression in comparison to 'never' status

	Te Unadjusted OR	otal OR(CI) Multiple-adj R(CI)	* Unadjusted (O	Men OR(CI) Multiple-adj R(CI) *	Women Unadjusted OR(CI) Multiple-adj OR(CI) *		
Smoking							
Former			2.83(0.94, 8.56)	2.92(0.77, 11.09)			
Alcoholic consumption				· · · · ·			
Former					1.54(0.87, 2.73)	1.47(0.77,2.80)	
Current			0.506(0.23,1.09)	0.48(0.20, 1.17)	1.10(0.58, 2.07)	1.12(0.55,2.30)	
Exercise habits							
Former	0.70(0.44, 1.12)	0.75(0.45,1.25)	0.66(0.28,1.56)	0.84(0.31,2.29)			
Current	0.84(0.54,1.30)	0.83(0.51,1.35)	0.49(0.21, 1.14)	0.31(0.11,0.83)			

*Adjusted for age, gender, educational levels, religion, cognitive function and BP levels and BMI.

The prevalence rates of illiteracy was higher (81.44% vs. 70.55% P<0.01) and Primary school (17.37% vs.26.39% P<0.05) was lower among depression than that among non-depression. For men and women, subjects with depression had lower cognitive function score than those without depression. There were no significant differences in the other covariates between subjects with and without depression (See table 1).

Discussion

In the cross-sectional observations, in communitydwelling nonagenarians and centenarians among Chinese, there was a high prevalence of depression (about 25%). Based on cross-sectional observations in community-dwelling oldest-old persons, we found that in Chinese nonagenarians and centenarians, in female, habit of former alcohol consumption might be associated with a greater risk of depression, but habit of exercise might be associated with a lower risk of depression among the whole population.

Numerous studies have found an association between cigarette smoking and depression in adolescents and adults. A cross-sectional study in Finns aged 60 years or over reported a positive relationship between depression and smoking in men, and a negative relationship in women, the latter contradicted the previous findings in women (25). A 3-year prospective study of the elderly in the United Kingdom found that current smoking predicted the development of depression, while a past history of smoking did not (26). However, the relationship was not examined separately for men and women. A cross-sectional study of the oldest-old aged 85 years or over showed that current smoking was associated with minor depression only in women but not

in men, and smoking was not related to major depression in both sexes (27). A recent cross-sectional study of Medicare members aged 65–103 years in the United States showed that smoking and depression were linked in the elderly as in younger populations (28), but the authors did not separately analyze the association for men and women. In the present study, among Chinese nonagenarians and centenarians, neither current nor former smoking habits were associated with depression both in men and in women. Therefore, in the very elderly, the relationship between depression and smoking were indefinable. Whether the reason for the in-consistent conclusions on this relationship in these studies were derived from race, gender, age and other causes or not should be further investigated.

Epidemiological evidence suggests moderate levels of alcohol consumption in older people can be beneficial (29). In particular, moderate alcohol consumption has been found to have a protective effect on cardiovascular morbidity and mortality, where observations of a Ushaped relationship with alcohol consumption have been supported by large-scale meta-analyses (29-31). In the present study, we found that among Chinese nonagenarians and centenarians, former habit of alcohol consumption had positive effect on depression in women, but not in men. Since the habits of alcohol consumption required by questionnaires, which did not include quantity of alcohol consumption, we could not conclude whether there was overdose alcohol consumption in the subjects with alcohol consumption habits in the oldestold population or not. But among Chinese female nonagenarians and centenarians, alcohol withdraw seems to be benefic for decrease depression.

To our knowledge, there is only one study which examined the association between consumption of tea and depression in humans (16). The study took place in Finland, and reported that an inverse relationship between daily tea drinking and the risk of being depressed was found in a relatively large general population sample. In this study the age of participants was between the ages of 25 and 64 years (16). Caffeine is among the most widely used psychoactive substances in the world. Doses of about 100 mg induce a mild euphoria but in high doses caffeine may induce a dysphoric and depressive mood. In most other parts of the world caffeine consumption is lower and tea often is the most favorite source of caffeine. In addition to caffeine, tea includes several other biologically active compounds. These include polyphenols such as cathecins and essential elements such as chromium, manganese, selenium and zinc. Tea has been found to have health promoting properties due to its antioxidant capacity. However, the results of the present study did not show that former and current tea consumption habit was benefit for prevention depression. The results of the present study did not concordant with the previous study

and could not extend the conclusion to the oldest-old population. Thus, in the oldest-old population, encouraging tea consumption habit as one of the prevention strategies of depression needs further investigation.

Support for the belief in the efficacy of exercise in treating depression comes from a number of metaanalyses (8). However, older people are not included as a subgroup in all these analyses. The beneficial effects of exercise in the elderly are well documented, including reduction in morbidity and in mortality (9), however, there has still be scanty evidence about relationship between exercise and depression in the oldest-old population. The results of the study showed that both current and former exercise habits were associated with lower risk of depression among Chinese nonagenarians/centenarians. After adjustment for age, gender, educational levels, religion habits and cognitive function and BP levels and BMI, we found that current habit of exercise had a significant odds ratio (OR=0.31) 95% CI (0.11, 0.83)) for depression in oldest old men, but the association did not show among women. The results of the present study were in line with the previous study and expanded the conclusion to the oldest-old population.

Our study had some limitations that deserved mention. First, because of the cross-sectional nature of this study, information on life habits obtained through questionnaires, there might be reminiscence bias and non-response bias. Second, since this a part of Project of Longevity and Aging, there might be survival bias. However, this is inherent to a study of individuals of this age-group. Third, we still lacked of adjustment for other potential confounders, such as socio-economic status and family history of cognitive impairment. Most of all (90%) participants lived in the countryside in the present study. So far, some subjects had been working in farm every day, and so physical activity may be a potential confounder. Thus this sample might not be representative of the urban population. Fourth, the lack of data on units per week (for alcohol) and pack years (for smoking) make us can not analyses the dose of the alcohol and cigarette consumption with depression.

Conclusion

In conclusion, we found among Chinese nonagenarians and centenarians, current and former habits of exercise and former habit of alcohol consumption were associated with depression. It seems that alcohol withdrawal and increasing exercise may prevent depression among nonagenarians.

Acknowledgements: This work was supported by Discipline Construction Foundation of Sichuan University. This work was supported by grants from the

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Conflict of Interest: None

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project of Science and Technology Bureau of Sichuan Province (2006Z09 - 006 - 4), Construction Fund for Subjects of West China Hospital of Sichuan University (XK05001). The authors thank the staff of the Department of Geriatrics medicine, West China hospital and Dujiangyan hospital, and all participants (as well as their legal proxies) for their great contribution.

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