Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.jfma-online.com

ORIGINAL ARTICLE

Association between adverse mental health and an unhealthy lifestyle in rural-to-urban migrant workers in Shanghai

Hua Yang [a,d], Jian Gao [b,d], Tianhao Wang [a], Lihong Yang [c], Yao Liu [a], Yao Shen [a], Jian Gong [a], Wei Dai [a], Jing Zhou [a], Jie Gu [a], Zhigang Pan [a,*], Shanzhu Zhu [a,*]

[a] *Department of General Practice, Zhongshan Hospital of Fudan University, Shanghai, China*
[b] *Center of Clinical Epidemiology and Evidence-based Medicine, Fudan University, Shanghai, China*
[c] *Department of General Practice, Xinjing Community Health Service Center, Shanghai, China*

Background/purpose: The association between adverse mental health and unhealthy lifestyle behaviors in migrant workers remains poorly defined in Chinese rural-to-urban migrants.
Methods: A cross-sectional study was conducted regarding health-related behaviors in 5484 migrants (51.3% males) employed in Shanghai for at least 6 months. The Chinese version of the Symptom Checklist-90-Revised (SCL-90-R) was used to assess migrant mental health status. Logistic regression was applied to determine the contribution of adverse mental health to lifestyle behaviors.
Results: Of the 5484 migrants, 21.1% had potential mental health problems and 63.1% had an unhealthy lifestyle. The three most prevalent mental disorders were obsessions−compulsions (O−C; 13.7%; 751/5484), interpersonal sensitivity (I-S; 11.0%; 603/5484), and hostility (HOS; 10.8%; 590/5484). Compared with the male participants, the female participants exhibited significantly increased mean scores for phobic anxiety (PHOB) and anxiety (ANX) ($p < 0.001$). Logistic regression indicated that after adjustment for potential confounding factors in both genders, an unhealthy lifestyle score was significantly associated with all nine subscales of the SCL-90-R. The male participants with psychoticism [PSY; odds ratio (OR) = 4.908, 95% confidence interval (CI) 2.474−9.735], ANX (OR = 4.022, 95% CI 2.151−7.518), or depression (DEP; OR = 3.378, 95% CI 2.079−5.487) were the most likely to have an unhealthy lifestyle. In the female participants, an unhealthy lifestyle was most associated with HOS (OR = 2.868, 95% CI 2.155−3.819), PSY (OR = 2.783, 95% CI 1.870−4.141), or DEP (OR = 2.650, 95% CI 1.960−3.582).

Conclusion: Lifestyle behaviors were significantly associated with mental health in rural-to-urban migrant workers, and these findings indicate the need to develop targeted psychological interventions to foster healthy lifestyles in migrants.

Introduction

Chinese individuals who become migrant workers move from impoverished rural areas to thriving cities to seek better job opportunities and pursue dreams of a better life. These workers greatly contribute to the economic growth of developed regions. In 2014, the number of migrant workers in China reached 274 million and has subsequently continued to increase.[1] However, migrant workers face many challenges, such as economic pressures, work load, family separation, discrepancies between expectations and reality, and acculturative stress.[2] These challenges may influence their mental health. Studies regarding the health of Chinese rural-to-urban migrants have demonstrated that mental disorder is a substantial health problem.[3–5] Zhang et al[6] have demonstrated that the mental health of Chongqing migrant workers was significantly worse than the Chinese norm. A study by Hu et al[7] concluded that compared with permanent urban residents, rural-to-urban migrants in China had an increased prevalence of symptoms related to insomnia. Mental disorders are also associated with international migration; for example, migration from Mexico to the United States has been associated with a dramatic increase in psychiatric morbidity.[8]

Kirmayer et al[9] identified several migration-related factors that could influence mental health, such as the exposure to harsh living conditions, disruption of social support, and unemployment. Psychological factors may interfere with the ability to engage in healthy lifestyle behaviors, which are important determinants of disease and mortality and thus fundamental to public health. Bonnet et al[10] demonstrated that anxiety and depression were significantly associated with physical inactivity, an unhealthy diet, and smoking habits in patients at risk for cardiovascular disease. Piwoński et al[11] reported that individuals with depressive symptoms were characterized by unhealthy lifestyles compared with healthy individuals. However, to our knowledge, an association between mental health and healthy lifestyles in Chinese rural-to-urban migrant workers has not been previously investigated.

The aim of the current study was to determine whether there is an association between adverse mental health and unhealthy lifestyle behaviors in Chinese migrant workers. As migrants may suffer from various mental health problems, we utilized the Chinese version of the Symptom Checklist-90-Revised (SCL-90-R),[12] which comprised nine primary symptom dimensions. Multiple healthy behaviors of the migrants were simultaneously investigated, which were subsequently used to create a composite unhealthy behavior score that reflected the extent of the individuals' healthy behaviors.

Methods

Study population

The present assessment of mental health status and health-related lifestyle behaviors was conducted between August 2012 and October 2012, based on a previous cross-sectional study of migrant workers in Shanghai.[13] The inclusion criteria for the study population consisted of male or female migrant workers, 18–65 years of age, with at least 6 months of residency.

A multistage, proportionally stratified, cluster random sampling procedure was employed to recruit participants. The participants were recruited from four of the eight urban districts (Xuhui, Putuo, Changning, and Yangpu) and three of the eight rural districts (Pudong, Jiading, and Qingpu) in Shanghai. A community health service center was randomly selected in each of the seven districts, specifically, the Cao Hejing, Changzheng, Xinjing, Yinhang, Sanlin, Huangdu, and Huaxin community centers.

Among the service populations of the selected health service centers, cluster random sampling was conducted according to the size of the workplace. In large-scale workplaces ($\geq$ 500 employees), the migrants were cluster sampled according to the workgroup, and the number of migrants was $\leq$ 200. In moderate-scale workplaces (100–500 employees), the number of migrants was $\leq$ 150. In small-scale workplaces ($\leq$ 100 employees), all migrants were investigated. Furthermore, migrant workers were sampled from six occupations: (1) manufacturing; (2) construction; (3) hospitality; (4) domestic service; (5) small business; and (6) recreation/leisure. The number proportion of migrant workers was required to meet the occupation proportion based on the Shanghai government's statistics. Written informed consent was obtained from all volunteers.

The general practitioners and nurses were trained prior to the investigation; the training included the investigational procedure. Assistance was provided to the participants who had difficulty regarding the completion of the questionnaire (primarily because of limited years of education), and the questionnaires were reviewed after completion.

The Ethics Committee of Zhongshan Hospital of Fudan University, Shanghai, China approved the study protocol (B2013-138).

Assessment of variables

Mental health
Mental health was evaluated by a Chinese version of the SCL-90-R,[12] which is a self-report mental health

questionnaire administered to examine mental status; its reliability and validity have been demonstrated by several studies.[14–16] It is a 90-item symptom inventory designed to measure current psychological symptom status and requires ~12–20 minutes to administer. Each item of the questionnaire is rated by the patient on a five-point scale of distress from 0 (none) to 4 (extreme). The SCL-90-R comprises the following nine primary symptom dimensions: somatization (SOM), obsessions—compulsions (O—C), interpersonal sensitivity (I-S), DEP, ANX, hostility (HOS), phobic anxiety (PHOB), paranoid ideation (PAR), and psychoticism (PSY).[17] Each of the nine symptom dimensions is assessed with 6–13 items. The score on each dimension represents the mean score of all items of the dimension and directly reflects the severity of the mental health problem. According to a previously study,[12] subscale scores ≥ 2 were suggestive of potential mental health issues.

Lifestyle behaviors

Six lifestyle behaviors were investigated, including smoking status, alcohol consumption, duration and quality of sleep, breakfast patterns, frequency of regular meals, and frequency of fruit and vegetable consumption.

Smoking status was dichotomized as current smokers (with a history of smoking in the past 30 days) versus previous smokers (≥ 100 cigarettes in their lifetime) /non-smokers, according to previously published analyses.[18] One point was allocated to current smokers.

Alcohol consumption was assessed by the Alcohol Use Disorders Identification Test-Consumption questionnaire (AUDIT-C)[19] and was dichotomized as nonhazardous alcohol use versus hazardous alcohol use, with one point for the latter.

The average hours per night spent sleeping over the previous month was reported by participants. One point was allocated for < 7 hours of sleep or > 9 hours of sleep, as previously established as risk factors for health.[20]

Breakfast habits, frequency of fruit and vegetable consumption, and frequency of regular meals were dichotomized into "almost daily" versus "no daily", with one point for the latter.

A lifestyle score was calculated based on these six factors, similar to previously described studies.[21–28] The lifestyle behavior of the migrant workers was dichotomized into two subcategories according to total score: healthy (0 point) or unhealthy (1–6 points).

Statistical analysis

The data are presented as percentages or means and standard deviations. Significant differences between groups were calculated using Chi-square tests for the percentages and unpaired t tests for the mean values. The associations between mental disorders and an unhealthy lifestyle score were assessed via logistic regression. The logistic regression model was fitted using the unhealthy lifestyle behavior categories as the dependent variables and the nine dimensions of the SCL-90-R as the independent variables. Adjustments were made for confounding factors, including age, occupation, workplace scale, educational attainment, marital status, accompanying child/children, salary, years

of residency in Shanghai, cities experienced, daily work hours, weekly workdays, type of residence, chronic disease, blood pressure, and body mass index (BMI). The odds ratios (ORs) and 95% confidence intervals (CI) were calculated. A two-tailed alpha with $p < 0.05$ was considered significant. The analyses were conducted using SPSS software, version 17.0 (SPSS Inc., Chicago, IL, USA) and SAS software, version 9.2 (SAS Institute, Cary, NC, USA).

Results

Participant characteristics

Of the 5855 participants approached, the complete questionnaire responses without missing data were included from 5484 (93.7%) participants. It was determined that the average age of the participants was 34.3 ± 10.5 years, and 51.3% of the participants were males; 50.9% of the participants completed junior high school, and 24.1% of the participants completed high school; 73.3% of the participants were married, and 70% of the participants had children; 77.1% of the participants earned Chinese Yuan (CNY) 1500–3500/mo; and 68.7% of the participants worked > 5 d/wk (Table 1).

Mental health of the migrant population

According to the criteria (i.e., subscale scores ≥ 2, which were suggestive of potential mental health issues[12]), of the 5484 participants in the study, 1159 (21.1%) individuals had potential mental health problems, which included 598 (21.3%) men and 561 (21.0%) women (Figure 1; Table 2). Of the nine primary symptom dimensions tested, the three most prevalent mental health problems were O—C (13.7%; 751/5,484), I-S (11.0%; 603/5,484), and HOS (10.8%; 590/5,484). Compared with the male participants, the female participants had significantly increased PHOB and ANX scores ($p < 0.001$ and $p = 0.013$, respectively; Table 2).

Health-related lifestyle behaviors of the migrant workers

In the current study, only 36.9% of the participants exhibited healthy lifestyle scores (Table 3). Compared with the female participants, the male participants reported significantly increased rates of smoking and alcohol consumption ($p < 0.001$). The female participants also reported an increased frequency of fruit and vegetable consumption and exhibited a healthier lifestyle compared with the male participants ($p < 0.001$).

Associations between mental disorders and an unhealthy lifestyle score

As indicated by the logistic regression analysis, after adjustment for potential confounding factors in both genders, an unhealthy lifestyle score was significantly associated with all nine subscales of the SCL-90-R (Figure 2). The male participants who were most likely to engage in an unhealthy lifestyle scored positive for PSY

Table 1 Prevalence of mental health problems among rural-to-urban migrant population by socio-demographic characteristics and physical health.

Variables	Total[a]	Mental health problems[b]		χ^2	p
		N	%		
Age (y)					
$\leq$ 32	2645	599	22.6	7.01	0.008
> 32	2839	560	19.7		
Gender					
Male	2811	598	21.3	0.07	0.795
Female	2673	561	21.0		
Occupation					
Manufacturing	2513	585	23.3	60.52	<0.001
Construction	769	134	17.4		
Hospitality	385	52	13.5		
Domestic service	574	111	19.3		
Small business	635	101	15.9		
Recreation/leisure	608	176	28.9		
Workplace scale					
Large	1500	320	21.3	0.15	0.929
Moderate	1942	413	21.3		
Small	2042	426	20.9		
Educational attainment					
Elementary or lower	1004	142	14.1	68.48	<0.001
Junior high school	2789	560	20.1		
High school	1320	347	26.3		
College	371	110	29.6		
Marital status					
Married	4019	740	18.4	77.20	<0.001
Single	1331	372	27.9		
Cohabitating	86	36	41.9		
Divorced or widowed	48	11	22.9		
Accompanying children					
No children	1645	442	26.9	48.02	<0.001
Cohabiting children	1846	361	19.6		
Children residing elsewhere	1993	356	17.9		
Salary					
< 1500 RBM	485	86	17.7	10.17	0.017
1500−2500 RBM	2528	559	22.1		
2500−3500 RBM	1699	332	19.5		
$\geq$ 3500 RBM	772	182	23.6		
Years of residency (y)					
< 1	735	158	21.5	0.23	0.893
1−5	2432	507	20.8		
$\geq$ 5	2317	494	21.3		
Number of cities resided in					
1−2	4066	810	19.9	13.88	<0.001
$\geq$ 3	1418	349	24.6		
Daily working hours					
< 8	80	10	12.5	13.13	0.004
8	2583	503	19.5		
8−11	1681	385	22.9		
$\geq$ 11	1140	261	22.9		
Weekly working days					
$\leq$ 4	156	40	25.6	17.86	<0.001
5	1564	310	19.8		
6	2247	529	23.5		
7	1517	280	18.5		
Type of residence					
Collective dormitory	1555	311	20.0	21.67	<0.001

Table 1 (*continued*)

Variables	Total[a]	Mental health problems[b]		χ^2	p
		N	%		
Renting with others	636	164	25.8		
Renting as a family	2297	440	19.2		
Renting alone	754	186	24.7		
Owning a living place	242	58	24.0		
Chronic diseases[c]					
Without	5035	1030	20.5	16.93	<0.001
With	449	129	28.7		
Blood pressure[d]					
Normal	4939	1071	21.7	9.03	0.003
Abnormal	545	88	16.1		
BMI[e]					
Underweight	346	98	28.3	18.12	<0.001
Normal	3655	789	21.6		
Overweight/obesity	1483	272	18.3		

BMI = body mass index; RMB = Ren Min Bi.

[a] $n = 5484$.

[b] $n = 1159$.

[c] Chronic diseases included hypertension, ischemic heart disease, diabetes, chronic obstructive pulmonary disease, asthma, renal dysfunction, abnormal liver function, rheumatoid arthritis, osteoarthritis, or mental illness.

[d] Blood pressure was measured on the spot only once (normal blood pressure defined as < 140/90 mmHg and abnormal blood pressure as ≥ 140/90 mmHg).

[e] BMI was calculated from self-reported height and weight according to Chinese adult overweight and obesity prevention and control guidelines, a BMI < 18.5 indicating underweight, a BMI between 18.5 and 24 normal weight, and a BMI ≥ 24 overweight or obesity.

(OR = 4.908, 95% CI 2.474−9.735), ANX (OR = 4.022, 95% CI 2.151−7.518), or DEP (OR = 3.378, 95% CI 2.079−5.487). In the female participants, the mental health problems most associated with an unhealthy lifestyle were HOS (OR = 2.868, 95% CI 2.155−3.819), PSY (OR = 2.783, 95% CI 1.870−4.141), or DEP (OR = 2.650, 95% CI 1.960−3.582).

Discussion

To investigate the association between adverse mental health and unhealthy lifestyle behaviors in Chinese rural-to-urban migrants, we conducted a cross-sectional study in 5484 migrants in Shanghai. Lifestyle behaviors were
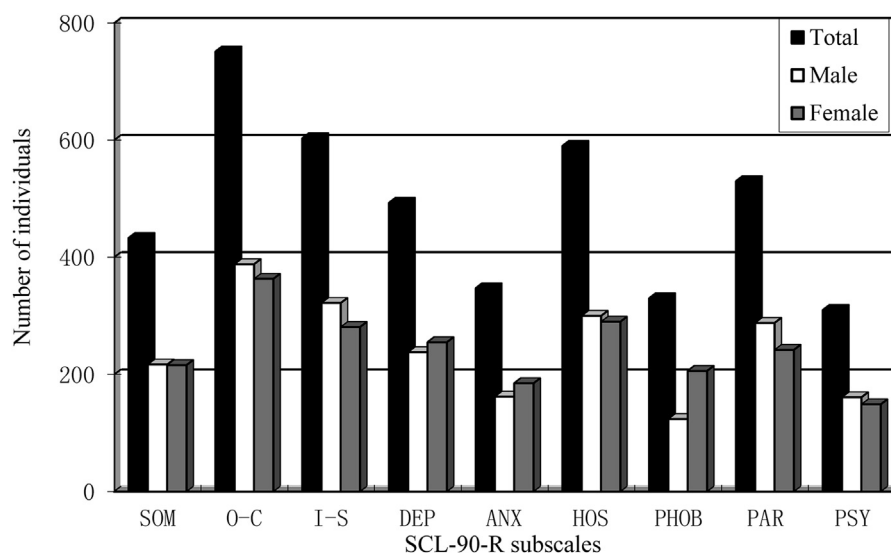

Figure 1 Symptom profile for migrant workers by gender. ANX = anxiety; DEP = depression; HOS = hostility; I−S = interpersonal sensitivity; O−C = obsessions−compulsions; PAR = paranoid ideation; PHOB = phobic anxiety; PSY = psychoticism; SOM = somatization.

Table 2 SCL-90-R subscale scores of the migrant workers according to gender.

	Total[a]	Males[b]	Females[c]	p[d]
Somatization (SOM)	1.30 ± 0.41	1.29 ± 0.42	1.31 ± 0.40	0.188
Obsessions—compulsions (O—C)	1.39 ± 0.50	1.38 ± 0.50	1.40 ± 0.50	0.300
Interpersonal sensitivity (I—S)	1.33 ± 0.47	1.33 ± 0.48	1.33 ± 0.46	0.712
Depression (DEP)	1.29 ± 0.44	1.29 ± 0.43	1.30 ± 0.44	0.329
Anxiety (ANX)	1.24 ± 0.39	1.22 ± 0.38	1.25 ± 0.40	0.013
Hostility (HOS)	1.31 ± 0.48	1.31 ± 0.48	1.31 ± 0.47	0.898
Phobic anxiety (PHOB)	1.20 ± 0.37	1.16 ± 0.33	1.24 ± 0.41	0.000
Paranoid ideation (PAR)	1.27 ± 0.44	1.28 ± 0.45	1.27 ± 0.42	0.130
Psychoticism (PSY)	1.22 ± 0.38	1.23 ± 0.39	1.21 ± 0.36	0.050
Global severity index	1.29 ± 0.39	1.28 ± 0.39	1.30 ± 0.39	0.290

Data are presented as mean ± standard deviation.
SCL-90-R = Symptom Checklist-90-Revised.
[a] $n = 5484$.
[b] $n = 2811$.
[c] $n = 2673$.
[d] Males compared with females.

significantly associated with mental disorders in men and women migrant workers.

The current study indicated that 21.1% of the migrant workers could be classified as mentally unhealthy. This prevalence rate was lower than most previously reported studies[6,29,30]; however, the rate was similar to several studies.[31,32] The mental health conditions of migrants in various individual and social environments may differ. Our finding may be explained by the criterion of at least 6 months of residency in Shanghai, which could thus represent a more settled population compared with previous investigations.

In general, the mentally unhealthy migrant workers in the current study experienced more symptoms related to O—C, I—S, and HOS. These findings were consistent with the results of Wong et al[33] and Dai.[34] O—C are characterized by irresistible thoughts, impulses, and actions that are unnecessary to the individual. I—S focuses on feelings of personal inadequacy and inferiority in comparisons with other individuals. HOS comprises thoughts, feelings, or actions that are characteristic of a negative affect state of anger.[17] In China, individuals who migrate from rural to urban areas do

so mainly for economic reasons. However, because of the household registration system, migrant workers cannot register as formal residents in cities; therefore, they are not entitled to equal interests or rights. Most migrant workers in cities belong to the lower socioeconomic rank.[35] This inequality may lead to sustained, meaningless, and adverse thoughts and feelings in migrant workers. For example, symptoms of O—C in migrants may originate from social isolation, teasing, or bullying. These symptoms can cause problems in relationships and interfere with the ability to study or work. I—S is also a mental problem characteristic of migrants. Compared with urban residents, migrant workers may experience low self-esteem, gloominess, and feelings of being treated unfairly. It is difficult for these workers to establish favorable interpersonal interactions with local inhabitants because of their unequal status. Within some migrant worker groups, it is also difficult for these individuals to form long-term friendly relationships because of the transitory nature of their lives and competition. However, some migrants migrating in groups from the same rural area to a single work unit could establish camaraderie which was

Table 3 Lifestyle behaviors of the migrant workers according to gender.

		Males[a]	Females[b]	p
Smoking status	Former smoker/never smoked	1489 (53.0)	2611 (97.7)	<0.001
	Current smoker	1322 (47.0)	62 (2.3)	
Alcohol consumption	Nonhazardous alcohol use	1979 (70.4)	2456 (91.9)	<0.001
	Hazardous alcohol use	832 (29.6)	217 (8.1)	
Sleep duration	7—9 h	2166 (77.1)	2107 (78.8)	0.114
	< 7 or > 9 h	645 (22.9)	566 (21.2)	
Breakfast habits	Almost every day	2302 (81.9)	2156 (80.7)	0.241
Fruit & vegetable consumption	Almost every day	2101 (74.7)	2149 (80.4)	<0.001
Regular meals	Almost every day	2398 (85.3)	2244 (84.0)	0.613
Lifestyle score	Healthy	640 (22.8)	1386 (51.9)	<0.001
	Unhealthy	2171 (77.2)	1287 (48.1)	

Data are presented as n (%).
[a] $n = 2811$.
[b] $n = 2673$.

Males:

SCL-90-R subscales

SCL-90-R subscales	OR (95% CI)	P-value
SOM	2.66 (1.67, 4.24)	<0.001
O-C	2.84 (2.00, 4.03)	<0.001
I-S	2.75 (1.87, 4.04)	<0.001
DEP	3.38 (2.08, 5.49)	<0.001
ANX	4.02 (2.15, 7.52)	<0.001
HOS	3.17 (2.09, 4.82)	<0.001
PHOB	3.02 (1.60, 5.69)	<0.001
PAR	2.59 (1.74, 3.85)	<0.001
PSY	4.91 (2.47, 9.73)	<0.001

Females:

SCL-90-R subscales

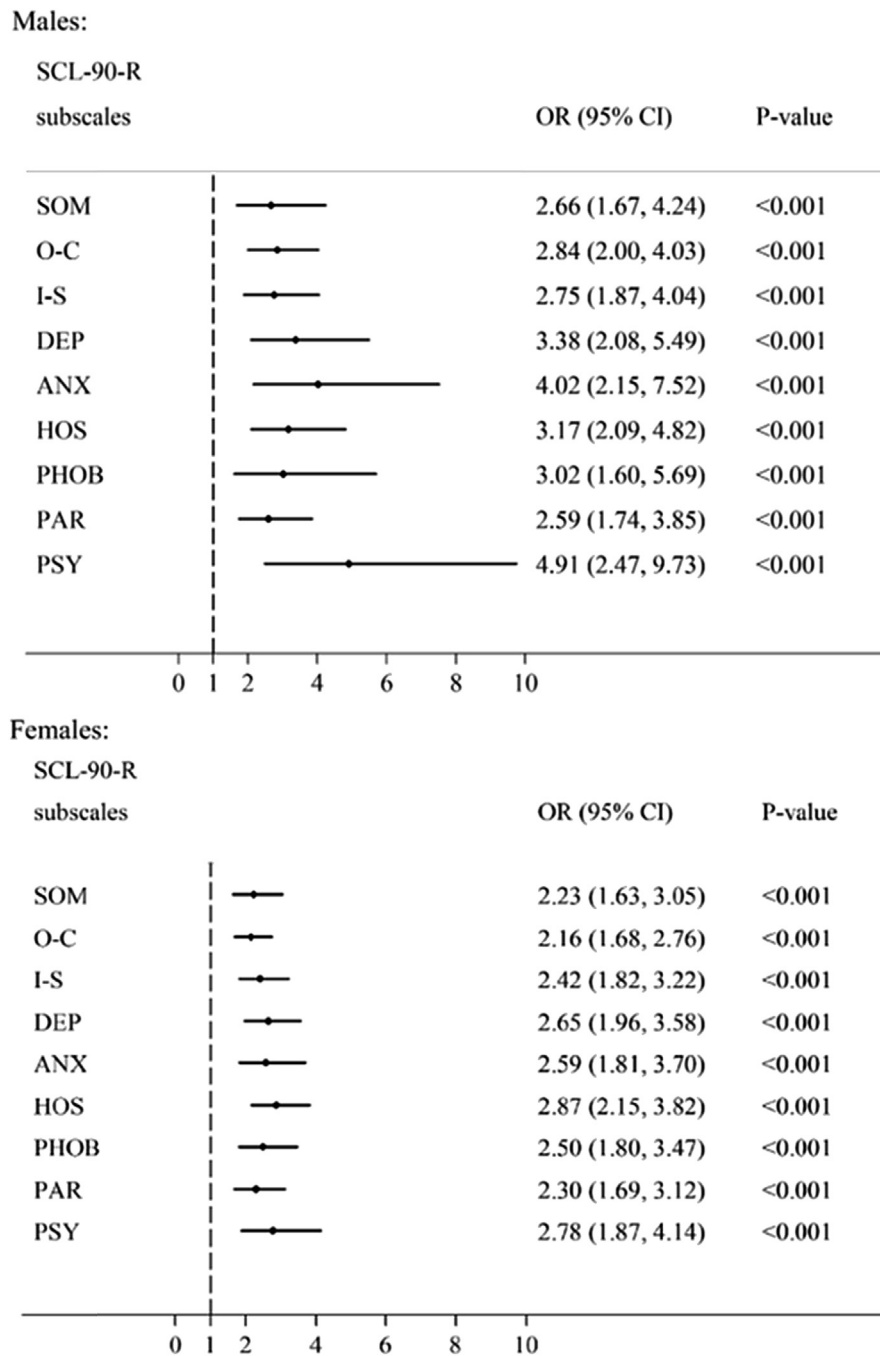| SCL-90-R subscales	OR (95% CI)	P-value
SOM	2.23 (1.63, 3.05)	<0.001
O-C	2.16 (1.68, 2.76)	<0.001
I-S	2.42 (1.82, 3.22)	<0.001
DEP	2.65 (1.96, 3.58)	<0.001
ANX	2.59 (1.81, 3.70)	<0.001
HOS	2.87 (2.15, 3.82)	<0.001
PHOB	2.50 (1.80, 3.47)	<0.001
PAR	2.30 (1.69, 3.12)	<0.001
PSY	2.78 (1.87, 4.14)	<0.001

Figure 2 Gender-specific association between psychiatric disorders and unhealthy lifestyle scores after adjustment for potential confounders. Adjustments were made for age, occupation, workplace scale, educational attainment, marital status, accompanying child/children, salary, years of residency in Shanghai, cities experienced, daily work hours, weekly workdays, type of residence, chronic disease, blood pressure, and body mass index. ANX = anxiety; CI = confidence interval; DEP = depression; HOS = hostility; I—S = interpersonal sensitivity; O—C = obsessions—compulsions; OR = odds ratio; PAR = paranoid ideation; PHOB = phobic anxiety; PSY = psychoticism; SOM = somatization.

helpful to relieve I—S.[36] In addition, HOS reflects the intense psychiatric pressures and conflicts of the migrants. Discontent with the present situation may transform into irritability, rage, resentment, or aggression, which may harm individuals and society.

The current study indicates that mental health problems may differ according to gender. This observation was similar to several studies[37,38] which illuminated that the female migrants had suffered more from hostility, depression, anxiety, phobic anxiety, and psychoticism. However, some studies on international migration showed mental health problems were found more in males. A study that investigated migration from the Caribbean to the United States identified an increase in the prevalence of common

mental disorders in men, but not women.[39] A study regarding mental health in immigrant men and women in Australia indicated that men from nonEnglish speaking foreign-born backgrounds may be at increased risk of mental health problems.[40] Due to the cross-sectional nature of the present study, we were limited in our ability to explain this finding.

The current study identified associations between nine dimensions of psychological disorders (SOM, O−C, I−S, DEP, ANX, HOS, PHOB, PAR, and PSY) and a cluster of unhealthy lifestyle behaviors in migrant workers. These findings were consistent with previous studies that demonstrated patients with DEP or ANX are more likely to practice unhealthy habits, such as smoking, alcohol consumption, or a lack of physical activity.[10,11,41] In the current study, with the exception of DEP and ANX, PSY was strikingly associated with an unhealthy lifestyle in the male migrants, whereas HOS and PSY were more typical of the female migrants.

Mental disorders can cause considerable functional and social disabilities, which exclude patients from normal life activities.[11] Mental disorders are also often associated with an unhealthy lifestyle.[42] The identification of individuals with mental disorders is therefore very important not only because of the need to treat clinically significant emotional abnormalities, but also to conduct behavioral interventions that target risk factors.

Health-related lifestyle behaviors are important determinants of disease and mortality and are fundamental to public health. The disease load in migrant workers is more serious compared with urban residents because of the lack of abundant social security (e.g., health insurance and unemployment insurance). Thus, primary prevention is vitally important to migrants. Our findings indicate that lifestyle modifications may be more challenging in migrants with mental disorders. The maintenance of favorable lifestyle behaviors requires the absence of emotional distress.[43] Therefore, mental disorders should be identified in the early stage, and various psychological interventions may foster a healthy lifestyle.

The current observational study has several intrinsic limitations. Due to the cross-sectional study design, we cannot determine causality between the presence of mental disorders and adhesion to unhealthy behaviors. Furthermore, data were not collected from native residents in Shanghai; thus, the current findings cannot address potential differences between migrant workers and native residents. Additionally, the details of the participants who had difficulty regarding the completion of the questionnaire were not recorded and analyzed in the current study. These would lead to information bias and affect the survey outcome partly. A prospective study is required to confirm that emotional stress may lead to unhealthy behaviors. Nevertheless, the current insights into the associations between mental disorders and lifestyle behaviors in migrant workers may facilitate the development of targeted primary prevention strategies for this population.

Acknowledgments

References

1. China NBoSo. *Investigative report on the monitoring of our country's migrant workers in 2014.* 2015. Available at: http://www.stats.gov.cn/tjsj/zxfb/201504/t20150429_797821.html [Accessed 3 November 2015].

2. Zhang J, Li X, Fang X, Xiong Q. Discrimination experience and quality of life among rural-to-urban migrants in China: the mediation effect of expectation−reality discrepancy. *Qual Life Res* 2009;**18**:291−300.

3. Mou J, Griffiths SM, Fong H, Dawes MG. Health of China's rural−urban migrants and their families: a review of literature from 2000 to 2012. *Br Med Bull* 2013;**106**:19−43.

4. Mou J, Cheng JQ, Griffiths SM, Wong SYS, Hillier S, Zhang D. Internal migration and depressive symptoms among migrant factory workers in Shenzhen, China. *J Community Psychol* 2011;**39**:212−30.

5. Qiu P, Caine E, Yang Y, Chen Q, Li J, Ma X. Depression and associated factors in internal migrant workers in China. *J Affect Disord* 2011;**134**:198−207.

6. Zhang F, Li ZS, Lu LL, Wang SY. Surveying the status of mental health of migrant rural workers in Chongqing. *Chin Health Serv Manag* 2011;**28**:864−7.

7. Hu PF, Mason WM, Song SG, Treiman DJ, Wang W. *Differential of insomnia symptoms between migrants and nonmigrants in China. California Center for Population Research*. On-line Working Paper Series. 2007. Available at:, http://escholarship.org/uc/item/3c15w75k [Accessed 20 January 2015].

8. Orozco R, Borges G, Medina-Mora ME, Aguilar-Gaxiola S, Breslau J. A cross-national study on prevalence of mental disorders, service use, and adequacy of treatment among Mexican and Mexican American populations. *Am J Public Health* 2013;**103**:1610−8.

9. Kirmayer LJ, Narasiah L, Munoz M, Rashid M, Ryder AG, Guzder J, et al. Common mental health problems in immigrants and refugees: general approach in primary care. *CMAJ* 2011;**183**:E959−67.

10. Bonnet F, Irving K, Terra JL, Nony P, Berthezène F, Moulin P. Anxiety and depression are associated with unhealthy lifestyle in patients at risk of cardiovascular disease. *Atherosclerosis* 2005;**178**:339−44.

11. Piwoński J, Piwońska A, Sygnowska E. Do depressive symptoms adversely affect the lifestyle? Results of the WOBASZ study. *Kardiol Pol* 2010;**68**:912−8.

12. Wang Z. Symptom Check-list90. *Shanghai Arch Psychiatry* 1984;**2**:68−70.

13. Yang H, He F, Wang TH, Liu Y, Shen Y, Gong J, et al. Health-related lifestyle behaviors among male and female rural-to-urban migrant workers in Shanghai, China. *PLoS ONE* 2015;**10**:e0117946.

14. Yan J, Guo XJ. An analysis of reliability and validity of SCL 90 by MGT and SEM. *J Huzhou Teach Coll* 2014;**36**:72−6.

15. Chen SL, Li LJ. Re-testing reliability, validity and norm applicatility of SCL-90. *Chin J Nerv Ment Dis* 2003;**29**:323−7.

16. Huang BH, Wang Y, Wang H, Wang QL. The reliability and validity of SCL-90 scale in immigrants. *Chinese J Behav Med Sci* 2008;**17**:943−5.

17. Holi M. *Assessment of psychiatric symptoms using the SCL-90.* Helsinki: Department of Psychiatry Helsinki University Finland; 2003. p. 24−35.

18. Yang GH, Ma JM, Liu N, Zhou LN. Smoking and passive smoking in Chinese, 2002. *Chin J Epidemiol* 2005;**26**:77—83.
19. Rubinsky AD, Dawson DA, Williams EC, Kivlahan DR, Bradley KA. AUDIT-C Scores as a scaled marker of mean daily drinking, alcohol use disorder severity, and probability of alcohol dependence in a US general population sample of drinkers. *Alcohol Clin Exp Res* 2013;**37**:1380—90.
20. Cappuccio FP, D'Elia L, Strazzullo P, Miller MA. Sleep duration and all-cause mortality: a systematic review and meta-analysis of prospective studies. *Sleep* 2010;**33**:585—92.
21. Kvaavik E, Batty GD, Ursin G, Huxley R, Gale CR. Influence of individual and combined health behaviors on total and cause-specific mortality in men and women: the United Kingdom health and lifestyle survey. *Arch Intern Med* 2010;**170**:711—8.
22. Djousse L, Driver JA, Gaziano JM. Relation between modifiable lifestyle factors and lifetime risk of heart failure: the physicians' health study I. *JAMA* 2009;**302**:394—400.
23. Forman JP, Stampfer MJ, Curhan GC. Diet and lifestyle risk factors associated with incident hypertension in women. *JAMA* 2009;**302**:401—11.
24. Eguchi E, Iso H, Tanabe N, Wada Y, Yatsuya H, Kikuchi S, et al. Healthy lifestyle behaviors and cardiovascular mortality among Japanese men and women: the Japan collaborative cohort study. *Eur Heart J* 2012;**33**:467—77.
25. Odegaard AO, Koh WP, Gross MD, Yuan JM, Pereira MA. Combined lifestyle factors and cardiovascular disease mortality in Chinese men and women: the Singapore Chinese health study. *Circulation* 2011;**124**:2847—54.
26. Khaw KT, Wareham N, Bingham S, Welch A, Luben R, Day N. Combined impact of health behaviors and mortality in men and women: the EPIC-Norfolk prospective population study. *PLoS Med* 2008;**5**:e12.
27. Van Dam RM, Li T, Spiegelman D, Franco OH, Hu FB. Combined impact of lifestyle factors on mortality: prospective cohort study in US women. *BMJ* 2008;**337**:a1440.
28. Carlsson AC, Wandell PE, Gigante B, Leander K, Hellenius ML, de Faire U. Seven modifiable lifestyle factors predict reduced risk for ischemic cardiovascular disease and all-cause mortality regardless of body mass index: a cohort study. *Int J Cardiol* 2013;**168**:946—52.
29. Lin QH, Liu YM, Zhou JD, Cao NQ, Fan YY. Influential factors on psychosocial health of the migrant workers in Guangzhou Chinese. *J Ind Hyg Occup Dis* 2012;**30**:201—4.
30. Sun CY. Investigation and analysis of mental health status of northeast peasant workers. *China J Health Psychol* 2007;**15**:460—2.
31. Liu DJ, Zheng L, Luo BQ. Mental health status and its influencing factors of migrant workers in industrial enterprises of Shenzhen City. *Occup Health* 2011;**27**:2057—9.
32. Liu LL, Li Q, Xia Y, Hu ML, Guo W. Survey on Xi'an peasant workers' mental health status and its influencing factor. *China J Health Psychol* 2012;**20**:61—3.
33. Wong DF, He X, Leung G, Lau Y, Chang Y. Mental health of migrant workers in China: prevalence and correlates. *Soc Psychiatry Psychiatr Epidemiol* 2008 Jun;**43**:483—9.
34. Dai X. The mental health, physical fitness and exercise of the migrant workers in the pearl river delta. *Chin J Sports Med* 2011;**30**:564—8.
35. Peng Y, Chang W, Zhou H, Hu H, Liang W. Factors associated with health-seeking behavior among migrant workers in Beijing, China. *BMC Health Serv Res* 2010;**10**:69—79.
36. Li L, Wang HM, Ye XJ, Jiang MM, Lou QY, Hesketh T. The mental health status of Chinese rural-urban migrant workers: comparison with permanent urban and rural dwellers. *Soc Psychiatry Psychiatr Epidemiol* 2007;**42**:716—22.
37. Li CQ, He MY, Zhang X. Integrated research of mental health in China's migrant workers. *Health Res* 2011;**31**:267—70.
38. Chen YL, Ye L, Zhang JJ, Wang P. Investigation of the mental health status of the new generation migrant workers in Anhui province. *J Bengbu Med Coll* 2015;**40**:388—92.
39. Williams DR, Haile R, Gonzalez HM, Neighbors H, Baser R, Jackson JS. The mental health of black Caribbean immigrants: results from the National Survey of American Life. *Am J Public Health* 2007;**97**:52—9.
40. Straiton M, Grant JF, Winefield HR, Taylor A. Mental health in immigrant men and women in Australia: the North West Adelaide Health Study. *BMC Public Health* 2014;**14**:1111.
41. Moselhy HF, Ghubach R, El-Rufaie O, Zoubeidi T, Badrinath P, Sabri S, et al. The association of depression and anxiety with unhealthy lifestyle among United Arab Emirates adults. *Epidemiol Psychiatr Sci* 2012;**21**:213—9.
42. Rohrer JE, Pierce Jr JR, Blackburn C. Lifestyle and mental health. *Prev Med* 2005;**40**:438—43.
43. Hayward C. Psychiatric illness and cardiovascular disease risk. *Epidemiol Rev* 1995;**17**:128—38.