


Anxiety and Depression Status and Influencing Factors of MSM in the Post-COVID-19 Epidemic Period: A Cross-Sectional Study in Western China

American Journal of Men's Health
November-December 1–12
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DOI: 10.1177/15579883211057701
journals.sagepub.com/home/jmh


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Abstract

This study aimed to explore the psychological status and influencing factors of men who have sex with men (MSM) during the stable period of the COVID-19 epidemic, to provide a reference for the mental health counseling of MSM, and to provide a scientific basis for this group to actively respond to public health emergencies. A cross-sectional survey was conducted on the demographic characteristics, epidemic experiences, risk perception, and COVID-19-related attitudes of MSM in western China, and MSM anxiety and depression were assessed by using the Anxiety Self-Rating Scale and the Center for Epidemiological Studies Depression (CES-D) Scale. The incidences of MSM anxiety and depression in the post-COVID-19 epidemic period are 21.7% and 38.0%, respectively. Logistic regression analysis showed that in terms of anxiety, high controllability of the epidemic (OR = 0.7616) is a protective factor. Thinking that they are more susceptible to COVID-19 (OR = 1.6168) and worrying about another outbreak of the epidemic (OR = 1.4793) are risk factors. In terms of depression, being able to protect themselves from being infected with COVID-19 (OR = 0.6280) is a protective factor. The role of anal sex as “0”/“0.5,” and believing that they are more susceptible to COVID-19 (OR = 1.3408) are risk factors. The sudden outbreak affected the psychological state of MSM and even caused negative feelings of anxiety and depression. These findings suggest that prevention and education should be strengthened, and effective intervention measures should be taken as soon as possible, to improve the mental health of MSM.

Keywords

MSM, COVID-19 epidemic, mental health, risk perception, epidemic experiences

Received December 19, 2020; revised October 15, 2021; accepted October 18, 2021

As a high-risk group of HIV infection, men who have sex with men (MSM) are 26 times more likely to be infected with HIV than the general population (UNAIDS, 2020). In China, the rate of new infections among MSM is on the rise. It is estimated that the male-to-male transmission rate of AIDS in China rose from 2.5% in 2006 to 28% in 2016 (CDC, 2016; Qin et al., 2017).

Due to their sexual orientation, most countries and regions have low social acceptance of MSM (Bluthenthal et al., 2012; Jiang et al., 2019). Stigmatization and discrimination against MSM are still widespread, which leads to poor psychosocial health in MSM (Logie et al., 2012; Mimiaga et al., 2015; Thomas et al., 2009; 2011; 2012). Compared with the general population, MSM has a higher prevalence of anxiety and depression. In previous

studies, the prevalence of anxiety in the general population was less than 10% (Salomon et al., 2009), and the prevalence of depression was between 5% and 12% (Kessler et al., 1994). Whereas the prevalence of anxiety and depression in MSM ranged from 26.4% to 44% and 39.3% to 80%, respectively. A meta-analysis (Li et al., 2020) on the prevalence of depression showed that the

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prevalence of depression among MSM in China was 43.9%, significantly higher than 3% among men (King et al., 2008). Studies have shown that the prevalence rates of anxiety among MSM in Zhejiang and Chongqing, China, were 24.0% and 31.97%, respectively. Besides, previous studies have reported that poor mental health such as anxiety and depression are related to the HIV risk of MSM (Babowitch et al., 2018; Brickman et al., 2017; Chen & Raymond, 2017; Fendrich et al., 2013; Lelutiu-Weinberger et al., 2013; Pan et al., 2017; Watkins et al., 2016). For instance, the higher the level of depressive symptoms reported by MSM, the more likely they are to have unprotected anal sex (Fendrich et al., 2013); anxiety has also been identified as an independent predictor of sexual risk (Lelutiu-Weinberger et al., 2013). At the same time, anxiety and depression not only harm people's mental health, but they are also related to other adverse health consequences, such as smoking (Taha & Goodwin, 2014), drinking (Saatcioglu et al., 2008), suicidal intention (Ruutel et al., 2017; Wei et al., 2020; Wu et al., 2015), low compliance with antiviral drugs (Colson et al., 2020; de Moraes & Casseb, 2017; Tao et al., 2017), and other chronic lifelong diseases (Wells et al., 1989).

At the end of December 2019, pneumonia caused by novel coronavirus infection was first reported in Wuhan, China. So far, SARS-CoV-2 (Gorbalenya et al., 2020) has rapidly spread to more than 200 countries or regions around the world (WHO, 2020c). As a public health emergency of international concern (WHO, 2020b), COVID-19 (WHO, 2020d) has caused 26,121,999 infections and 864,618 deaths worldwide (WHO, 2020c). The COVID-19 pandemic (WHO, 2020d) has also caused unprecedented social chaos, with huge impacts on society, the economy, and health care, and severe psychological trauma to people (Gonzalez-Sanguino et al., 2020; Kawohl & Nordt, 2020; Yang & Ma, 2020). Suddenness and uncertainty of public health emergencies will inevitably make individuals prone to psychological stress responses and behavioral problems, such as fear, anxiety, hypochondriasis, depression, insomnia, and so on. Studies have reported that the physical damage caused by public health emergencies may be recovered in a short time. However, the negative psychological impact on people may be long-lasting and persistent (Xi et al., 2020; Zhang et al., 2011).

Many studies have reported that sociodemographic characteristics (Phillips et al., 2009) substance use (Fendrich et al., 2013), alcohol consumption (Hu et al., 2019), sexual orientation (Bostwick et al., 2010; Jorm et al., 2002; Liu et al., 2020; Phillips et al., 2009), and commercial sexual behavior (Hu et al., 2019), and so on, are associated with anxiety and depression in MSM. Previous studies have focused on MSM sexual identities: anal sex role "0" (more feminine in behavior, who only

engage in receptive anal intercourse), anal sex role "1" (more masculine in appearance, who only engage in insertive anal intercourse), and anal sex role "0.5" (engage in both receptive and insertive anal intercourse) (Hu et al., 2019; Liu et al., 2020; Tomori et al., 2016). Female gender expressions of MSM with sex role "0" makes them easily identifiable (Chakrapani et al., 2013; Chakrapani et al., 2011), making them obvious targets for stigmatization and discrimination (Thomas et al., 2012), and they play a submissive role in male sexual intercourse (Hart et al., 2014). MSM with sex role "0.5" play both "1" and "0" roles. Therefore, there is considerable sex-role conflict among MSM (Johns et al., 2012; Wei & Raymond, 2011). Studies have reported varying degrees of anxiety and depression among the general population in China during the COVID-19 epidemic (Dong et al., 2020; Li et al., 2020; Zhen & Zhou, 2020). As a major public health emergency, the novel coronavirus pneumonia outbreak has also undergone an incubation period, an outbreak period, and a recovery period (Zhao, 2020; Zeng & Huang, 2017). The psychological status of MSM as a vulnerable population in the post-COVID-19 epidemic period is worthy of attention. At present, most of the studies on the mental health of MSM are carried out in regular periods, and little is known about the psychological conditions and needs related to MSM at the later stage of the epidemic. Therefore, based on their anal sex roles of MSM and risk perceptions associated with the epidemic, this study investigated the prevalence and influencing factors of anxiety and depression in the post-COVID-19 epidemic period among MSM in three provinces (Chongqing, Sichuan, and Xinjiang) of western China. It has innovative and practical implications for better understanding the sexual culture of MSM and the impact of the epidemic on psychological status in western China. In addition, it also provides a reference for mental health prevention and intervention policies for the mental health of MSM and has practical implications for this population to actively respond to public health emergencies.

Materials and Methods

Sample

A cross-sectional study was conducted by self-filled questionnaire. The subjects were recruited from the National Key Project for Infectious Diseases of the Ministry of Science and Technology of China in the "13th Five-Year Plan" period. This project is based on the intelligent reminder system to improve the pre-exposure prophylaxis medication adherence of MSM population to reduce new HIV infection. Participants were recruited using nonprobability sampling in southwest China (Sichuan and Chongqing) and northwest China (Xinjiang).

We publicized and promoted on the WeChat public account of the health service center, gay website, and QQ group, and cooperated with local NGOs to provide them with information about HIV prevention, consultation, and testing on the Internet. We informed NGO managers of the specific information about this study, including the purpose, process, potential benefits, and risks, in order to obtain their support. Participants were encouraged to invite friends who meet the criteria. Inclusion criteria were male, age 15 or above, who had engaged in sex with male partners in the past 6 months. We followed relevant guidelines to ensure that this study is voluntary and confidential. The study was approved by the Ethics Committee of XX Medical University (Reference Number: 2019001), and participants all signed the written informed consent before completing the questionnaire. Each participant received a bonus of ¥10.

From July 15 to September 15, 2020, questionnaires were distributed to the subjects one-to-one via WeChat, and returned to the investigator after completion. If the participants encountered something unclear, the investigator would answer the question one by one through WeChat.

The quality control of the questionnaire was as follows: (a) Set up test questions in the questionnaire; wrong choices will be regarded as invalid questionnaire. (2) Eliminate data with an answering time of less than 5 min or more than 30 min (the answering time of each questionnaire is automatically monitored in the background of the online questionnaire). (c) Each participant can only fill out the questionnaire once and complete it before submitting it. (d) The same IP address can only be answered once.

Measurement

Demographic characteristics included age, education attainment and residence, employment status, marital status, and monthly personal income.

Sexual role and HIV infection status were collected by anonymous questionnaire survey. All participants were asked to answer “What is your usual sex position during anal sexual activities with men?” According to the above answer, MSM were divided into three sexual identities: anal sex role “0,” the way that MSM only engaged in receptive anal intercourse; anal sex role “1,” the way that MSM only engaged in insertive anal intercourse; and anal sex role “0.5,” the way that MSM engaged in both receptive and insertive anal intercourse. Participants were also be asked about the current status of their HIV infection.

The epidemic exposure scale was compiled based on the exposure scales of Ping Wu (Wu et al., 2009) and Hal (Hall et al., 2015) and combined with the COVID-19 outbreak. The scale consisted of eight items (e.g., “Have you ever been isolated due to the diagnosis or suspected infection of the COVID-19?” and “Do you have a neighbor

diagnosed with COVID-19?”); each item was scored by 0 = “No” and 1 = “Yes.” The total score was obtained by adding the scores of the eight items. If the score was 0, the epidemic experience was no, and if the score was greater than or equal to 1, the epidemic experience was yes.

Based on the SARS risk perception questionnaire of Brug (Brug et al., 2004) and Shikan (Shi et al., 2003), combined with the COVID-19-related questionnaire (Brewer et al., 2007; WHO, 2020a) of WHO and the specific situation of the epidemic, the risk perception questionnaire for COVID-19 epidemic situation was developed. Risk perception included five dimensions: controllability and familiarity of epidemic risk information, possibility, susceptibility, and severity of infection. There were three items of the controllability dimension (e.g., “I can take protective measures,” “I can control the economic losses caused by the epidemic,” and “I can make sure I am not infected with COVID-19”). The familiarity of epidemic risk information, possibility, susceptibility, and severity of infection each had one item respectively, which were “Curative effect of COVID-19,” “Possibility of infection with the coronavirus,” “More susceptible to COVID-19 than others,” and “Unable to handle daily affairs if infected.”

Affective response to the COVID-19 epidemic was assessed through a single item (Lee & Lemyre, 2009): “I am very worried about another outbreak.” The rating was based on a five-point Likert scale (1 = *totally agree*, 5 = *totally disagree*).

Attitudes toward COVID-19 were composed of nine items (e.g., “I think COVID-19 is very contagious,” “I think COVID-19 is very prevalent where I live,” “I am terrified of COVID-19,” “COVID-19 is very close to me,” “I feel nervous when I go out,” “The epidemic has been effectively controlled,” “I think there will be another small epidemic,” “The epidemic will cause economic losses to me,” “Taking measures can effectively prevent COVID-19 infection.”), all of which are scored from 1 to 5, ranging from *completely disagree* to *completely agree*. The univariate results only showed items with statistical differences. The Cronbach’s α in this study was 0.632. Anxiety was measured by the Anxiety Self-Rating Scale (Zung, 1971), and previous studies have good reliability and validity. The scale consists of 20 items, five of which are reverse items. According to the frequency of occurrence of each item in the past week, the participants rated from 1 (*rarely or none of the time*) to 4 (*most or all of the time*). For example, I feel afraid for no reason at all, I can feel my heart beating fast, I have nightmares, and so on. The scores of the 20 items were added up to obtain the total rough score, which was then multiplied by 1.25 and converted to a standard score. Those with a score greater than or equal to 50 are anxious. The higher the score, the

more severe the anxiety. The Cronbach's α in this study was 0.840.

Depression was measured by the Center for Epidemiological Studies Depression (CES-D) Scale (Radloff, 1977), and many studies have confirmed that this scale has good reliability and validity (Qin et al., 2017; Xu et al., 2014). The scale consists of 20 items (e.g., "I felt fearful" and "My sleep was restless"), four of which are reverse items. CES-D uses a four-level scale, from 0 (*occasionally or none*) to 3 (*most of the time*), and the total score was obtained by adding the scores of 20 items to assess the level of depression. Those with a score greater than or equal to 16 are depressed. The higher the score, the more severe the depressive symptoms. The Cronbach's α in this study was 0.922.

Statistical Analysis

IBM SPSS 25 was used for statistical analysis. According to the purpose of the study, some continuous variables (age, epidemic experience times, anxiety score, depression score) in this study are converted into categorical variables. The chi-square test is used to compare whether there is a difference in the incidence of anxiety and depression of MSM with different characteristics. The trend of the occurrence of anxiety and depression in MSM with the changes of MSM characteristics is analyzed by trend chi-square, and the latent variables are preliminary screened. The binary logistic regression analysis method was used to screen the influencing factors of anxiety and depression, and the variables with $p \leq 0.1$ in the univariate analysis were brought into the logistic regression analysis with the stepwise procedure ($\text{sle} = 0.05$, $\text{sls} = 0.05$).

Results

A total of 418 questionnaires were distributed, of which 350 were qualified, with a pass rate of 83.7%. There was no statistical difference between the 350 MSM population included and the 68 MSM excluded in terms of their main demographic characteristics (residence, education attainment, ethnicity, marital status, monthly personal income) ($p > .05$). Among the qualified questionnaires, 110 were from the Southwest (Sichuan Province and Chongqing) and 240 were from the Northwest (Xinjiang Province).

Participants' Characteristics

The MSM participating in the study were between 15 and 63 years old. Most participants were under 36 years old (57.71%), employed (78.57%), and urban residents (77.71%). The MSM with a college degree or above were the most (48.29%), followed by junior college degree (36.86%) and high school degree (8.57%). A proportion

43.43 of the MSM had a monthly personal income of more than 5000 yuan, 36% had a monthly personal income of 3001–5000 yuan, and 20.57% had a monthly personal income of no more than 3000 yuan. Further, 71.14% of MSM were unmarried, 16.57% were married, and 12.29% were divorced or widowed. The majority of MSM participants (73.71%) had been tested for the novel coronavirus, and the untested rate was only 26.69%. See Table 1 for more details.

Prevalence and Influencing Factors of Anxiety in MSM

Among the MSM, 21.7% (76 of 350) experienced anxiety symptoms.

The results of univariate analysis showed that (a) In terms of demographic and sexual behavior characteristics, there were no statistically significant differences in age, education attainment, employment status, marital status, income, sexual behavior, and self-reported HIV infection status among the groups ($p > .05$). (b) In terms of attitudes toward COVID-19, as the fear of COVID-19 decreased, the incidence of anxiety showed a downward trend. The less you agree that COVID-19 was very close to you, the lower the occurrence of anxiety. As the tension of going out decreased, the incidence of anxiety gradually declined. The difference was also statistically significant in terms of effective control of the epidemic and economic losses caused by the epidemic ($p < .05$). (c) In terms of risk perception, the controllability dimension: the more uncontrollable the epidemic situation brought to their own economic losses, the lower the incidence of anxiety; the familiarity dimension: in terms of familiarity with the cure effect of COVID-19, the incidence of anxiety had no statistical difference ($p > .05$); the possibility dimension: in terms of the possibility of infecting COVID-19, the difference in the incidence of anxiety was not statistically significant ($p > .05$); the dimension of susceptibility to infection: with the increase in recognition that they were more susceptible to COVID-19 than others, the incidence of anxiety was on the rise; the dimension of severity of infection: the more severe they thought they were infected with COVID-19, the higher the incidence of anxiety. The more worried about another outbreak of the epidemic of COVID-19, the higher the incidence of anxiety (Table 1).

In the multivariable model, MSM who were more able to control the economic losses caused by the epidemic were less likely to develop anxiety symptoms (OR = 0.7616, 95% CI [0.5902, 0.9828]). MSM who thought they were more likely to be infected with COVID-19 were more likely to have anxiety symptoms (OR = 1.6168, 95% CI [1.1505, 2.2720]). The more worried about the outbreak, the more likely to have anxiety symptoms (OR = 1.4793, 95% CI [1.0365, 2.1112]) (Table 2).

Table 1. Participants' Characteristics of MSM and Univariate Analysis.

Variable	Total n (%)	Anxiety		p Value	Depression		p Value
		No n (%)	Yes n (%)		No n (%)	Yes n (%)	
N	350	274 (78.3)	76 (21.7)		217 (62.00)	133 (38.00)	
Demographic characteristics							
Age ^a				.278			.243
≤35	202 (57.71)	154 (76.24)	48 (23.76)		120 (59.41)	82 (40.59)	
>35	148 (42.29)	110 (81.08)	28 (18.92)		97 (65.54)	51 (34.46)	
Residence ^a				.770			.532
Urban	272 (77.71)	212 (77.94)	60 (22.06)		171 (62.87)	101 (37.13)	
Rural	78 (22.29)	62 (79.49)	16 (20.51)		46 (58.97)	32 (41.03)	
Ethnic groups ^a				.614			.908
Han nationality	314 (89.71)	247 (78.66)	67 (21.34)		195 (62.10)	119 (37.90)	
National minorities	36 (10.29)	27 (75.00)	9 (25.00)		22 (61.11)	14 (38.89)	
Educational level ^a				.257			.114
Junior high or below	22 (6.29)	16 (72.73)	6 (27.27)		11 (50.00)	11 (50.00)	
Senior high	30 (8.57)	26 (86.67)	4 (13.33)		21 (70.00)	9 (30.00)	
Junior college	129 (36.86)	95 (73.64)	34 (26.36)		72 (55.81)	57 (44.19)	
College and above	169 (48.29)	137 (81.07)	32 (18.93)		113 (66.86)	56 (33.14)	
Employment status ^a				.534			.573
On the job	275 (78.57)	218 (79.27)	57 (20.73)		174 (63.27)	101 (36.73)	
Retired or unemployed	59 (16.86)	43 (72.88)	16 (27.12)		33 (55.93)	26 (44.07)	
Students at school	16 (4.57)	13 (81.25)	3 (18.75)		10 (62.50)	6 (37.50)	
Marital status ^a				.149			.307
Unmarried	249 (71.14)	190 (76.31)	59 (23.69)		149 (59.84)	100 (40.16)	
Married	58 (16.57)	51 (87.93)	7 (12.07)		41 (70.69)	17 (29.31)	
Divorced or widowhood	43 (12.29)	33 (76.74)	10 (23.26)		27 (62.79)	16 (37.21)	
Monthly personal income ^a				.103			.367
≤3000	72 (20.57)	63 (87.50)	9 (12.50)		46 (63.89)	26 (36.11)	
3001–5000	126 (36.00)	96 (76.19)	30 (23.81)		72 (57.14)	54 (42.86)	
≥5001	152 (43.43)	115 (75.66)	37 (24.34)		99 (65.13)	53 (34.87)	
Novel-coronavirus detection ^a				.241			.046
Had not done	92 (26.29)	76 (82.61)	16 (17.39)		65 (70.65)	27 (29.35)	
Had done	258 (73.71)	198 (76.74)	60 (23.26)		152 (58.91)	106 (41.09)	
Sexual role and HIV infection status							
The role of MSM in anal sex with male sexual partner ^a				.799			.162
Anal sex role “0”	66 (18.86)	50 (75.76)	16 (24.24)		36 (54.55)	30 (45.45)	
Anal sex role “0.5”	193 (55.14)	151 (78.24)	42 (21.76)		118 (61.14)	75 (38.86)	
Anal sex role “1”	91 (26.00)	73 (80.22)	18 (19.78)		63 (69.23)	28 (30.77)	
Self-reported HIV infection status ^a				.902			.212
Negative	319 (91.14)	250 (78.37)	69 (21.6)		201 (63.01)	118 (36.99)	
Positive	31 (8.86)	24 (77.42)	7 (22.58)		16 (51.61)	15 (48.39)	
Epidemic exposure experience							
Epidemic experience ^a				.086			.002
No	164 (46.86)	135 (82.32)	29 (17.68)		116 (70.73)	48 (29.27)	
Yes	186 (53.14)	139 (74.73)	47 (25.27)		101 (54.30)	85 (45.70)	
Attitudes toward COVID-19							
Be terrified of COVID-19 ^b				.002			.124
Totally agree	49 (14.00)	34 (69.39)	15 (30.61)		27 (55.10)	22 (44.90)	
Quite agree	65 (18.57)	47 (72.31)	18 (27.69)		39 (60.00)	26 (40.00)	
Average	160 (45.71)	124 (77.50)	36 (22.50)		100 (62.50)	60 (37.50)	
Not quite agree	43 (12.29)	39 (90.70)	4 (9.30)		27 (62.79)	16 (37.21)	

(continued)

Table 1. (continued)

Variable	Total n (%)	Anxiety		p Value	Depression		p Value
		No n (%)	Yes n (%)		No n (%)	Yes n (%)	
Totally disagree COVID-19 is very close to me ^b	33 (9.43)	30 (90.91)	3 (9.09)	.015	24 (72.73)	9 (27.27)	.206
Totally agree	79 (22.57)	56 (70.89)	23 (29.11)		47 (59.49)	32 (40.51)	
Quite agree	93 (26.57)	73 (78.49)	20 (21.51)		57 (61.29)	36 (38.71)	
Average	128 (36.57)	100 (78.13)	28 (21.88)		77 (60.16)	51 (39.84)	
Not quite agree	38 (10.86)	33 (86.84)	5 (13.16)		26 (68.42)	12 (31.58)	
Totally disagree I feel nervous when I go out ^b	12 (3.43)	12 (100.00)	0 (0.00)	.001	10 (83.33)	2 (16.67)	.048
Totally agree	19 (5.43)	11 (57.89)	8 (42.11)		10 (52.63)	9 (47.37)	
Quite agree	40 (11.43)	27 (67.50)	13 (32.50)		22 (55.00)	18 (45.00)	
Average	134 (38.29)	104 (77.61)	30 (22.39)		81 (60.45)	53 (39.55)	
Not quite agree	99 (28.29)	81 (81.82)	18 (18.18)		62 (62.63)	37 (37.37)	
Totally disagree The epidemic has been effectively controlled ^b	58 (16.57)	51 (87.93)	7 (12.07)	.025	42 (72.41)	16 (27.59)	.013
Totally agree	166 (47.43)	138 (83.13)	28 (16.87)		112 (67.47)	54 (32.53)	
Quite agree	120 (34.29)	87 (72.50)	33 (27.50)		70 (58.33)	50 (41.67)	
Average	50 (14.29)	43 (86.00)	7 (14.00)		30 (60.00)	20 (40.00)	
Not quite agree	10 (2.86)	4 (40.00)	6 (60.00)		5 (50.00)	5 (50.00)	
Totally disagree The epidemic will cause economic losses to me ^b	4 (1.14)	2 (50.00)	2 (50.00)	.039	0 (0.00)	4 (100.00)	.015
Totally agree	177 (50.57)	130 (73.45)	47 (26.55)		96 (54.24)	81 (45.76)	
Quite agree	84 (24.00)	67 (79.76)	17 (20.24)		59 (70.24)	25 (29.76)	
Average	66 (18.86)	58 (87.88)	8 (12.12)		46 (69.70)	20 (30.30)	
Not quite agree	18 (5.14)	16 (88.89)	2 (11.11)		13 (72.22)	5 (27.78)	
Totally disagree Taking measures can effectively prevent COVID-19 infection ^b	5 (1.43)	3 (60.00)	2 (40.00)	.268	3 (60.00)	2 (40.00)	.032
Totally agree	239 (68.29)	190 (79.50)	49 (20.50)		156 (65.27)	83 (34.73)	
Quite agree	85 (24.29)	65 (76.47)	20 (23.53)		49 (57.65)	36 (42.35)	
Average	24 (6.86)	18 (75.00)	6 (25.00)		11 (45.83)	13 (54.17)	
Not quite agree	1 (0.29)	1 (100.00)	0 (0.00)		1 (100.00)	0 (0.00)	
Totally disagree Controllability dimension of risk perception	1 (0.29)	0 (0.00)	1 (100.00)		0 (0.00)	1 (100.00)	
I can make sure I am not infected with COVID-1 ^b				.102			.000
Totally agree	267 (76.29)	215 (80.52)	52 (19.48)		183 (68.54)	84 (31.46)	
Quite agree	56 (16.00)	40 (71.43)	16 (28.57)		21 (37.50)	35 (62.50)	
Average	24 (6.86)	17 (70.83)	7 (29.17)		11 (45.83)	13 (54.17)	
Not quite agree	2 (0.57)	1 (50.00)	1 (50.00)		1 (50.00)	1 (50.00)	
Totally disagree I can take protective measures ^b	1 (0.29)	1 (100.00)	0 (0.00)	.328	1 (100.00)	0 (0.00)	.007
Totally agree	149 (42.57)	120 (80.54)	29 (19.46)		105 (70.47)	44 (29.53)	
Quite agree	139 (39.71)	109 (78.42)	30 (21.58)		80 (57.55)	59 (42.45)	
Average	50 (14.29)	36 (72.00)	14 (28.00)		26 (52.00)	24 (48.00)	
Not quite agree	8 (2.29)	5 (62.50)	3 (37.50)		4 (50.00)	4 (50.00)	
Totally disagree I can control the economic loss caused by the epidemic ^b	4 (1.14)	4 (100.00)	0 (0.00)	.013	2 (50.00)	2 (50.00)	.000
Totally agree	53 (15.14)	45 (84.91)	8 (15.09)		42 (79.25)	11 (20.75)	
Quite agree	50 (14.29)	40 (80.00)	10 (20.00)		36 (72.00)	14 (28.00)	

(continued)

Table 1. (continued)

Variable	Total n (%)	Anxiety		p Value	Depression		p Value
		No n (%)	Yes n (%)		No n (%)	Yes n (%)	
Average	129 (36.86)	107 (82.95)	22 (17.05)		77 (59.69)	52 (40.31)	
Not quite agree	47 (13.43)	33 (70.21)	14 (29.79)		25 (53.19)	22 (46.81)	
Totally disagree	71 (20.29)	49 (69.01)	22 (30.99)		37 (52.11)	34 (47.89)	
Possibility dimension of risk perception							
Possibility of infection with the coronavirus ^b				.070			.047
Very likely	10 (2.86)	6 (60.00)	4 (40.00)		5 (50.00)	5 (50.00)	
More likely	27 (7.71)	22 (81.48)	5 (18.52)		15 (55.56)	12 (44.44)	
Likely	119 (34.00)	88 (73.95)	31 (26.05)		69 (57.98)	50 (42.02)	
Unlikely	166 (47.43)	133 (80.12)	33 (19.88)		107 (64.46)	59 (35.54)	
Extremely unlikely	28 (8.00)	25 (89.29)	3 (10.71)		21 (75.00)	7 (25.00)	
Susceptibility dimension of risk perception							
More susceptible to COVID-19 than others ^b				.000			.000
Totally agree	17 (4.86)	13 (76.47)	4 (23.53)		11 (64.71)	6 (35.29)	
Quite agree	26 (7.43)	11 (42.31)	15 (57.69)		6 (23.08)	20 (76.92)	
Average	116 (33.14)	83 (71.55)	33 (28.45)		64 (55.17)	52 (44.83)	
Not quite agree	131 (37.43)	114 (87.02)	17 (12.98)		92 (70.23)	39 (29.77)	
Totally disagree	60 (17.14)	53 (88.33)	7 (11.67)		44 (73.33)	16 (26.67)	
Severity of infection dimension of risk perception							
Unable to handle daily affairs if infected ^b				.028			.041
Totally agree	75 (21.43)	50 (66.67)	25 (33.33)		40 (53.33)	35 (46.67)	
Quite agree	68 (19.43)	53 (77.94)	15 (22.06)		42 (61.76)	26 (38.24)	
Average	78 (22.29)	67 (85.90)	11 (14.10)		49 (62.82)	29 (37.18)	
Not quite agree	82 (22.43)	65 (79.27)	17 (20.73)		51 (62.20)	31 (37.80)	
Totally disagree	47 (13.43)	39 (82.98)	8 (17.02)		35 (74.47)	12 (25.53)	
Affective response to the COVID-19							
Very worried about another outbreak ^b				.000			.003
Totally agree	137 (39.14)	95 (69.34)	42 (30.66)		73 (53.28)	64 (46.72)	
Quite agree	87 (24.86)	69 (79.31)	18 (20.69)		54 (62.07)	33 (37.93)	
Average	86 (24.57)	73 (84.88)	13 (15.12)		60 (69.77)	26 (30.23)	
Not quite agree	32 (9.14)	29 (90.63)	3 (9.38)		24 (75.00)	8 (25.00)	
Totally disagree	8 (2.29)	8 (100.00)	0 (0.00)		6 (75.00)	2 (25.00)	
Familiarity of epidemic risk information dimension of risk perception							
Curative effect of COVID-19 ^b				.218			.015
Very familiar	65 (18.57)	49 (75.38)	16 (24.62)		43 (66.15)	22 (33.85)	
Relatively familiar	122 (34.86)	99 (81.15)	23 (18.85)		82 (67.21)	40 (32.79)	
Average	123 (35.14)	100 (81.30)	23 (18.70)		73 (59.35)	50 (40.65)	
Relatively unfamiliar	28 (8.00)	21 (75.00)	7 (25.00)		16 (57.14)	12 (42.86)	
Unfamiliar	12 (3.43)	5 (41.67)	7 (58.33)		3 (25.00)	9 (75.00)	

Note. ^aChi-square test was used.

^bTrend chi-square test was used. Bold values indicate statistical significance at $p \leq .05$.

Table 2. Multivariate Logistic Stepwise Regression of Anxiety in MSM.

Variable	B	SE	Wald χ^2	p Value	OR	95% CI	
Able to control the economic loss caused by the epidemic	-0.2724	0.1301	4.3826	.0363	0.7616	0.5902	0.9828
More susceptible to COVID-19 than others	0.4804	0.1736	7.6598	.0056	1.6168	1.1505	2.2720
Worried about another outbreak	0.3915	0.1815	4.6541	.0310	1.4793	1.0365	2.1112

Note. OR = adjusted odds ratio; 95% CI = 95% confidence interval. Bold values indicate statistical significance at $p \leq .05$.

Table 3. Multivariate Logistic Stepwise Regression of Depression in MSM.

Influence Factor	B	SE	Wald χ^2	p Value	OR	95% CI	
The role of MSM in anal sex with male sexual partner							
Anal sex role "1"	Reference						
Anal sex role "0"	0.8081	0.3855	4.3933	0.0361	2.2436	1.0539	4.7764
Anal sex role "0.5"	0.6403	0.3112	4.2334	0.0396	1.8971	1.0308	3.4913
Able to remain uninfected	-0.4653	0.2122	4.8088	0.0283	0.6280	0.4143	0.9518
More susceptible to COVID-19 than others	0.2933	0.1469	3.9871	0.0459	1.3408	1.0054	1.7881

Note. OR = adjusted odds ratio; 95% CI = 95% confidence interval. Bold values indicate statistical significance at $p \leq .05$.

Prevalence and Influencing Factors of Depression in MSM

Thirty-eight percent (133 of 350) of MSM experienced depressive symptoms.

The results of univariate analysis showed that: (a) In terms of demographic and sexual behavior characteristics, there were no statistically significant differences in age, education attainment, employment status, marital status, income, and self-reported HIV infection status among the groups ($p > .05$). The novel coronavirus detection and epidemic experiences showed significant differences among the groups ($p < .05$). 2) In terms of attitudes toward COVID-19, the incidence of depression gradually decreased with the decrease of the stress of going out. The differences were statistically significant in the aspects of effective control of the epidemic, economic losses caused by the epidemic situation, and effective prevention of COVID-19 by taking measures ($p < .05$). 3) In terms of risk perception, the controllability dimension: the more controllable the epidemic situation brought to their own economic losses, and the more they agreed that they can take protective measures, the lower the incidence of depression; the familiarity dimension: in terms of familiarity with the cure effect of COVID-19, the incidence of depression had a statistical difference ($p > .05$); the possibility dimension: in terms of the possibility of infecting COVID-19, the difference in the incidence of depression was statistically significant ($p > .05$); the dimension of susceptibility to infection: with the increase in recognition that they were more susceptible to COVID-19 than others, the incidence of depression was on the rise; the dimension of severity of infection: the more severe they think they were infected with COVID-19, the higher the incidence of depression. The more worried about the outbreak of the epidemic, the higher the incidence of depression (Table 1).

In the multivariate model, MSM who only do "0" were 2.2436 times more likely to be depressed than MSM who only do "1," and MSM who do "0.5" are 1.8971 times more likely to be depressed than MSM who only do "1." MSM who can ensure that they were not infected with COVID-19 were less likely to have depressive

symptoms (OR = 0.6280, 95% CI [0.4143, 0.9518]). MSM who thought that they were more susceptible to COVID-19 than others were more likely to have depressive symptoms (OR = 1.3408, 95% CI [1.0054, 1.7881]) (Table 3).

Discussion

The blockade and timely treatment and isolation of patients in China effectively contained the spread of the outbreak and reduced future COVID-19 infections and subsequent morbidity and mortality. However, the potential mental health consequences of the significant social changes brought about by the blockade cannot be ignored, especially for MSM as a vulnerable group. Our findings highlight the impact of higher susceptibility of risk perception to COVID-19 on anxiety and depression and suggest that the psychological state, especially depression, of MSM with anal sex roles of "0" and "0.5" is of key concern.

Our findings revealed that MSM with high-risk perception is more likely to have anxiety and depressive symptoms. The direct relationship between depression and anxiety and high-risk perception of MSM illustrates the widespread mental health consequences of the COVID-19 pandemic as much of the global literature illustrates (Pfefferbaum et al., 2020; Zhang & Ma, 2020). Studies have reported that perceptions of pandemic severity and increased risk perceptions predict poorer psychiatric outcomes (Ding et al., 2020; Li et al., 2020; Simione & Gnagnarella, 2020). The strong relationship between risk perceptions and anxiety and depressive symptoms suggests that there is a potential threat to mental health of MSM from the COVID-19 pandemic. Although our cross-sectional research on risk perception and anxiety and depression restricts us from inferring causality, the results we have obtained have certain value in reducing the negative emotions of MSM in the post-COVID-19 epidemic period. Because risk will bring uncertainty to people, especially in situations with serious consequences, such uncertainty will bring people depression or anxiety, as well as great psychological pressure (Christman et al.,

1988). Studies have also reported that a high percentage of MSM discontinued Preexposure Prophylaxis (PrEP) during the epidemic and that many experienced challenges in accessing PrEP, HIV testing, or STD testing (Pampati et al., 2021), and many MSM experienced depressive symptoms during the epidemic (Hyndman et al., 2021). Considering that an increase in adverse psychological conditions such as anxiety and depression may lead to multiple sexual partners and/or group sex, public policies and actions should not only focus on access and utilization of HIV-related services for MSM, but also on enhancing their mental health.

In conclusion, this study found that MSM are likely to suffer from anxiety or depression under COVID-19, regardless of the demographic characteristics. Among them, MSM with stronger control over the epidemic are less likely to experience anxiety or depression. Therefore, during and after the epidemic prevention and control stage, the relevant health departments should be reminded to pay attention to the special group of MSM, and conduct screening and intervention for anxious and depressed people as soon as possible to reduce the negative psychological emotions caused by the epidemic, improve their sense of control, help them relieve and prevent anxiety or depression, so as to improve their psychological conditions.

The shortcomings of this study are as follows. First, the non-probability sampling may cause some deviations and limitations in this study. Second, MSM anxiety and depression, as examined by Anxiety Self-Rating Scale and CES-D, are only a kind of emotional tendency, which is not enough for clinical diagnosis. The information obtained in this research is self-reported by the participants, so the results of some sensitive questions may be biased. By using the method of cross-sectional survey, this study does have certain limitations in determining cause and effect.

Acknowledgments

The author sincerely thank The First Affiliated Hospital of Chongqing Medical University and Xinjiang Medical University, Suining and Chongqing NGOs for their support and cooperation, and thank all the members of the team for their hard work.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by grants from the National Key Project for Infectious Diseases of the Ministry of Science and Technology of China (No. 2018ZX10721102-005).

Ethical Approval

The study was approved by the Ethics Committee of Chongqing Medical University (Reference Number: 2019001), and participants all signed the written informed consent before completing the questionnaire.

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