

1 **The psychological distress and coping styles in the early stages of the**
2 **2019 coronavirus disease (COVID-19) epidemic in the general mainland**
3 **Chinese population: a web-based survey**

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45 **Abstract**

46 **Background**

47 As the epidemic outbreak of 2019 coronavirus disease (COVID-19), general
48 population may experience psychological distress. Evidence has suggested
49 that negative coping styles may be related to subsequent mental illness.
50 Therefore, we investigate the general population's psychological distress and
51 coping styles in the early stages of the COVID-19 outbreak.

52

53 **Methods**

54 A cross-sectional battery of surveys was conducted from February 1-4, 2020.
55 The Kessler 6 psychological distress scale, the simplified coping style
56 questionnaire and a general information questionnaire were administered
57 on-line to a convenience sample of 1599 in China. Spearman's correlation
58 was used to measure the correlations among category variables.

59

60 **Results**

61 General population's psychological distress were significant differences
62 based on age, marriage, epidemic contact characteristics, concern with media
63 reports, and perceived impacts of the epidemic outbreak (all $p < 0.001$) except
64 gender ($p = 0.316$). Those with a history of visiting Wuhan and a history of
65 epidemics occurring in the community, more concern with media reports,
66 perceived more severe impacts and negative coping style had a higher level

67 of psychological distress, which was significantly positively correlated with
68 a history of visiting Wuhan ($r=0.548$, $p<0.001$), a history of epidemics
69 occurring in the community ($r=0.219$, $p<0.001$), and concern with media
70 reports ($r=0.192$, $p<0.001$). Coping styles were significantly different across
71 all category variables (all $p <0.001$), and negatively correlated with other
72 category variables (all $p<0.01$) except age and marriage. Psychological
73 distress was significantly negatively correlated with the coping style
74 ($r=-0.573$, $p<0.01$).

75

76 **Conclusions**

77 In the early stages of COVID-19, general population with epidemic contact
78 characteristics, excessive concern with media reports, and perceived more
79 severe impacts have higher levels of psychological distress. Psychological
80 distress was significantly negatively correlated with the coping style.
81 Interventions should be implemented early, especially for those population
82 with a high level of psychological distress and/or with a negative coping
83 style.

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91 **Introduction**

92 The epidemic of the 2019 coronavirus disease (COVID-19) has aroused
93 widespread concern throughout society in China. Because the virus can be
94 transmitted through droplets, contact, etc. [1], cities in many regions of
95 China have closed non-essential public places, restricted mass gathering
96 activities, and enacted other control measures to effectively control the
97 spread of the virus [2]. The epidemic has had a strong impact on general
98 population's daily life. At the same time, as the epidemic continues, general
99 population gradually experience different levels of psychological distress,
100 such as nervousness, fear of infection, anxiety, depression, sleep problems,
101 and inattention [3,4]. Previous studies have reported that some psychological
102 problems often occur during similar epidemic [5,6] or other traumatic stress
103 events, such as natural disasters [7,8], disease [9], or long-term employment
104 in high stress occupations [10-12], and may last for a long time [13,14].

105 When faced with stress or traumatic experiences, general population often
106 responds differently, with some responding positively and others responding
107 negatively. Evidence has suggested that coping styles in the face of stress
108 have an impact on the quality of general population's life [15,16], and
109 negative coping styles may be related to psychological distress or mental
110 illness such as post-traumatic stress disorder (PTSD), anxiety, and depression

111 [7,8,12]. For this reason, we conducted this study in the early stages of this
112 epidemic to investigate the general population's psychological distress and
113 coping style related to the epidemic of COVID-19 so that those who have
114 high levels of psychological distress and/or respond negatively can be
115 detected early and undergo timely intervention.

116

117 **Methods**

118 This study was conducted through an online survey, starting at 16:00 on
119 February 1, 2020 and ending at 24:00 on February 4, and the survey was
120 approved by the ethical review board of the West China Hospital of Sichuan
121 University. The snowball sampling method was used to invite subjects. All
122 invitees completed the questionnaire online via Questionnaire Star
123 (<https://www.wjx.cn>). An initial set of invitees (10 participants) was chosen
124 to ensure broad representation of age, gender, occupation, education level,
125 and city. This set of invitees then forwarded the questionnaire to 10
126 companions whom they considered suitable for the survey, and this second
127 set forwarded the questionnaire in the same way. The study included a
128 general population aged 18 years or older who volunteered to participate in
129 the study, and respondents were excluded if they reported a history of mental
130 illness and/or could not complete the online survey independently.

131

132 **Data collection**

133 A self-made questionnaire was used to collect demographic and
134 epidemiological information of participants, including gender, age, marriage,
135 epidemic contact and concern characteristics, and perceived epidemic
136 impacts of the epidemic of COVID-19.

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138 **Psychological distress assessment**

139 The Kessler 6 psychological distress Scale (K6) was used to assess the
140 psychological distress of participants; this scale has been proven to have
141 cross-cultural reliability and validity [17]. It contains six questions that ask
142 participants to rate how often they have felt ‘nervous’, ‘hopeless’, ‘restless or
143 fidgety’, ‘so depressed that nothing could cheer you up’, ‘that everything was
144 an effort’, and ‘worthless’ during the past 30 days.

145

146 **Coping style assessment**

147 The Simplified Coping Style Questionnaire (SCSQ) was used to assess the
148 participants’ coping styles during the COVID-19 epidemic; this
149 questionnaire has been proven to have good reliability and validity in
150 Chinese [18]. The SCSQ contains twenty items, with each item using a
151 four-point score (0 = never, 1 = seldom, 2 = often, 3 = always),
152 and two subscales: positive coping (12 items) and negative coping (8 items).
153 According to the average and standard deviation of the positive coping style
154 and the negative coping style scores, a Z conversion is used to calculate their

155 respective standard scores, and then, the negative coping standard scores are
156 subtracted from the positive coping style standard scores to calculate the
157 tendency value of coping style. A result greater than 0 was defined as a
158 participant adopting a positive coping style when faced with stress, and a
159 result less than 0 was defined as a participant adopting a negative coping
160 style [19].

161

162 **Statistical analysis**

163 Differences in psychological distress (K6 score) among categorical variables
164 were tested by t-tests or one-way analysis of variance, and differences in
165 coping styles were tested by chi-squared tests. Correlations among all
166 categorical variables were measured by Spearman's correlation. All statistical
167 analyses were conducted in SPSS version 22.0 (IBM, Chicago, IL, USA),
168 and $p < 0.05$ was considered to be statistically significant.

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170 **Quality control**

171 The same IP address could be used only once to complete the questionnaire,
172 which did not collect any personal information such as names, thereby
173 ensuring anonymity and honest responses. The time spent on each
174 questionnaire was monitored automatically, and the whole questionnaires
175 completed in fewer than 120 seconds were rejected as invalid.

176

177 **Results**

178 **Sample characteristics**

179 There were 1607 individuals from 26 regions of China who completed this
180 survey, and 1599 (99.5%) were included in the analysis participants. Among
181 all participants, 1068 were female (66.8%); ages ranged from 18 to 84 years
182 old (mean 33.9±12.3 years); 914 were married (57.2%); 326 had a history of
183 visiting Wuhan (20.4%); and 333 had a history of epidemics occurring in
184 their community (20.8%) (Table 1).

185

186

Table1 Sample description

Variables	n (%)
Total	1599(100.0)
Demographic characteristics	
Gender	
female	1068(66.8)
male	531(33.2)
Age (mean 33.9±12.3, years)	
18-30	722(45.2)
31-40	471(29.5)
41-50	254(15.9)
>50	152(9.5)
Marriage	
single	624(39.0)
married	914(57.2)
divorced	61(3.8)
Epidemic contact characteristics	
History of visiting Wuhan	
no	1273(79.6)
yes	326(20.4)
History of epidemics occurring in the community	
no	1266(79.2)
yes	333(20.8)
Concern with media reports related to the epidemic	
less concerned	16(1.0)

concerned	141(8.8)
more concerned	428(26.8)
extremely concerned	1014(63.4)
Perceived impacts of the epidemic	
Changes over living situations	
feel relax	209(13.1)
no change	479(30.0)
feel nervous	911(56.9)
Emotional control	
no difficult	832(52.0)
less difficult	304(19.0)
difficult	70(4.4)
more difficult	70(4.4)
extremely difficult	323(20.2)
Epidemic-related dreams	
no	987(61.7)
less	151(9.4)
general	115(7.2)
more	33(2.1)
extremely large	313(19.6)

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188 **Comparison of the psychological distress**

189 The results revealed significant differences in the participants' psychological
190 distress based on age, marriage, epidemic contact characteristics, concern
191 with media reports related to the epidemic, and perceived impacts of the
192 epidemic (all $p < 0.001$); there were no significant differences based on
193 gender ($p = 0.316$). As age increases and marital status changes, K6 scores
194 have a downward trend. Those with a history of visiting Wuhan and a history
195 of epidemics occurring in the community have a higher level of
196 psychological distress than those without such experiences. The
197 psychological distress tended to increase with concern with media reports
198 related to the epidemic and perceived impacts of the epidemic. At the same
199 time, the results also show that those with a negative coping style have a

200 higher level of psychological distress than those with a positive coping style

201 (Table 2).

202

203 **Table2 Psychological distress (K6 scores) of participants (n=1599).**

Variables	Means (SD)	95%CI	t/F*	p
Total	7.7(7.7)	7.36,8.11		
Demographic characteristics				
Gender			-1.002	0.316
female	7.6(7.5)	7.15,8.05		
male	8.0(8.1)	7.32,8.69		
Age category (mean33.9±12.3, years)			102.04	<0.001
18-30	11.1(8.9)	10.47,11.76		
31-40	5.2(5.3)	4.77,5.73		
41-50	4.8(4.7)	4.22,5.36		
>50	4.3(4.8)	3.55,5.08		
Marriage			141.73	<0.001
single	11.5(9.0)	10.75,12.17		
married	5.4(5.4)	5.01,5.72		
divorced	5.2(6.0)	3.68,6.68		
Epidemic contact characteristics				
History of visiting Wuhan			-40.86	<0.001
no	5.0(4.8)	4.70,5.23		
yes	18.6(7.1)	17.80,19.34		
History of epidemics occurring in the community			-10.25	<0.001
no	6.8(7.0)	6.37,7.14		
yes	11.5(8.8)	10.50,12.40		
Concern with media reports related to the epidemic				
			21.84	<0.001
less concerned	2.4(2.6)	1.10,3.65		
concerned	4.0(3.9)	3.34,4.62		
more concerned	6.9(7.3)	6.19,7.58		
extremely concerned	8.7(8.0)	8.21,9.20		
Perceived impacts of the epidemic				
Changes over living situations			331.71	<0.001
feel relax	2.4(2.8)	2.01,2.78		
no change	3.2(3.0)	2.94,3.47		
feel nervous	11.3(8.2)	10.81,11.87		
Emotional control			1863.07	<0.001
no difficult	3.0(2.8)	2.84,3.22		
less difficult	5.6(3.5)	5.23,6.01		

difficult	8.9(3.9)	7.97,9.80		
more difficult	10.3(5.1)	9.11,11.49		
extremely difficult	21.0(3.3)	20.68,21.39		
Epidemic-related dreams			1642.78	<0.001
no	3.6(3.4)	3.38,3.80		
less	6.2(3.8)	5.62,6.83		
general	7.4(4.5)	6.54,8.18		
more	10.7(4.6)	9.13,12.27		
extremely large	21.4(2.6)	21.06,21.65		
Coping style			37.41	<0.001
negative	15.0(8.3)	14.31,15.70		
positive	4.0(3.5)	3.75,4.17		

204 Note: * representing the differences of K6 scores among categorical variables by t-test or one-way
 205 analysis of variance

206

207 **Comparison of the coping style**

208 The ratios of the coping styles are 34.2% negative and 65.8% positive. The
 209 comparison found that the coping style was significantly different across all
 210 category groups (all $p < 0.001$) (Table 3). Compared with the positive coping
 211 style, the negative coping style occurred more in those between 18 and 30
 212 years old, single people, those with a history of visiting Wuhan, those with a
 213 history of epidemics occurring in the community, those who reported that
 214 perceived emotional control was extremely difficult and those who reported
 215 having many epidemic-related dreams (Table 3).

216

217 **Table3 Coping style of participants (n=1599).**

Variables	Coping Style		X ²	p
	Negative (%)	Positive (%)		
Total	547(34.2)	1052(65.8)		
Demographic characteristics				
Gender			6.83	0.009
female	342(32.0)	726(68.0)		
male	205(38.6)	326(61.4)		

Age (mean 33.9±12.3, years)			180.89	<0.001
18-30	373(51.7)	349(48.3)		
31-40	105(22.3)	366(77.7)		
41-50	43(16.9)	211(83.1)		
>50	26(17.1)	126(82.9)		
Marriage			172.73	
single	335(53.7)	289(46.3)		
married	197(21.6)	717(78.5)		
divorced	15(24.6)	46(75.4)		
Epidemic contact characteristics				
History of visiting Wuhan			440.89	<0.001
no	275(21.6)	998(78.4)		
yes	272(83.4)	54(16.6)		
History of epidemics occurring in the community			56.86	<0.001
no	375(29.6)	891(70.4)		
yes	172(51.7)	161(48.4)		
Concern with media reports related to the epidemic			13.98	0.003
less concerned	4(25.0)	12(75.0)		
concerned	32(22.7)	109(77.3)		
more concerned	135(31.5)	293(68.5)		
extremely concerned	376(37.1)	638(62.9)		
Perceived impacts of the epidemic				
Changes over living situations			172.61	<0.001
feel relax	36(17.2)	173(82.8)		
no change	76(15.9)	403(84.1)		
feel nervous	435(47.8)	476(52.3)		
Emotional control			715.31	<0.001
no difficult	118(14.2)	714(85.8)		
less difficult	68(22.4)	236(77.6)		
difficult	27(38.6)	43(61.4)		
more difficult	24(34.3)	46(65.7)		
extremely difficult	310(96.0)	13(4.0)		
Epidemic-related dreams			711.68	<0.001
no	166(16.82)	821(83.18)		
less	39(25.83)	112(74.17)		
general	22(19.13)	93(80.87)		
more	14(42.42)	19(57.58)		
extremely large	306(97.76)	7(2.24)		

218

219 **Correlation analysis**

220 The correlation analysis found that psychological distress was significantly

221 positively correlated with a history of visiting Wuhan ($r=0.548$, $p<0.001$), a
222 history of epidemics occurring in the community ($r=0.219$, $p<0.001$),
223 concern with media reports related to the epidemic ($r=0.192$, $p<0.001$), and
224 perceived changes over living situations ($r=0.571$, $p<0.001$), emotional
225 control ($r=0.752$, $p<0.001$) and epidemic-related dreams ($r=0.708$, $p<0.001$).
226 Psychological distress was significantly negatively correlated with age
227 ($r=-0.371$, $p<0.001$), marriage ($r=-0.301$, $p<0.001$) and coping styles ($r=-0.573$,
228 $p<0.001$); there was no significant correlation with gender. The coping style
229 was significantly positively correlated with age and marriage, and
230 significantly negatively correlated with other category variables. All
231 epidemic contact characteristics and concern with media reports related to
232 the epidemic were significantly positively correlated with perceived impacts
233 of the epidemic (Table 4).

234 **Table4 Correlations of demographic, epidemic contact and concern characteristics, perceived epidemic impacts, coping style and psychological distress in all participants(n=1599) (Spearman's**
 235 **rank correlation)**

	Gender	Age	Marriage	History of visiting Wuhan	History of epidemics occurring in the community	Concern with media reports related to the epidemic	Changes over living situations	Emotional control	Epidemic-related dreams	Coping style	Psychological distress
Demographic characteristics											
Gender	1										
Age	-0.032	1									
Marriage	-0.061*	0.768***	1								
Epidemic contact characteristics											
History of visiting Wuhan	0.039	-0.477***	-0.420***	1							
History of epidemics occurring in the community	0.031	-0.236***	-0.214***	0.257***	1						
Concern with media reports related to the epidemic											
	-0.004	0.017	0.006	0.130***	0.052*	1					
Perceived impacts of the epidemic											
Changes over living situations	-0.103***	-0.212***	-0.125***	0.321***	0.142***	0.229***	1				
Emotional control	-0.020	-0.411***	-0.320***	0.586***	0.219***	0.155***	0.506***	1			
Epidemic-related dreams	-0.023	-0.378***	-0.296***	0.646***	0.215***	0.199***	0.462***	0.714**	1		
Coping style											
	-0.065**	0.389***	0.317***	-0.525***	-0.189***	-0.088***	-0.316***	-0.577***	-0.563***	1	
Psychological distress											
	0.000	-0.371***	-0.301***	0.548***	0.219***	0.192***	0.571***	0.752***	0.708***	-0.573***	1

236 Note: *** $p < 0.001$, ** $p < 0.01$, and * $p < 0.05$.

237

238 **Discussion**

239 The results of the study suggest that the general population with a history of
240 visiting Wuhan, those with a history of epidemics occurring in their
241 community, and those who perceived more severe impacts of the epidemic of
242 COVID-19 on their living situations, emotional control, and epidemic-related
243 dreams have a higher level of psychological distress than those with none or
244 little of these experiences. These findings are consistent with the findings of
245 previous studies. The traumatic stress experience during the occurrence of
246 emergency events, such as major public events or natural disasters, is often
247 related to the general population's psychological distress and subsequent
248 mental illness [5,6,8].

249 Furthermore, the study found that there were more participants who
250 exhibited a negative coping style (34.2%), especially among younger, single,
251 those with a history of epidemic contact, and those who perceived severe
252 impacts of the epidemic of COVID-19.

253 Other studies related to traumatic stress events have reported that those in
254 the general population with traumatic stress experiences were more likely to
255 adopt a negative coping style [9]. Some studies have shown that this
256 phenomenon is related to the general population's brain functional
257 connectivity [15], while others have shown that it is related to social support
258 [20,21]. The underlying mechanism of this association has yet to be
259 elucidated, which may be the result of the combined effect of the two

260 mechanisms. Further study is needed to confirm this hypothesis. More
261 importantly, the study also found that the general population with negative
262 coping styles has higher psychological distress than those with positive
263 coping styles. Many previous studies have shown that different coping styles,
264 especially negative coping styles, for trauma stress events are usually related
265 to subsequent mental illness [7,10,22]. Therefore, this part of the general
266 population with a negative coping style should be given attention and
267 follow-up, and appropriate interventions should be given if necessary.

268 Finally, this study included concern with media reports related to the
269 epidemic of COVID-19 in the analysis. Previous studies have reported that
270 post-disaster mental health problems, such as post-traumatic stress disorder
271 (PTSD), may be related to media reports in addition to direct exposure to the
272 disaster environment [23,24]. The study found that with increasing concern
273 with media reports related to epidemic, the general population's
274 psychological distress level has also increased accordingly; this study also
275 found that the general population's coping style was negatively related to
276 concern with media reports. This result suggested that during the epidemic of
277 COVID-19, the degree of concern with media reports affected the general
278 population's psychological distress level and coping style, which might be
279 related to that media reports could affect the general population's perceptions
280 of the disease and what preventive measures they would take [25,26]; further
281 research is needed to confirm this relation.

282 In conclusion, this study found that the epidemic of COVID-19 caused
283 different levels of psychological distress. Those with epidemic contact
284 characteristics, excessive concern with media reports, and those who
285 perceived more impacts of the epidemic reported higher levels of
286 psychological distress. The psychological distress was significantly different
287 in general population and was significantly negatively correlated with coping
288 style. Therefore, appropriate interventions should be implemented early to
289 address the impacts of such epidemics, especially for those in the general
290 population with a high level of psychological distress and/or with a negative
291 coping style.

292 **Limitations**

293 There are several limitations in our study. First, the survey method is based
294 on network invitation rather than face-to-face random sampling, and
295 participants need to be able to use network tools. As a result, the status of the
296 general population who cannot use network tools is unclear. Second, we did
297 not assess whether and how respondents were engaging in prevention.
298 Finally, our study design is cross-sectional and thus cannot capture changes
299 in psychological distress and its predictors over the course of the COVID-19.

300

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303 resisted the COVID-19 epidemic, and thank the Questionnaire Star

304 (<https://www.wjx.cn>) for providing us with a data survey platform.

305

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