

Quality of life during the epidemic of COVID-19 and its associated factors among enterprise workers in East China

Xiaoxiao Chen

Taizhou City Center of Disease Prevention and Control, Zhejiang Province

Qian Xu

Fudan University School of Public Health

Haijiang Lin

Taizhou City Center of Disease Prevention and Control, Zhejiang Province

Jianfu Zhu

Deqing County Center of Disease Prevention and Control, Zhejiang Province

Yue Chen

School of Epidemiology and Public Health, Faculty of Medicine, University of Ottawa

QI Zhao

School of Public Health, Key Laboratory of Public Health Safety, NHC Key Laboratory of Health Technology Assessment, Fudan University

Chaowei Fu

School of Public Health, Key Laboratory of Public Health Safety, NHC Key Laboratory of Health Technology Assessment, Fudan University

Na Wang (✉ na.wang@fudan.edu.cn)

Fudan University School of Public Health

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Abstract

Background: The impact of COVID-19 related quarantine on quality of life was expected and unclear for enterprise workers. We investigated the quality of life during the epidemic in enterprise workers just returned to work and assessed its potential influencing factors to get a better understanding of the impact of COVID-19 epidemic.

Methods: This was a cross-sectional study among enterprise workers in Deqing and Taizhou, Zhejiang Province, China. Chinese version of EQ5D to assess life quality, and information about general characteristics and COVID-19 related information was collected by a structured questionnaire online distributed through the social application “Wechat”.

Results: A total of 2435 participants were enrolled, 59.5% of which worked in Deqing. About 50% reported worries about the COVID-2019 epidemic and 40.1% of participants performed centralized or home quarantine during the epidemic. The mean EQ-5D score and VAS were 0.990 and 93.5. Multiple logistic regression suggested that physical activities (ORad=0.46) and keeping home ventilation (ORad=0.04) was related with life quality in Deqing, while for participants in Taizhou, wearing a mask when going out (ORad=0.35), keeping home ventilation (ORad=0.16), unmarried status (ORad=2.38) and experienced centralized or home quarantine (ORad=1.64) was related with quality of life.

Conclusions: Enterprise workers in two areas with different risk of COVID-19 experienced different life quality during the epidemic of COVID-19. Physical activity, marital status, worry about epidemic of COVID-19, keeping home ventilation, wearing a mask and quarantine were related with quality of life.

Background

The outbreak of novel coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) occurred in Wuhan, Hubei province, China(1, 2). Since then, the infection has been spreading rapidly and has affected millions of people worldwide(3–5), especially the elderly and those with comorbidities(1, 6). To prevent and control the spread of COVID-19, the Chinese central government took a series of unprecedented measures in late January 2020, including a lockdown for Wuhan, the epicenter of the epidemic, and implementing quarantine measures countrywide(7). During the quarantine, people had to stay at home and socially isolated (8). There are various negative effects associated with isolation and quarantine, both physically and mentally, such as sedentary behavior, physical inactivity, food shortage, anxiety and depression. The impact of COVID-19 related quarantine and social isolation on quality of life is expected but has not been well evaluated for working people who bring the main income for ordinary families. We assessed the quality of like for enterprise workers during the epidemic and its potential influencing factors for a better understanding of the impact of COVID-19 epidemic.

Methods

Study population and design

We carried out a cross-sectional study among the employees who had returned to work in Deqing and Taizhou, Zhejiang Province, China, from 5 March 2020 to 14 March 2020. At the beginning of our investigation, there were 3 confirmed cases in Deqing and 146 cases in Taizhou, and Deqing was classified as a low risk area and Taizhou as a high risk area for COVID-19 epidemic (9). The enterprises were included if they were reopened in mid-February with the annual business turnover of 20 million RMB or above and excluded if the general manager or director refused to participate in this study. The eligible enterprises will be included in the study until more than 900 subjects were recruited in each area. Finally, 123 of 738 enterprises in Deqing and 43 of 996 enterprises in Taizhou were included in this study, which covered the different kinds of enterprises. All subjects were recruited by enterprises included in the study. The full-time employees who had returned to work since mid-February in the selected enterprises were eligible. An anonymous self-reported questionnaire included EQ-5D and self-structured part was distributed through an application named “Wechat”, which was widely used in China. Participants accessed to the questionnaire online by scanning the distributed two-dimensional code. Finally, we collected a total of 2461 questionnaires. Data on 2435 completed questionnaires were analyzed in this study and 26 were excluded since the participants spent too short (2 min) or too long (60 min) to complete the questionnaire.

Measures of quality of life and influencing factors

The quality of life (QoL) was assessed by using the Chinese version EuroQol (EQ-5D-3L)(10), which has been previously validated (11–13). The questionnaire of EQ-5D-3L consists of two parts. The first part comprises questions in five different health dimensions: 1) mobility, 2) self-care, 3) usual activities, 4) pain/discomfort, and 5) anxiety/depression. Each question has three levels of response, scored from 1 to 3 (no problem, some/moderate problems and extreme problems). The combination of three different levels for each of five dimensions has 243 possible conditions to describe the gravity of health status for participants(14). The EQ-5D has been applied to a Chinese general population and reveals the utility values of each health condition(15). The second part contains a visual analogue scale (VAS) ranged from 0 (the worst health condition) to 100 (the best health condition)(14). In the current analysis, the quality of life was divided into two groups based on EQ-5D by using a cut-off value of 0.951, and those with a lower score were considered to have compromised life quality(16).

Information about demographic characteristics, COVID-19 and lifestyle was collected by the self-structured questionnaire. Questions on lifestyle factors, including regular alcohol drinking (> 3 times/week for \geq 6 months)(17), regular cigarette smoking (> 3 times/week for \geq 6 months)(18), regular tea drinking (> 3 times/week for \geq 6 months)(19) and regular physical activity (> 10 min/day for \geq 6 months)(20) were designed according to previous epidemiological researches. COVID-19 related information included quarantine status, awareness of COVID-19, self-protection measures and history of vaccination.

Statistical analysis

The differences in the distributions of basic characteristics and quality of life based on EQ-5D between Deqing and Taizhou were compared by using the independent-samples t tests and the χ^2 tests, or Wilcoxon and Kruskal-Wallis test when data distribution was skewed. The correlation between VAS and EQ-5D values was evaluated with the Pearson correlation test. Multiple logistic regression analysis was performed to assess the associations of influencing factors with compromised quality of life. A forward approach was used to include important factors in the final model. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated. All statistical analyses were performed in SPSS version 22.0, and an alpha level $p \leq 0.05$ was considered to be statistically significant.

Results

Participant Characteristics and COVID-19 related information

Among 2435 participants, 1239 (50.9%) were male and 1448 (59.5%) worked in Deqing (Table 1). One participant had COVID-19 and 3 had a close contact with COVID-19 patients. The participants were aged 35.9 years on average. Two thirds of participants (62.7%) lived in families with 4 to 6 members. The majority of participants were married (76.6%) and had an education of over 9 years (66.2%). Half of the participants reported an annual family income between 50,000 to 200,000 Chinese yuan (52.0%). Table 1 shows the distributions of the factors by study site. There were no differences in the distributions of cigarette smoking, alcohol drinking and physical activity between participants from Deqing and Taizhou, except for tea drinking ($\chi^2 = 5.50, p = 0.019$).

About 92.6% (2254/2435) of participants had returned to work when the survey was conducted. About 50% reported worries about the COVID-2019 epidemic. Most participants knew about COVID-19 (85.4%) and about 40.1% of participants performed centralized or home quarantine during the epidemic. Almost everyone always wore a mask (97.2%) when going outside and kept home ventilation daily (99.4%). The majority of participants believed that the virus would be quickly under control (70.5%). Table 2 shows the results of comparison between two study sites. Compared with participants in Taizhou, those workers in Deqing were more likely to have the knowledge about COVID-19 ($\chi^2 = 13.24, p < 0.001$) and to wear a mask when going out ($\chi^2 = 21.34, p < 0.001$), and were less likely to worry about COVID-19 ($\chi^2 = 16.87, p < 0.001$).

Table 1
 Characteristics of all participants from Deqing and Taizhou, 2020

Variables	Deqing (n = 1448)	Taizhou (n = 987)	P value
Gender, n(%)			
Male	719(49.7)	520(52.7)	0.142
Female	729(50.3)	467(47.3)	
Age (years) ¹ , n(%)			0.015
15–25	130(9.1)	104(10.6)	
25–35	622(43.2)	374(38.0)	
35–45	389(27.0)	314(31.9)	
45–	298(20.7)	192(19.5)	
Marital status, n(%)			0.121
Married	1106(76.4)	758(76.8)	
Single	265(18.3)	160(16.2)	
Others	77(5.3)	69(7.0)	
Family members ² , n(%)			0.001
≤ 3 persons	469(32.4)	274(27.8)	
4 ~ 6 persons	900(62.2)	625(63.5)	
≥ 7 persons	78(5.4)	86(8.7)	
Annual family income, n(%)			< 0.001
< 50,000	188(13.0)	210(21.3)	
50,000-200,000	753(51.9)	512(51.9)	
≥ 200,000	202(14.0)	93(9.4)	
Unclear	305(21.1)	172(17.4)	
Level of education, n(%)			< 0.001
≤ 9 years	357(24.6)	464(47.3)	

¹ 12 cases missing.

² 3 cases missing

Variables	Deqing (n = 1448)	Taizhou (n = 987)	P value
≥9 years	1091(75.4)	523(52.7)	
Smoking, n(%)			0.73
Yes	361(24.9)	240(24.3)	
No	1087(75.1)	747(75.7)	
Alcohol drinking, n(%)			0.358
Yes	122(8.4)	73(7.4)	
No	1326(91.6)	914(92.6)	
Tea drinking, n(%)			0.019
Yes	445(30.7)	260(26.3)	
No	1003(69.3)	727(73.7)	
Physical activity, n(%)			0.413
Yes	1207(83.4)	835(84.6)	
No	241(16.6)	152(15.4)	
¹ 12 cases missing.			
² 3 cases missing			

Table 2
Distribution of COVID – 19 related questions for participants from Deqing and Taizhou, 2020

Variables		Deqing (n = 1448)	Taizhou (n = 987)	P values
Centralized or home quarantine, n(%)	Yes	581(40.1)	396(40.1)	0.999
	No	867(59.9)	591(59.9)	
Known about COVID-19, n(%)	Yes	1268(87.6)	812(82.3)	< 0.001
	No	180(12.4)	175(17.7)	
Worried about COVID-19, n(%)	Yes	727(50.2)	579(58.7)	< 0.001
	No	721(49.8)	408(41.3)	
Believe the epidemic would be quickly under control, n(%)	Yes	1029(71.1)	688(69.7)	0.471
	No	419(28.9)	299(30.3)	
Wear a mask when going out, n(%)	Yes	1426(98.5)	941(95.3)	< 0.001
	No	22(1.5)	46(4.7)	
Wash hands frequently, n(%)	Yes	1443(99.7)	979(99.2)	0.122
	No	5(0.3)	8(0.8)	
Keep home ventilation frequently, n(%)	Yes	1443(99.7)	978(99.1)	0.069
	No	5(0.3)	9(0.9)	
Having influenza/pneumonia vaccination, n(%)	Yes	467(32.3)	338(34.2)	0.353
	No	981(67.7)	649(65.8)	

Quality of life quality based on EQ-5D

The majority of participants (93.8%) had a perfect score for EQ-5D. Few participants reported moderate anxiety/depression (3.9%) and moderate pain/discomfort (2.3%). Only 7 participants had problems on self-care. The utility of EQ-5D based on Chinese population showed a moderate correlation (0.325, $p < 0.001$) with the VAS. The mean EQ-5D score and VAS were 0.990 and 93.5, respectively. No gender or age difference was observed in total EQ-5D score and five dimensions. Nonparametric analysis suggested that participants in Deqing had an overall higher average EQ-5D score ($Z = -2.127$, $p = 0.033$) and VAS ($Z = -3.185$, $p = 0.001$) compared with Taizhou.

Influencing factors for quality of life

Table 3 presents the results of multiple logistic regression for factors associated with compromised quality of life in Deqing and in Taizhou. In Deqing, physical activity ($OR_{ad}=0.46$) and keeping home ventilation ($OR_{ad}=0.04$) were significantly associated with a reduced risk of compromised quality of life. In Taizhou, wearing a mask when going out ($OR_{ad}=0.35$), keeping home ventilation ($OR_{ad}=0.16$) and being married were associated with a low risk of compromised quality of life, while those who worried about the epidemic ($OR_{ad}=2.38$) and experienced centralized or home isolation ($OR_{ad}=1.64$) had a increased risk of compromised quality of life.

Table 3
Logistic regression analysis for factors associated with compromised quality of life in Deqing and Taizhou, 2020

Variables	OR_{ad} (95%CI)
Deqing:	
Physical activity	0.46(0.27–0.77)
Keep home ventilation usually	0.04(0.01–0.26)
Taizhou:	
Centralized or home quarantine	1.64(1.00-2.70)
Worried about COVID-19	2.38(1.35–4.17)
Wear a mask when going out	0.35(0.15–0.81)
Keep home ventilation usually	0.16(0.04–0.63)
Marital status:	
Married	ref
Single	2.18(1.21–3.91)
Others	2.23(0.98–5.09)

Discussion

This study investigated the quality of life among 2435 employees in Deqing County and Taizhou City during the COVID-19 epidemic in March 2020, shortly after their return to work. Our study found that most participants had returned to work, and employees in Taizhou where epidemic was more severe were more likely to worry about the epidemic and had relatively low quality of life compared with Deqing, a low risk area. The awareness of the COVID-19 was common and most people implemented some measures to protect themselves accordingly, which were also associated with a higher quality of life. Being married and having no isolation were associated with better quality of life, while worrying about the epidemic led to a reduced quality of life.

Our study participants had a higher mean EQ-5D utility value (0.990 ± 0.033) compared with the results from previous studies(16, 21, 22), so was the average VAS score (93.5) (16, 21, 23). Moderate pain/discomfort and anxiety/depression were the common problems affecting quality of life in our study population, which was consistent with results from some other studies (16, 21, 22). Our results showed that anxiety/depression was the main problem followed by pain/discomfort, which was consistent with the finding from the study by Liu et al(21) but was inconsistent with results from studies by Guan et al(16) and Zhang et al(22) with the same questionnaire of EQ-5D. There might exist healthy worker effect and also our study participants were younger compared with some other studies.

Our results also indicated that regular physical activity and keeping home ventilation were related to the better quality of life in Deqing. However, in Taizhou, worrying about the epidemic, wearing a mask, keeping home ventilation and marital status were associated with quality of life. Of these factors, wearing a mask, keeping home ventilation and be married had a protective impact on the quality of life.

Recent studies showed that anxiety and depression caused by COVID-19 was associated with people's life quality (24–26). However, only 3.9% participants reported problems of moderate anxiety/depression, while about 50% felt worried about COVID-19 in our study. Therefore, we suspected that the low-intensity and continuous worry about the epidemic seemed not enough to cause anxiety and depression, but enough to have a negative impact on people's quality of life instead. Meanwhile, even during the quarantine, most people still regularly went out to purchase essential supplies. Some protective measures such as home ventilation and wearing a mask when going out could reduce the risk of infection and might comfort people's emotions, which might explain their associations with life quality at high risk area. Associations of physical activities and marital status with life quality were also observed in previous study in Chinese general population (27) (28), which were similar with ours. The findings of Zhang(25) suggested that, most people received increased support and spiritual solace from their friends and family members. Our result that single participants were more likely to have worse life quality than those be married supported this assumption, which suggested that the unmarried people were more vulnerable to a worse quality of life during the epidemic. Physical activity was related to better life quality in youth(29) as well as working-age population (30), which was also observed in our study.

The main strength of our study was the relatively large sample size of 2435 participants and we assessed quality of life during the epidemic just after those participants returned to work. This study had some limitations: 1) non-randomized sampling limits the generalization of the results; and 2) we used cross-sectional study design and there was no information on change of quality of life before and after the epidemic.

Conclusion

In summary, the quality of life differed somehow between two areas with different a risk of COVID-19. Anxiety/depression was the most common problems impacting on life quality for these participants.

Physical activity, marital status, worry about epidemic of COVID-19, keeping home ventilation, wearing a mask and quarantine were related with quality of life.

Abbreviations

COVID-19: novel coronavirus disease 2019

SARS-CoV-2: severe acute respiratory syndrome coronavirus 2

Qol: Quality of life

EQ-5D EuroQol five-dimension

EQ-5D-3L: EuroQol five-dimension three-level

VAS visual analogue scale

OR: odds ratio

CI confidence interval

Declarations

Ethics approval and consent to participate: This research was in accordance with the ethical standards of institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards and approved by Fudan University School of Public Health Institutional Review Board (IRB#2020-TYSQ-03-9, IRB#2020-04-0817).

Consent to publish: All participants have given a brief online informed consent before they began to answer the questionnaires by scanning the distributed two-dimensional code in “Wechat”. They were informed that all information collected in this study have been completely anonymized so that their identity cannot be identified via the paper.

Availability of data and materials: The datasets used during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

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Authors' contributions: XC and QX are joint first authors. NW, CF and QZ contributed to the planning, conducting of the study. JZ and HL contributed to the collation and collection of raw data. XC and QX wrote the first draft of the manuscript and conducted the primary statistical analysis. NW and YC revised the drafts of the manuscript. All authors have read and agreed to the published version of the manuscript.

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