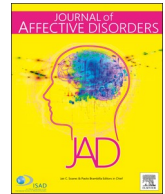Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Correspondence

Insight into the psychological problems on the epidemic of COVID-19 in China by online searching behaviors

By the end of 2019, the rapid spread of a new infectious disease defined as COVID-19 had attracted great attention to the people in China and other countries (WHO, 2020). According to the report from the official website of the National Health Commission of the People's Republic of China, the cumulative number of confirmed cases were 78,064 with 2715 deaths in 31 provinces in mainland China as of Feb 25, 2020 (NHC, 2020). It was reported that COVID-19 might become a global pandemic if no effective measure was timely operated (Wang and Zhang, 2020). A series of correspondences involving psychological care have been reported, focusing on exploring the possible psychological-related problems of medical workers as well as responses from mental health service providers during the epidemic (Bao et al., 2020; Chen et al., 2020; Liu et al., 2020; Xiang et al., 2020). Among them, Liu's and Xiang's researches reported that both medical staff and the public might suffer from psychological problems, including anxiety, depression, and stress. In Liu's research, it was noticed that stress-related symptom was the most common psychological problem among medical staff, followed by depression, anxiety and insomnia. However, the epidemiological data on psychological problems among the public are still not available (Asmundson and Taylor, 2020a, b).

We tried to explore the potential psychological problems among the public in Wuhan city and the whole country of China, by using their online searching behaviors. According to the 2019 Chinese search engine user behavior study report released by China Internet Network Information Center Reports, there are 695 million searching engine users in China as of June 2019. The user penetration rate of Baidu search exceeds 90%. Being the largest searching tool in China, Baidu offers Baidu Index Service (BIS), allowing the registered users to harness data on particular keywords being searched. Being one of the functions of BIS, Baidu Search Index (BSI) is calculated by weighting the searching frequency of each keyword in Baidu search according to the searching volume of internet users and the keywords. A series of papers on surveillance and prediction of psychological and suicidal problems by searching behaviors have been reported (Bach and Wenz, 2020; Morch et al., 2018; Rivas et al., 2020). The retrieval process was as follows: terms being used for searching included combination of "depressed" and "sad" for depressive symptoms, "panic" and "fear" for anxiety symptoms, "insomnia" for sleeping-related problems, "Obsessive Compulsive Disorder (OCD)" and "psychological counseling". The retrieved areas covered the whole country, with Wuhan as the epicenter of China. For each searching term, BSIs were compared between the same period by Chinese lunar calendar in 2019 and 2020 to explore the potential impact of COVID-19 epidemic on psychological health. The retrieval period covered one month both in 2019 and 2020. In 2020, the searching period was from Jan 24, one day after the lockdown announcement of Wuhan, to Feb 22. Nonparametric Mann–Whitney U test was used to compare the BSIs for the keywords being searched between the same periods of the two consecutive years.

Data showed that both the median National BSIs (N-BSI) for insomnia appeared the highest during the timespan in the two years, with 4358 in 2020 and 4361 in 2019, and the difference was not statistically significant ($P > 0.05$). During the first two weeks in Fig. 1, BSIs for insomnia in the two years appeared to be on the rise, which may be associated with fluctuations in insomnia prevalence during the Spring Festival holiday. However, N-BSI for insomnia in 2020 exceeded that in 2019 (See Fig. 1), noticed two weeks after the Wuhan lockdown announcement with the difference statistically significant ($P < 0.05$). Numbers for both N-BSIs for panic/fear (Median, 1277 vs. 739) and psychological counseling (Median, 386 vs. 230) were significantly larger in 2020 than those in 2019 ($P < 0.05$), with an increase of 73% and 68% respectively. However, N-BSIs for depressed/sad (Median, 934 vs. 1206) and OCD (Median, 1736 vs. 2109) were with reversed results ($P < 0.05$). Results from Wuhan were consistent with those from the whole country (see Supplement Fig. 2). The daily BSI figures for panic and fear in Wuhan showed sharp rise after the announcement on lockdown of Wuhan, peaked on the third day, then kept fluctuating at high levels but exceeding the corresponding levels in 2019. The peak period for seeking psychological counseling started two weeks later among the public.

Data on online searching behaviors indicated that the public were more likely to develop anxiety symptoms as panic and fear than depressive symptoms and insomnia in the early stage of COVID-19 epidemic. However, BSIs for depressive symptoms were decreasing compared with the same period of the previous year. The result also presented different in terms of the psychological problems among medical staff with the prevalence of depressive symptoms ranking higher than anxiety (Liu et al., 2020). This may be due to the fact that medical staff have been in the front line of the battle and with higher risks of exposure to COVID-19. BSIs for psychological counseling had also been on the rise comparing with the same period of the previous year. The result also echoed Liu's findings that online psychological counseling services had been gradually developed and implemented in China (Liu et al., 2020). Online searching behaviors can reflect psychological activities or psychological needs of the public (Bach and Wenz, 2020; Morch et al., 2018; Rivas et al., 2020). However, it is far from enough to just provide passive psychological services. With prevailed online services and well-developed network, we suggest that it is imperative to build network-based systems throughout the country which include active monitoring, early warning and intervention of potential psychological problems, to better serve the public, especially during public health-related emergencies. There were limitations in this study as we only discussed the short-term psychological impact of the epidemic among the public but the long-term psychological involvement will depend on the control of COVID-19. Again, we only offered insight on the "potential psychological problems" through keyword searching behaviors, rather than "disease diagnosis". Hence,
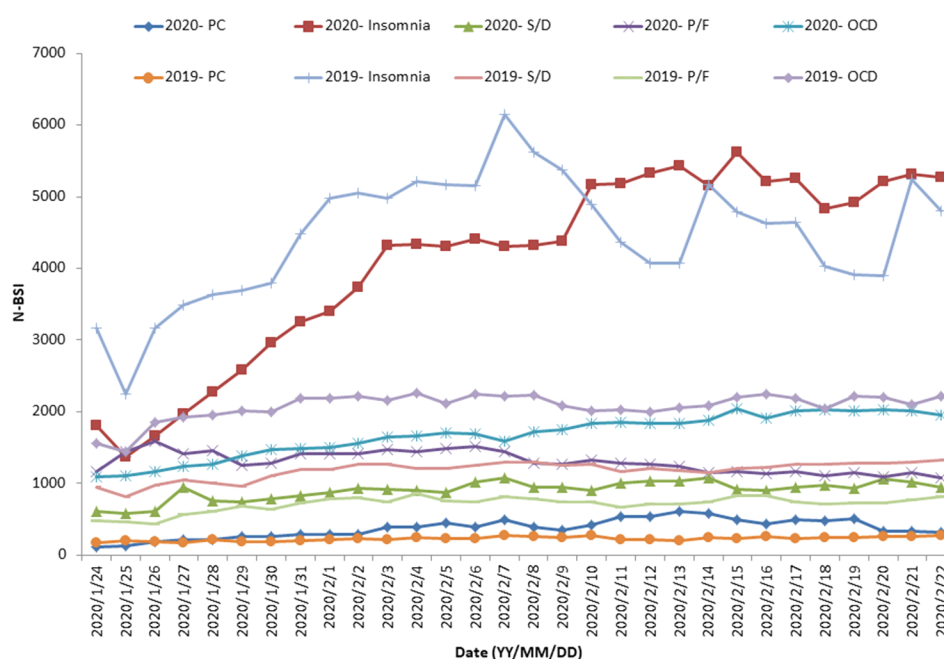
Figure 1 Comparison of N-BSIs for psychological keywords search during COVID-19 epidemic in 2020 with corresponding periods in 2019*

Note: PC Psychological Counseling; S/D Sad and Depressed; P/F Panic and Fear; OCD Obsessive Compulsive Disorder; N-BSIs, National Baidu Search Index

Fig. 1. Comparison of N-BSIs for pychological keywords searc during COVID-19 epidemic in 2020 with corresponding periods in 2019.

extrapolation of the conclusion needed to be cautious.

Declaration of Competing Interest

None.

Acknowledgement

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2020.07.128.

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