REVIEW

General Population's Psychological Perceptions of COVID-19: A Systematic Review

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Abstract: During the COVID-19 pandemic, general population's mental health may be influenced by their perceptions of major pandemic issues. Therefore, a systematic search was conducted to screen out those concerns and analyse the impacts. EBSCO, Scopus and Web of Science were searched for publications from inception to 1 February 2023. Nineteen articles were extracted and four issues were screened out as general population's major concerns, namely "Risk perception", "Government trust", "Media coverage and authenticity", and "Conspiracy theory". The population's perceptions of those issues could affect their mental health by arousing emotional reactions, which vary in different countries, social classes and groups, and would change in different stages of virus outbreak. The findings suggest that the general population's attitudes towards COVID-19-related social issues could affect their psychological health and should receive more concerns. As different issues are related to one another, an integrated solution system is in need, which would be helpful for coping with similar public emergencies in the future.

Keywords: COVID-19, attitude, perception, mental health, general population

Introduction

Since December 2019, the Coronavirus disease 2019 (COVID-19) has become a worldwide pandemic and put a great impact on people's lives with its rapid evolution and spread in the past years. Multiple aspects of the global, public, and private economy were affected, which aggravated the problems related with the livelihood of general population.[1] The continuous recurrence of the epidemic threatened people's life and safety, hindered transportation, affected work and employment, and restricted entertainment. With the normalization of the pandemic, the public continued to face with a huge test both physically and psychologically.[2] Based on Santomauro et al's study among 204 countries and territories in 2020, it was found that with the growth of the infection rate, the major depressive and anxiety disorder prevalence significantly increased, which led to over 25% of additional cases of each mental problem.[3] Although in May 2023, the WHO chief declared an end to COVID-19 as a global health emergency, the risk remained of new variants emerging and causing new cases and deaths, making the mental influence of the pandemic exist in a longer period of time in the post-epidemic era.

Compared with physical health, the decline of mental wellness is more indirect and imperceptible, and may cause significant negative effects and huge losses,[4,5] especially when it becomes a common situation in general population.[6] According to past studies, widespread COVID-19 was associated with an increase in depression, anxiety, psychological distress and other mental illness,[3,7–9] and led to a projected and international increase in suicide.[10] Those negative mental impacts may also be associated with various risk factors, which include not only the features of social environment such as news accuracy,[11] and governments' reactions and measures,[12] but also people's demography features like age and gender,[3,13–15] educational levels,[15,16] original physical status,[17] cultural backgrounds,[9,15] employment status,[18] and marital status.[9,15,18] These phenomena should receive more attention from psychiatrists across the world, and their causes, correlates, and managing strategies should be researched on.

Based on the theory of Lazarus and Folkman,[19] cognitive appraisal is a fundamental link between an event and the distress it may cause, which has been further proven by other studies.[5] Similarly, perceptions of and attitudes towards general population towards COVID-19 may act as mediating factors between the virus and the occurrence of their psychological

problems.[20] When it comes to the influence of mental reaction and mental health, people's psychological concerns of the COVID-19 issues are even more essential than the physiological effects caused by the epidemic. Therefore, it is of vital significance to discover the key issues and corresponding perceptions of general population. The associated factors of the perceptions should also be researched on and screened out, in order to shed some light on the cause of public psychological problems and illnesses during this pandemic. However, studies and discussions focusing on general people's attitudes of the virus and related social issues are relatively limited.

Therefore, this systematic review was designed to analyse the extant literature addressing the issues related to mental health concerns during the pandemic, focusing on general population's perceptions of and attitudes towards those issues and how they changed during the procedure of virus spreading and control. An additional objective was to identify factors that are associated with those psychological perceptions and attitudes.

Materials and Methods
Search Strategy
The systematic study was based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 (PRISMA 2020) guidelines,[21] and was conducted on EBSCO, Scopus and Web of Science. The database search was conducted on 1 February 2023, and the publications included were from COVID-19 inception to 1 February 2023. The terms used for searching were: (COVID-19 OR SARS-CoV-2 OR 2019nCoV OR novel coronavirus OR HCoV-19 OR pandemic OR Corona Virus) AND (perception OR strateg* OR perceive* OR perception OR cogniz* OR attitud* OR acknowledge* OR cop* OR repl* OR respon* OR evaluat* OR strateg*) AND (general population OR general public OR public OR community). The detailed procedure is shown in Figure 1.
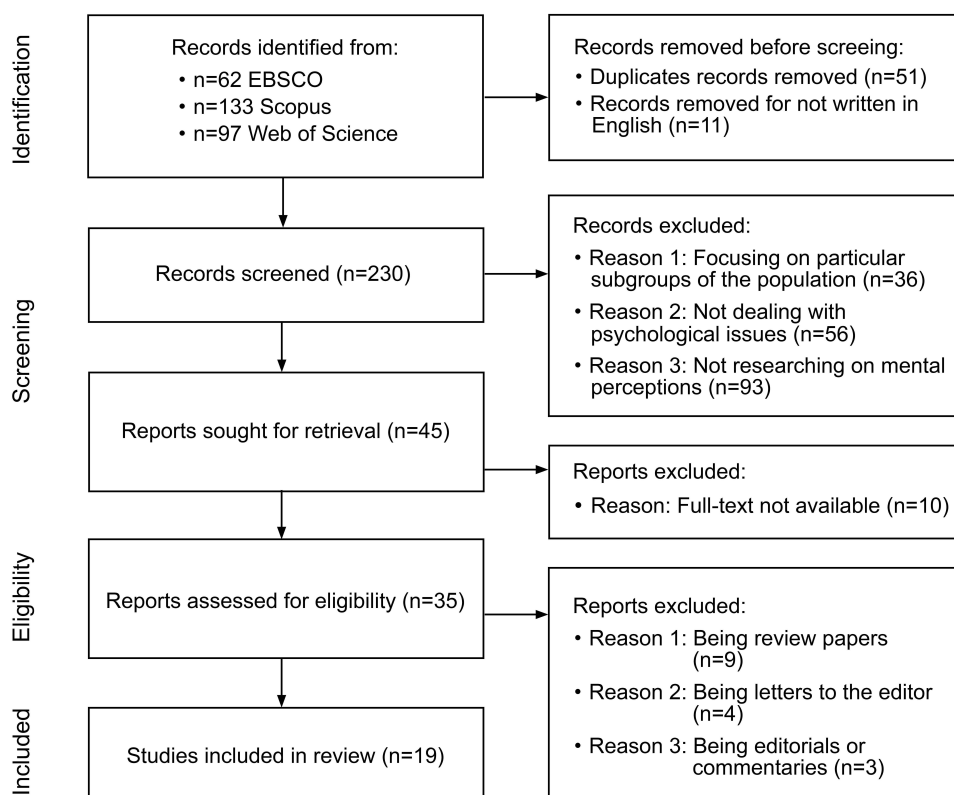

Figure 1 The article selection flow by preferred reporting items for systematic reviews and meta-analyses 2020 (PRISMA 2020).

Article Selection

A total of 292 citations were retrieved using the method above, among which 51 articles were first removed due to duplication. The titles and abstracts of each paper were then reviewed for their relevance to the topic. Studies were excluded if they: 1) were not full-text available in the language of English, 2) only focused on specific subgroups of the population (eg, healthcare workers, infected patients, women and children, aged people, etc.), 3) only concentrated on the research field of medical treatment or therapeutic effect rather than psychological and sociological issues, 4) only involved the report of mental illnesses without analysing the perceptual reasons, 5) were not peer-reviewed. Studies were eligible for inclusion if they: 1) were original researches following cross-sectional study design, 2) assessed the psychological attitudes of the general population/public towards the COVID-19 pandemic and related issues.

On reviewing the above citations, 206 articles were excluded: 11 articles were only in Japanese, Spanish, or Chinese. Thirty-six articles were excluded because they only focused on particular subgroups of the population. Fifty-six dealt with other aspects of the COVID-19 outbreak, rather than psychological issues, and 93 were excluded because they only reported the mental illnesses caused by the virus, without researching on people's mental perceptions. Ten reports were excluded for not having full-text available.

After screening processes, 35 were left for the full-text eligibility assessment. Sixteen articles were then excluded for not being original research: nine articles were review papers, four articles were letters to the editor, and three were editorials or commentaries. A careful review of the remaining 19 articles were conducted, which confirmed that they met the inclusion criteria.

Quality Appraisal

The quality of the selected articles was assessed using the quality appraisal method of the revised Newcastle-Ottawa Scale (NOS). NOS was modified by Xiong et al[18] to assess the quality of cross-sectional studies. The tool was further revised for the specific purpose of this research and was attached as Supplementary Material 1: RNOS. Three dimensions and eight categories of the selected articles were assessed, including the dimensions of Selection (the samples' representativeness, sample size, proportionate respondence, ascertainment of exposure), Comparability (based on design or analysis), and Outcome (assessment of outcome, assessing tools, statistical test). A study could be awarded a maximum of four stars for the Selection categories, two stars for Comparability, and five stars for Outcome. Moreover, the risk of bias assessments were carried out using the Cochrane Collaboration's tool, which was commonly adopted by systematic reviews to evaluate the validity of studies included.[22]

The result of the quality appraisal is presented in Table 1. The overall quality of the included studies is high, with 14 (73.7%) studies awarded over five stars. Figure 2 shows bias assessments of the included studies, indicating that over 60% of the studies have low risks of selection bias of allocation concealment, performance bias, attrition bias, and reporting bias. However, more than 50% of studies have high risks of selection bias of random sequence generation, which is mainly caused by adopting non-probability sampling methods. Such defect is discussed in Limitation.

Thematic Analysis

The basic information of each study was listed in the data extraction form (Table 2), which included 1) Title, 2) Lead author, 3) Country/Region of the population studied, 4) Survey time, 5) Sample size, 6) Sampling method (probability sampling or non-probability sampling), 7) Sample characteristics (age and gender), 8) Assessing tools (scales or questionnaires used in the study), 9) Main issues /Attitudes (towards)

According to the data summarized in Table 2, the 19 studies were conducted in different countries or regions from four continents: (1) Asia: China (n=1), the Arab region (n=1), Jordan (n=1), India (n=1), Bangladesh (n=1); (2) North America: the US (n=2), Canada (n=1) (3) Europe: the Netherlands (n=1), the UK (n=2), Italy (n=1), Denmark (n=1), Croatia (n=1), Serbia (n=1), Guatemala (n=1); (4) Africa: Egypt (n=1). Two Internet search studies covered respondence from multiple countries. The sampling method used in each study was probability or non-probability or both. Non-probability sampling involved snowball sampling, convenient sampling, national probabilistic quota sampling, and purposive sampling. Most of the studies were carried out in 2020, when there was a global outbreak of COVID-19.

Table 1 Quality Appraisal of Included Studies

Study	Total Score	Selection				Comparability	Outcome		
		Representativeness of the Sample	Sample Size	Proportionate Respondents	Ascertainments of Exposure	Based on Design and Analysis	Assessment of Outcome	Assessing Tools	Statistical Test
Abdelhafiz et al, 2020[23]	9		*	*	*	**	*	**	*
Castillo and Hernandez, 2023[24]	7	*	*		*	**	*		*
Chang et al, 2022[25]	9		*	*	*	**	**	*	*
Christensen et al, 2020[26]	9	*	*	*	*	**	*	*	*
Di Crosta et al, 2020[27]	9	*	*	*	*	**	*	*	*
Elayeh et al, 2020[20]	7	*	*		*	**	*		*
Hartman et al, 2021[28]	9	*	*	*	*	**	*	*	*
Jolley and Paterson, 2020[29]	7		*		*	**	*	*	*
Leigh et al, 2020[30]	8	*	*	*	*	**	*	*	
Mourad and Elbassuoni, 2022[31]	4		*		*	*	*		
Marta et al, 2020[32]	3	*	*		*				
McFadden et al, 2020[33]	4		*	*	*		*		
Quinn et al, 2020[34]	3		*		*		*		
Ramani et al, 2022[35]	6		*	*	*		**	*	
Ruisch et al, 2021[36]	7		*	*	*	**	*		*
Schuessler et al, 2022[37]	7		*	*	*	**	*		*
Simons et al, 2022[38]	5	*	*	*	*		*		
Tonković et al, 2021[39]	8	*	*		*	**	*	*	*
Zarouali et al, 2022[40]	7		*	*	*	*	*	**	

Notes: *The score of each category according to the RNOS (For example, if there are two "*" in the category of "Based on design" or "Assessment of outcome", it means the corresponding study meets two requirements worth one point or meets one requirement worth two points).
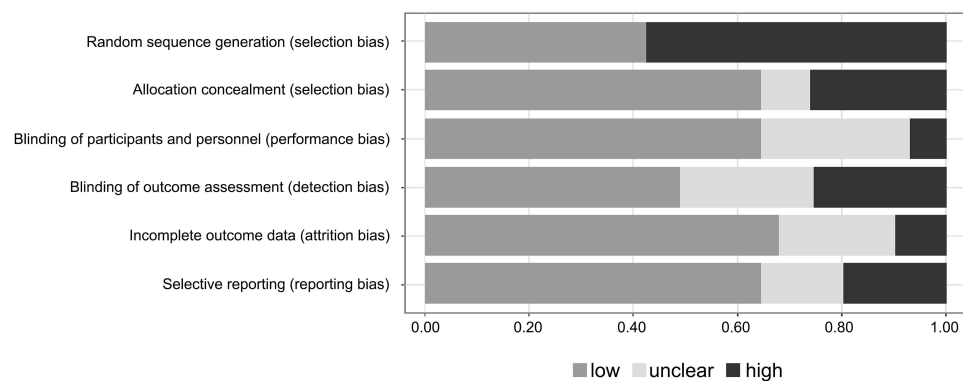
Random sequence generation (selection bias)
Allocation concealment (selection bias)
Blinding of participants and personnel (performance bias)
Blinding of outcome assessment (detection bias)
Incomplete outcome data (attrition bias)
Selective reporting (reporting bias)

0.00   0.20   0.40   0.60   0.80   1.00

■ low   ■ unclear   ■ high

Figure 2 Risk of bias assessment.

The sample sizes ranged from 300 to 10,635,996, with a total of 22,682 participants and 10,636,296 pieces of Internet comments. Most of the participants were over 18 years old, and female participants made up approximately 46.1% of the total sample participants.

The main issues involved in the included studies varied. Ten studies included people's attitudes towards the virus itself, as well as the knowledge or preventive measures of the disease. Three studies targeted on people's emotional responses of COVID-19. Sixteen studies related social issues caused by COVID-19 and the public reaction of the issues, such as the performance of the government and media, the treatment of people during the epidemic, as well as the rumors arose in the period. Four broad themes related to the general population's perceptions of or attitudes towards COVID-19 were then identified across the publications: (1) Risk perception, (2) Government trust, (3) Media coverage and authenticity, (4) Conspiracy theory. Those themes were further analysed across the articles, and the main perspectives of the population were shown in the results part.

Results
Risk Perception
The risk of infection was assessed as one of the main threats of COVID-19 in 11 publications.[20,23–27,30,32,33,35,38] Most people were aware of the danger of the disease and were concerned about the possibility that they or their family members could get infected with the virus,[23] and the worry for family members was more serious.[30] Such fear of infection risk made people reluctant to visit the hospital even though they needed to, in case of contracting the virus.[25] However, one study reported that in face of the infection risk, the emotion feedback of the citizens (of Serbia) was not fear, but caution, indicating a lower risk assessment in the country.[32]

One study found that a great majority of people realized that the risk of the disease was associated with people's age and basic physical condition, believing that the virus was more dangerous for the elderly, and those with chronic diseases.[23] It was observed in one study that the risk perception was different among people with different genders and ages. Males and younger people showed higher levels of risk tolerance.[24]

Cognition of infection risk may cause further emotional reactions.[24] It was found that some people would associate the infection with patient-related stigma,[23,35] which was partly caused by the fear of being forcefully quarantined and dying alone. Such emotion results in hesitancy in seeking healthcare even after having symptoms.[35] Also, the fear of getting infected and the infection consequences would cause mental stresses and illnesses.[27]

Although the risk of infection and its severity were widely perceived, people's attitudes may still stay positive in the case that they believe they have effective preventive measures to follow,[20] or trust the information on COVID-19 from their health professionals and officials.[33] The findings of Simons et al[38] also showed people's demands of news and information on the virus in reducing their personal risk. Four studies found that with the changes of the epidemic phases during the past years, there was a shift in people's attitudes of infection risk. The threaten assessment of the disease dropped and the risk tolerance increased, which led to fear decrease and a general laxity.[20,24,35]

Table 2 Basic Information of Reviewed Studies

Title	Lead Author	Country/Region	Survey Time	Sample Size (n=)	Sampling Method	Sample Characteristics	Assessing Tools	Main Issues /Attitudes (Towards)
Knowledge, perceptions, and attitude of Egyptians towards the novel coronavirus disease (COVID-19)[23]	Abdelhafiz, A.S.	Egypt	March, 2020	559	Probability sampling (online survey) + Non-probability sampling (convenient sampling with patient interviews)	Age range: ≥18 Sex (f/m): 348/211	Author-designed questionnaire	1. Disease 2. Preventive Measures of COVID-19
The unintended consequences of confinement: evidence from the rural area in Guatemala[24]	Castillo, J.G.	Guatemala	November-December 2019, May-June 2020	2142	Non-probability sampling (interviews and phone surveys on agricultural households)	Not reported	Author-designed questions	1. Risk tolerance 2. Trust and generosity 3. Emotional issues
Risk perceptions, level of government trust, and psychological distress during COVID-19 pandemic in Taiwan[25]	Chang, P.Y.	China	April, 2020	1098	Probability sampling (random proportional sampling and random dialing)	Age range: ≥20 Mean age: 47.7±16.4 Sex (f/m): 566/532	1. Author-designed questionnaire 2.5-item Brief Symptom Rating Scale (BSRS-5)	1. COVID-19 2. Government trust
Political and personal reactions to COVID-19 during initial weeks of social distancing in the United States[26]	Christensen, S.R.	USA	March 31st, 2020	1030	Non-probability sampling (Quotas for sex, race, and income, derived from US Census data)	Mean age: 48.8 Sex (f/m): 541/489	1. Political Polarization 2. Reuters Institute Digital News Report 3. Author-constructed questions	1. Pandemic media coverage 2. Government action 3. Public response
Individual differences, economic stability, and fear of contagion as risk factors for PTSD symptoms in the COVID-19 emergency[27]	Di Crosta, A.	Italy	April, 2020	1253	Non-probability sampling (web-based survey by the Qualtrics survey software)	Age range: 18–64 Mean age: 39.48±11.94 Sex (f/m): 808/445	1. Author-designed questions 2. The Big Five Inventory 10-item (BFI-10) 3. The Impact of Event Scale-Revised (IES-R)	1. Risk perceptions 2. Mental health
Before and after case reporting: a comparison of the knowledge, attitude and practices of the Jordanian population towards COVID-19[20]	Elayeh, E.	Jordan	February to March, 2020	2104	Non-probability sampling (snow ball sampling with the link to the Google form questionnaire sent to the contact lists of the authors)	Age range:≥18 Sex (f/m):1586/518	Author-designed questionnaire	1. Personal role in preventing COVID-19 2. Government trust

Different conspiracy theories have different psychological and social determinants: comparison of three theories about the origins of the COVID-19 virus in a representative sample of the UK population[28]	Hartman, T. K.	UK	March-May, 2020	1406	Non-probability sampling (online surveys through Qualtrics)	Age range: 18–75+ Sex (f/m): 676/730	1. Author-designed questions 2. Authoritarianism scale (Bizumic and Duckitt, 2018) 3. Social dominance orientation scale (SDO-7; Ho et al,2015) 4. Political affiliation question (adapted from the British Election Study 2017) 5. Two items to measure ethnocentrism (adapted from Davidov, 2011) 6. Intolerance of Uncertainty Scale (IUS) (Buhr and Dugas, 2002)	1. Conspiracy theories 2. Public Health
Pylons ablaze: examining the role of 5G COVID-19 conspiracy beliefs and support for violence[29]	Jolley, D.	Briton	April, 2020	601	Probability sampling (online survey)	Mean age: 34.34±12.09 Sex (f/m): 436/162	1. Author-designed questions 2. The State Anger Scale (Spielberger and London, 1982) 3. Measures of violence (Lamberty and Leiser, 2019) 4. Paranoid Ideation Scale (Fenigstein and Vanable, 1992)	Conspiracy theories
A national cross-sectional survey of public perceptions of the COVID-19 pandemic: self-reported beliefs, knowledge, and behaviors[30]	Leigh, J.P.	Canada	April, 2020	1996	Non-probability sampling (Online survey)	Age range: 34–66 Mean age: 50 Sex (f/m): 1080/899	Author-designed questionnaire	1. Risk perceptions 2. Media coverage

(*Continued*)

Table 2 (Continued).

Title	Lead Author	Country/ Region	Survey Time	Sample Size (n=)	Sampling Method	Sample Characteristics	Assessing Tools	Main Issues /Attitudes (Towards)
A large-scale analysis of COVID-19 tweets in the Arab region[31]	Mourad, A.	The Arab region	March, 2021	10,635,996 tweets	Intensive sampling (of tweets from a dataset)	Sex (f/m): 31.5%/68.5%	Author-designed questions	1. Economics 2. Stocking Up 3. Vaccine/Cure 4. COVID-19 Statistics 5. COVID-19 Information 6. Politics 7. Public Health Measures 8. Governmental Measures 9. Fake Treatment 10. Conspiracy Theory 11. Non-Informative.
Serbian citizens' opinion on the COVID-19 epidemic[32]	Marta, I.	Serbia	April, 2020	5989	Non-probability sampling (convenient sampling with electronic questionnaires)	Not reported	Author-designed questionnaire	1. Emotional reaction 2. Trust in the media and the health system 3. Conspiracy theories
Perceptions of the adult US population regarding the novel coronavirus outbreak[33]	McFadden, S. M.	USA	February, 2020	718	Probability sampling (online survey)	Age range:18–55+ Sex (f/m):386/330		1. Risk perception 2. Trust in sources of information
The instagram infodemic: cobranding of conspiracy theories, coronavirus disease 2019 and authority-questioning beliefs[34]	Quinn, E.K.	Multiple	April, 2020	300	Probability sampling (hashtag selection through Instagram)	Not reported	Hashtag searching	1. General mistrust 2. Antimisinformation 3. Conspiracies 4. Quarantine
Corona was scary, lockdown was worse: a mixed-methods study of community perceptions on COVID-19 from urban informal settlements of Mumbai[35]	Ramani, S.	India	September to October, 2020	468+49	Probability sampling (telephonic interviews) + Non-probability sampling (snow ball sampling by telephonic interviews)	Quantitative data: Age range: 18–77 Mean age: 33.2±9.6 Sex (f/m):242/226 Qualitative data: Age range: 18–51+ Sex (f/m): 8/9	Questionnaire adapted from existing survey tools	Emotional reaction

Examining the left-right divide through the lens of a global crisis: ideological differences and their implications for responses to the COVID-19 pandemic[36]	Ruisch, B.C.	Multiple	April-June 2020	4441	Probability sampling (online survey through Amazon's Mechanical Turk)	Age range: 36.31–39.48 Sex (f/m): 31.5%/68.5%	Author-designed 21-item multifaceted measure	1. Ideological gap in pandemic response politics 2. Empathic concern 3. Trust in science 4. COVID-19 knowledge
Public support for unequal treatment of unvaccinated citizens: evidence from Denmark[37]	Schuessler, J.	Denmark	December, 2021	2458	Probability sampling (stratified sampling of by computer assisted self-administered survey)	The seventh wave: Mean age: 49.1 Sex (f/m): 1254/1204	Author-designed questionnaire	1. Unequal treatment of the unvaccinated 2. Trust in institutions 3. Restrictive policies
Public perception of media's role during COVID-19 pandemic in Bangladesh[38]	Simons, G.	Bangladesh	June, 2020	392	Non-probability sampling (purposive sampling among professions by email and digital platforms)	Age range:<25–55+ Sex (f/m):157/227	Author-designed questionnaire	1. Media's role 2. Performance of the mass media's coverage
Who believes in COVID-19 conspiracy theories in Croatia? Prevalence and predictors of conspiracy beliefs[39]	Tonković, M.	Croatia	Before December 2020 (Not explicitly described)	1060	Non-probability sampling (national probabilistic quota sampling by region and size of the dwelling with online survey)	Age range: 18–74 Mean age: 44 Sex (f/m): 563/497	1. 10-item scale by Neal and Groat (1974) 2. Trust in Science and Scientists Inventory 3. Author-designed questionnaire	1. Conspiracy theories 2. Trust in science and scientists 3. Political powerlessness
Exploring people's perceptions and support of data-driven technology in times of COVID-19: the role of trust, risk, and privacy concerns[40]	Zarouali, B.	The Netherlands	April, 2020	907	Probability sampling (online survey)	Age range: 18–55+ Mean age: 50.87±15.90 Sex (f/m): 418/489	1. Trust: a 5-item instrument by Malhotra et al (2004) 2. Risk: a 7-point measure by Malhotra et al (2004) 3. Privacy: a single scale adopted from prior studies	1. COVID-19 2. Government Trust 3. Risk

Another basic concern was the risk of economic break down and personal income reduction.[24] According to Abdelhafiz et al,[23] a psychological gap may exist, which over 60% of the general population expected to continue receiving their salaries while being quarantined, while less than 40% believed it would really happen. One study revealed specific fears caused by the risk of income reduction. A majority were afraid of lacking money to purchase basic supplies for themselves and their families if they cease to work because of personal sickness or social distancing rules.[26] Those fears were more common among people in lower-income brackets,[26] while households with higher incomes were less sensitive to such financial crisis, because of their leverage for better welfare.[24]

Generally speaking, although the perception of risk was normal and necessary during the spreading period of COVID-19 in making people stay cautious and protective of themselves and families, it would also generate negative psychological responses, lead to anxiety, hostility, depression, interpersonal sensitivity/inferiority, and psychological symptoms,[25] but such perception showed a downward trend over time as the pandemic got weaker.

Government Trust

Ten publications addressed the attitudes of general population towards their governments,[20,23,25,26,31–33,36,37,40] and two major issues related to government trust were 1) the government's ability to manage the pandemic; 2) information spreading and personal data collection.

As for the first issue, the public's attitudes towards the government varied across countries. In Egypt and China, the majority of public responded positively to the ability and the preventive measures of the government.[23,25] However, more than half of the people in Jordan showed distrust of the approach adopted by the Ministry of Health. Similarly, there is an overwhelming negative sentiment towards government measures across the majority of Arab countries, but such a situation may change over time. These articles also showed that the percentage of people who trust their governments in confronting COVID-19 increased significantly in some countries as time passed.[20,31]

Several articles pointed out the relation between government trust and politics, especially in the US, where the pandemic had become politicized.[26,33,36] According to Christensen et al,[26] compared with conservatives, liberals in the US were more likely to feel that the government had not done enough in response to COVID-19. Another study in America found that the majority of the respondents showed more trust towards scientific/public health leadership than political leadership.[33] The study of Schuessler et al[37] displayed a moderating effect of individual's government trust in supporting stricter rules for the un-vaccinated. The article of Chang et al[25] stated the bad effect of government distrust, indicating that those with low levels of trust in the government's capacity to manage the pandemic were more likely to have psychological distress.

As for the second issue, one study revealed people's blame of government officials for spreading panic through public speeches and daily public addresses.[32] Another paper pointed out that people's trust of health professional officials for information on COVID-19 would decrease their risk perceptions.[33] When it comes to personal privacy protection with regard to governmental data collection, the study of Zarouali et al[40] showed that the doubt and concern about privacy increased with higher educational degree. Accordingly, trust in government would drop when such concerns arose.

Media Coverage and Authenticity

Seven publications have identified the perception of media coverage and authenticity as essential.[20,23,26,30,32,35,38] One study showed people's increasing demand for media coverage to reduce personal risk, and their agreement of the media coverage's significance in forming and influencing people's attitudes towards the virus (including social media and mainstream media).[38] According to Leigh et al,[30] most Canadian participants reported a perceived adequate news coverage.

Two studies pointed out the relation between media and politics.[26,38] Christensen et al[26] reported that in the US, people's attitude towards media coverage was associated with their political ideologies. According to Simons et al,[38] more than 60% of the participants in Bangladesh thought the news about COVID-19 had been politically biased.

People's perspectives of media's authenticity varied across countries. In Bangladesh and Canada, respondents tended to show positive attitudes towards the credibility of mainstream media rated media performance in their countries.[30,38] However, in Jordan and Serbia, over half of the participants did not trust the news of the media,[20,32] and over 70% of the participants in Canada reported having seen or heard incorrect or misleading information related to COVID-19.[30] In

Egypt, 16.8% of the participants thought that the media coverage was exaggerated.[23] One study mentioned the proportionality of media news, saying that the lack of community-level messaging gave rise to misinformation and denial of the outbreak.[35]

Conspiracy Theory

The issue of conspiracy theory was discussed in 6 out of 19 studies,[20,23,28,29,34,39] with the main theories concerned including 1) Lab conspiracy theory, 2) 5G COVID-19 conspiracy theory, 3) The false information theory, 4) Others.

The lab conspiracy theory described a hypothesis that the coronavirus was created in a laboratory and designed as a biological weapon. The theory was supported by 26.8% of the public in Egypt according to Abdelhafiz et al,[23] while in Jordan, the percentage reached up to 49.7%, and even greater amount of people (57.9%) believed that such "designing" was associated with international tension and trade wars.[20] The study of Tonković et al revealed a 45.09% support of the laboratory creating assumption and pointed out the possible aim of destroying economies, which was agreed by 38.68% people.[39] Hartman et al's research suggested a mean value of 0.38 (scaled 0–1) of belief in the lab creation speculation.[28]

Another wide spread theory was the 5G COVID-19 conspiracy theory, which indicates that coronavirus spreads faster in the presence of 5G networks. Such a theory received less support compared with the biological weapon theory. There were only 10.38% of people believing in this theory according to Tonković et al.[39] The mean supporting value was also lower, with 1.93 (scaled 1–7) in Jolley and Paterson's study,[29] and 0.11 (scaled 0–1) according to Hartman et al.[28]

The false information theory described the idea that the truth was hidden or the information was fabricated by the government or media. There were more than half of agreement or strong agreement responses (58.55%) in Tonković et al's study,[39] and the rate of general mistrust in Quinn et al's research was 43.8%.[34]

Other conspiracy theories include the meat market origin theory that the virus originated in a meat market in Wuhan, China,[28] and the assumption that the virus was created by a company that wanted to make money on vaccines.[39]

Several democratic and perceptive factors were proved to relate to the belief of conspiracy theories, including lower education levels, lower economic standards, higher degrees of religious recognition, less self-identification of politics, higher social dominance, and conventionalism.[39] A lack of authority trust or authority-questioning attitudes were positively correlated with believing in COVID-19 conspiracies,[28,34,39] while the trust in science and scientists could mediate the relationship between authoritarianism and conspiracy beliefs, as well as the relationship between social dominance and conspiracy beliefs.[39] The belief in conspiracies was also positively correlated with a higher expected personal impact from the pandemic.[39]

Predictors of conspiracy beliefs vary depending on conspiracy types. According to Hartman et al,[28] social dominance orientation and distrust in scientists were strongly positively associated with both the lab conspiracy theory and the 5G network conspiracy theory, while negatively associated with the meat market origin theory. General conspiracy ideation and less reliable news sources were strong predictors of lab conspiracy theory, while less associated with the 5G network conspiracy theory. People's political stance of right-wing authoritarianism was strongly positively related to the belief in the lab conspiracy theory, however, strongly negatively associated with belief in the 5G conspiracy theory. COVID-19 related anxiety was associated with both the lab conspiracy theory and the meat market origin theory, and the meat market origin theory was also predicted by intolerance of uncertainty and ethnocentrism. Jolley and Paterson found that people with greater state anger or paranoid personality were more likely to believe in the 5G COVID-19 conspiracy theory.[29]

Generally speaking, a quarter to half of the population believed in at least one of the conspiracy theories. The belief of those conspiracy theories could be predicted by personal political-psychological predispositions, public health attitudes, and the specific content of the theory.[28]

Discussion

This review has analysed the general population's concerns about COVID-19, the impacts of those concerns on people's mental health, and the influential factors. Four main issues were screened out based on the reports in 19 studies, including "Risk perception", "Government trust", "Media coverage and authenticity", and "Conspiracy theory". People's attitudes varied across countries towards those issues. Significant correlations between such attitudes and people's emotions were

reported, confirming the hypothesis that the pandemic had great psychological effects on the general population and influenced their mental health. Besides, demographic factors were also predictive for general population's perceptions of the issues, including age, gender, education, income, personality, and political stances. Cross-correlations between perceptions of different issues may also exist. These findings are therefore further discussed as follows.

Psychological Effects of Attitudes Towards COVID-19

Psychological influences were found related to people's attitudes towards the COVID issues. A higher risk perception of the virus could cause more negative emotions like worrisomeness and fear and further cause mental stress and even illnesses,[23,27,30,32] while the belief of having effective preventative measures (which could be broadcast by the government and media) would reduce such negative emotions. Besides, lower government trust was related to a greater tendency to have psychological distress.[25] Since the public's emotional reactions were constantly caused by the lasting COVID-19 pandemic and even continued amid the post-epidemic period, long-term psychological impacts on the general population would possibly get aroused.

Influential Demographic Factors of COVID-19 Perceptions

Several personal factors were identified from the studies as related to attitudes towards COVID issues. For example, males and younger people tended to have lower levels of COVID risk perceptions.[24] People with lower income had more worrisome about the financial risk.[24,26] Those who had higher educational degrees showed more concerns about their personal data privacy, which may in turn decrease their government trust.[40] The belief in conspiracy theories was more common among people with lower education and economic standards, higher degrees of religious recognition, higher social dominance, and conventionalism.[39] The tendency of conspiracy theory belief was also positively correlated with greater state anger and paranoid personality.[29] Moreover, people's government trust, attitudes towards media coverage, conspiracy beliefs were all associated with their political stances.[26,33,36,39]

Cross-Correlations Between the Perceptions of Different Issues

There were also correlations between people's perceptions of different issues. For instance, people's trust of government's information on COVID-19 could reduce their risk perceptions.[33,40] Conspiracy beliefs were positively correlated with a lack of authority trust,[28,34,39] as well as a higher risk perceptions of the virus.[39] As the authority is generally responsible for the dissemination of COVID-related information, the mainstream media's coverage and news authenticity were well associated with people's trust of their governments. An over-report of the virus would lead to people's over-estimate of the risk and cause public panic,[32] while inadequate news coverage could not meet the up-going demand of information to reduce personal risks.[38] Also, false information spread by the media was one of the major resources of conspiracy theories.[28] Those situations would diminish people's trust of their governments and health officials.

Limitations

The limitations of this review are as follows.

Firstly, there was a relatively high degree of heterogeneity across studies, caused by the differences in sampling methods, measuring tools, subjects' age and gender distributions and issues focused on. Such heterogeneity causes a risk of bias, and makes it impossible for this review to compare the outcome of each study using objective methods, such as data analysis.

Additionally, selection bias exists in some studies where the respondent sample was not similar to the general population in terms of age, gender, and education, indicating that the sample may not be representative of the true population.

Another concern is that the studies included were conducted in a limited number of countries. Thus, there are challenges in synthesising evidence of psychological perceptions among the general population at a global level.

Moreover, there was only one reviewer involved in the reviewing process, which led to a less critical evaluation of the studies. In addition, studies not available in full text were not included in the review, which may leave out some useful information.

Conclusion

Based on the findings of this systematic review, several practical implications could be revealed, which can shed some light on the enhancement of general population's mental health in face of public health events like COVID-19.

1. Negative emotions caused by COVID-19 are not only the fear of getting infected but also the financial problems and other side effects brought by the event. Therefore, general population's actual needs behind the superficial problems should not be overlooked and particular solutions to the problems ought to be offered.
2. The public trust of government and medical institutions are of vital significance in restoring people's confidence of winning against the virus. Therefore, a trustworthy image of the authority should be built, through broadcasting information truthfully, reacting rapidly and taking measures effectively in face of emergencies.
3. Specific measures to tackle the COVID-related mental problems are essential for different social classes and groups. Vulnerable groups including women, the elderly, and people with lower incomes should be paid more attention to in reducing their over-worrisome. People with religions or political stances are prone to have prejudice to the public event and may need specific psychological counseling when they show antisocial tendency. Individual personality is another important issue to be focused on, and extensive psychological education is helpful for the people with bad temper or negative personality.
4. A cross-correlation between the public's perceptions of different issues was found, which indicated that the chain effect of multiple social problems could not be neglected in reducing the negative influence of the pandemic, and an integrated solution system considering all the issues as a whole to alleviate the virus' hazards to mental health is needed.

Abbreviations

COVID-19, corona virus disease 2019; COVID, corona virus disease; SARS-CoV-2, severe acute respiratory syndrome corona virus 2; 2019nCoV, 2019 novel corona virus; HCoV-19, human corona virus 2019; WHO, World Health Organization; PRISMA, reporting items for systematic reviews and meta-analyses, NOS, Newcastle-Ottawa Scale; RNOS, Revised Version of Newcastle-Ottawa Scale; 5G, fifth generation mobile communication technology.

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