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Investigating the Potential Determining Factors Contributing to Mental Health Problems in Pregnancy During the COVID-19 Pandemic: A Systematic Review

Parisa Razmjouei[1], Maryam Kasraeian[2], Neda Dehghani[3], Noroozi Asl Samaneh[4], Fatemeh Ranjbar[5], Benyamin Fazli[6], Sara Saadat[7], Masumeh Ghazanfarpour[8*]

Abstract

Objectives: The present study aimed to investigate the potential determining factors responsible for the mental health problems during the COVID-19 pandemic.

Methods: The databases including PubMed/MEDLINE, Web of Science, and Cochrane Library were searched for the required articles in February, 2021. The quality of the studies was determined based on the STROBE checklist.

Results: A total of 31 articles were included in this systematic review. Stopped in-person prenatal care and using the phone for prenatal care were significantly associated with greater changes of anxiety during COVID-19. Parity, gestational age, and pregnancy complication were found to be statistically and significantly associated with anxiety. Social and family supports were specifically associated with reduced anxiety. Women with low body mass index (BMI) were detected to be more prone to developing depression and anxiety. While obesity had protective effects on depression, stress and anxiety, lower sleep quality, lower household income, lower physical health, and less physical activity were found associated with higher anxiety levels. Other significant factors related to mental health included employment status, employment status, marriage status, household size, educational level, ethnicity, knowledge score, marital life satisfaction, and fear of the COVID-19 infection.

Conclusions: Clinical, economic, and socio-demographic physical health were associated with mental health problem during COVID-19. Therefore, it was recommended that the potential determining factors should be further explored and identified in order to help protect people against mental health problems.

Keywords: Determining factors, Mental health, Pregnancy, COVID-19, Review

Introduction

The main symptoms reported by patients with COVID-19 are fever, cough, shortness of breath, confusion, headache, sore throat, muscle ache, rhinorrhea, chest pain, diarrhea, nausea, and vomiting (1). This infection not only develops various physical disorders but also causes psychological distress, stress, anxiety, and depression, thereby seriously affecting the general and quarantined population, healthcare providers (2). Higher levels of anxiety and depression have been observed among women after the declaration of the COVID-19 epidemic (3). Concomitant infections may further increase the psychological burden on perinatal women due to health concerns about the fetus's health (4) and fear of anticipated delivery (5). Excessive pressure on pregnant women may have indirect adverse effects on their physical and mental health (6,7). Numerous complications, including low birth weight, premature birth, fetal growth retardation, postpartum complications, gestational diabetes, hypertension, and preeclampsia have been reported following pregnancy depression (8,9). Therefore, it is important to explore and identify potential determining factors, which may help protect people against the mental health problems (10). This study aimed to investigate the potential factors responsible for the mental health problems during the COVID-19 pandemic.

Objective

The current meta-analysis aimed to investigate the potential factors responsible for mental health problems during the COVID-19 pandemic by reviewing all observational studies.

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[1]Maternal-fetal Medicine Research Center, Department of Obstetrics and Gynecology, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran. [2]Maternal-Fetal Medicine Research Center, Shiraz University of Medical Sciences, Shiraz, Iran. [3]Department of Midwifery, Firoozabad Branch, Islamic Azad University, Firoozabad, Iran. [4]Pediatrics Endocrinology Department, Mashhad University of Medical Sciences, Mashhad, Iran. [5]Student Research Committee, Kerman University of Medical Sciences, Kerman, Iran. [6]Department of Anesthesiology, Mashhad University of Medical Sciences, Mashhad, Iran. [7]Department of Pediatric, Division of Nephrology Mashhad University of Medical Sciences, Dr Sheikh hospital, Mashhad Iran. [8]Nursing Research Center, Kerman University of Medical Sciences, Kerman, Iran.

***Corresponding Author:** Masumeh Ghazanfarpour, Email: Masumeh.Ghazanfarpour@yahoo.com

Methods

Participants

All women pregnant during COVID-19 pandemic were included in this study.

Search Scope

The search strategy was adopted to screen the databases of Web of Science and PubMed/MEDLINE in February, 2021, with no language restriction.

Search Strategy

The following terms were used in our search: pregnant OR pregnancy OR prenatal OR gestation OR partum" OR "prepartum" OR trimester" OR "perinatal "prenatal" OR "partus" OR "maternal") AND (epidemic OR pandemic OR COVID-19 OR SARS-COV 2) and (anxiety OR "anxiety", "social anxiety", "general anxiety", "anxiety health" OR "depression" OR mental) The terms were searched in English and other languages (Figure 1).

Inclusion and Exclusion Criteria

All published articles with an observational design (e.g., cohort, longitudinal and cross-section) and assessing significant factors contributing to mental health problems in pregnancy during the COVID-19 Pandemic were included in this study. It should be also noted that the studies were not selected based on methodological quality.

Data Extraction

Two reviewers independently extracted the necessary data from the full-text articles based on a predetermined eligibility, including the name of the first author, date of publication, country of study, type of study, number of the participants, age of the participants, sampling method, sampling date, recruitment places, questionnaire, and outcomes (Table 1 and Table S1) (8,11-39).

Quality Assessment

The searched studies were assessed for quality in accordance with 22-item checklist of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) (40), the result of which indicated a STROBE score of ≥12 as high quality and a STROBE score of <12 as low quality (41). Two separate reviewers completed checklists for all studies, and any differences between among were resolved by agreement. Total score strobe was recorded Table 1.

Results

A total of 31 articles were included in this systematic review. The potential factors causing mental health problems in pregnancy during the COVID-19 pandemic

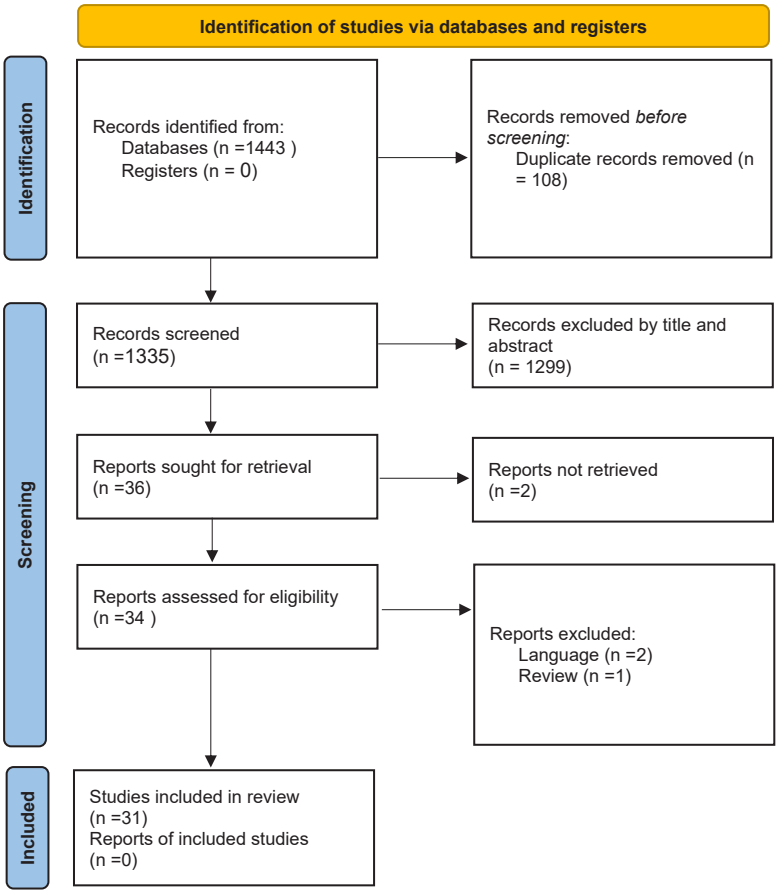

Figure 1. Flow Diagram of the Sstudy.

Table 1. Extracted Data From the Full-text Articles Based on a Predetermined Eligibility by Two Reviewers

Author, Date, Country	Type of Study	No. of Participants	Age	Sampling Method	Recruitment Site	Questionnaires	Score STORBE
Ahorsu et al, 2020, Iran (11)	Cross-sectional	N =580	29.24	Random sample	Healthcare centers	HADS	18
Ayaz et al, 2020, Turkish (12)	Prospective	N=63	30.4	Convenience sample	Training and research hospital	BAI	20
Effati-Daryani et al,2020 , Iran (13)	Cross-sectional	N=205	<25=25.4%; 25-35 =58.5% >35=6.%	C luster sampling	Health centers	DASS-21	18
Beheshtinasab et al, 2020, Iran (14)	Cross-sectional	N=200	26.03	Convenient sampling	Health centers of Iran	HAI 18, PDQ	18
Kahyaoglu Sut et al, 2020, Turkey(15)	Cross-sectional	N=403	28.2 ± 4.5	Convenience sample	Social media	HADS	16
Saadati et al, 2020 Iran (16)	Cross-sectional	N=350	26.54	Random sample	The same social media	COPE, EPDS	15
Jiang et al, 2021 ,China(17)	Cross-sectional	N=1873	29	Direct online and snowball recruitment methods	Hospital	CPSS, SAS, EDS, EPDS	18
Medina-Jimenez et al, 2020, Mexico (18)	Cross-sectional web survey	N=549	28.1	Consecutive method	Public and private hospitals	PSS, EPDS	19
Lin et al, 2021, China(19)	Cross-sectional	N=751	30.51	Non-random sample, a snowball sampling	Obstetric clinics in maternity and child health care hospitals	SAS, PHQ9	18
Preis et al, 2020, USA (20)	Cross-sectional	N=788	29.2	Convenience sampling	Online	GAD-7, PREPS	18
Mei et al, 2020, China (21)	Two cohort study	Pregnant cohort study: N=784, Healthy baby cohort study: N=2448	Pregnant cohort study=30.36; Healthy baby cohort study = 20.95	Convenience sampling	Social media	BSI-18, EPDS, GAD-7	16
Wu et al, 2020 China (22)	A multicenter, cross-sectional study	N=4124	27–32 years	Convenience sampling	Hospitals	EPDS	17
Kassaw and Pandey, 2020 Ethiopia (23)	Cross-sectional	N=1500	>28 110 (61.7%) <28 68 (38.3%)	Consecutive sampling.	A hospital-based	GAD-7	16
Gildner et al, 2020, USA (24)	Cross-sectional	N=2099	31.3	Convenience sample	Social media	CARE	18
Lebel et al, Canada 2020 (10)	Cross-sectional	N=1987	32.4	Convenience sampling	Social media	EPDS	20
Harrison et al, 2021, UK (25)	Cross-sectional	N=205	18-24 (6.3%), 25-34 (62.9%), 35-44 (30.7%)	Convenience sample	A battery of online measures	EPDS, MPSS, PASS, RNT, RTQ-10	17

Table 1. Continued

Author, Date, Country	Type of Study	No. of Participants	Age	Sampling Method	Recruitment Site	Questionnaires	Score STORBE
Matsushima et al, 2020, Japan (26)	Cross-sectional	N=1777	Age <25 years 5.35%; Age 25-29 years (29.21%); Age 30-34 years (37.20%); Age ≥35 years (28.25%)	Convenience sampling	Online	EPDS	18
Ravaldi et al, Italy, 2020 (27)	Cross-sectional	N=1015	34.4	Snowball technique	Web-based, national survey	NSESSS, PTSD	22
Dagklis et al, 2020, Greece (28)	Cross-sectional	N=146	≥35 year: 32.2 <35: 67.8	Convenience sampling	University clinic	STAI	18
Hocaoglu et al, 2020, Turkey (29)	Cross-sectional	N=283	29.20	Convenience sample	Training and research hospital	STAI, IES-R	22
Ding et al, 2021, China (30)	Cross-sectional	N=817	29.1	Convenience sampling	Maternal hospitals	SAS, self-rating anxiety scale	18
Guo et al, China, Italy, Netherland, 2021 (31)	Cross-sectional	Dutch n=900, Italian n=641, and Chinese mother n=922	36.74± 5.58	Snowball sampling	Social media	BSI-18, PTSD	18
Saccone et al, 2020, Italy (32)	Cross-sectional	N= 100	36.9	Convenience sampling	University	IES-R, STAI, VAS	16
Yue et al, 2021, China(33)	Cross-sectional	N= 308	31.02 ± 3.91	Convenience sampling	Online survey	SAS, SSRS	18
Moyer et al, 2020, USA (34)	Cross-sectional	N=2740	32.7	Snowball sampling	Online survey	PRAS	8
Patabendige et al, Sri Lanka, 2020, (35)	Cross-sectional	N = 1500	29.2	A quota sampling technique	Antenatal hospital clinics	HADS	18
Thayer et al, 2020, USA (36)	Cross-sectional	N=2099	31.3	Convenience sample	Social media	EPDS	18
Ng et al, 2020, Singapore (37)	Cross-sectional	N= 324	31.8	Random sample	The antenatal clinics of and children's hospital	DASS-21	18
Durankuş et al, 2020, Turkey (8)	Cross-sectional	N=260	29.56	Survey Monkey	Center	BDI, BAI, EPDS	18
Mappa et al, 2020, Italy (38)	Cross-sectional	N= 200	Median = 33	Convenience sampling	A link of questunnaire was sent through emails women antenatal clinic	STAI	18
Berthelot et al, 2020, Canada (39)	Two Cohorts study	N=1754	29.27	Convenience sample	Through advertisements in prenatal clinics	DES-II	20

STAI: State-Trait Anxiety Inventory; EPDS: Edinburgh Postnatal Depression Scale; MPSS: Multidimensional Scale of Perceived Social Support; PASS: Perinatal Anxiety Screening Scale; RNT: repetitive negative thinking; RTQ-10: repetitive negative thinking question; BDI: Beck Depression Inventory; IES-R: Impact of Event Scale-Revised; STAI: Spielberger State-Trait Anxiety Inventory; VAS: visual analog scale; SPDQ: Prenatal Distress Questionnaire; HAI 18: health anxiety index-short form; PREPS: Pandemic-Related Pregnancy Stress Scale; GAD-7: generalized anxie-ty disorder-7; PTSD: post-traumatic stress symptoms; BSI-18: Brief Symptom Inventory 18; PDQ: Prenatal Distress Questionnaire; COPE: Coronavirus perinatal experiences; CPSS: Chinese Perceived Stress Scale; EDS: Self-Rating Anxiety Scale; STAI: State-Trait Anxiety Inventory; IES-R: Impact of Events Scale-Revised; DASS-21: Depression, Anxiety and Stress Scale-21; PHQ9: Patient Health Questionnaire; PSS: Perceived Stress Scale; NSESSS: National Stressful Events Survey; CARE: COVID-19 and Reproductive Effects; SAS: Self-Rating Anxiety Scale; IDAS II: the Inventory of Depression and Anxiety Symptoms II; BAI: Beck Anxiety Inventory; BSI-18: Brief Symptom Inventory 18; PRAS: pregnancy-related anxiety scale; SSRS: Social Support Rating Scale; DES-II: Dissociative.

were classified into four major variables: demographic variables, lifestyle variables, physical health, as well as metal and pregnancy-related factors (e.g., pregnancy complication, gestational age, the number of pregnancies maternal age, prenatal care, choose, and type of delivery).

Smoking

In the study by Dagklis et al, the odds ratio for anxiety in pregnant women with a history of smoking was three times higher than that for non-smokers ($P=0.032$) (28).

Maternal Age

The results indicated an association between younger age with higher anxiety (26) and depression level (22,26,31).

Body Mass Index

In the study by Wu et al, women with a BMI less than 18.5 were found to be more vulnerable to the developing depression and anxiety symptoms (22). It was also demonstrated that obese pregnant women might have faced lower risks of depression, stress(21), and anxiety ($P<0.05$) (12,21,22) during the COVID-19 outbreak.

Sleep Quality

According to two studies (19,21), lower sleep quality was associated with higher maternal depression and anxiety.

Physical Health

In the study by Guo et al study, poor physical health was more related to mental health symptoms (31).

Exercise

In the study by Wu et al, women who had exercised less than seven hours faced a relative risk of 1.23 of depression ($P=0.02$) when compared to women who had exercised seven hours or more per week (22). In the study by Gildner et al, participants were asked "has your exercise routine changed at all since the COVID-19 pandemic began?" and their findings showed that changes in exercise behavior during the pandemic was associated with higher depression scores than those reporting no changes (24). Physical activity status were factors related to anxiety ($P<0.05$) (10,15). In the study by Lebel et al, more physical activity decreased the anxiety symptoms (10).

Marital Life Satisfaction

Marital life satisfaction ($P<0.05$) (18) was the predictor of stress, depression (18), and anxiety symptoms (13,18). The IDAS II scores were predicted by the relationship between husband and wife ($P=0.02$) (12).

Fear of the COVID-19 Infection

Fear of contracting the COVID-19 infection ($P<0.001$) and concern about getting infected with COVID-19 from the ultrasound probe ($P<0.001$) may have influenced the prenatal anxiety (30). History of depression ($P=0.06$) predicted the IDAS II scores (12). Husbands and their pregnant wives' fear of COVID-19 may have also influenced depression and anxiety ($P<0.001$) (11). A significant association was detected between previous depression and anxiety and current PTSD symptoms (27).

Social and Family Support

According to Wu et al, perceived poor support from family was significantly associated with a higher perinatal depression (22). Several studies showed that an increase in perceived social support decreased depression and anxiety symptoms (10,18,25). Furthermore, grandparents and spouses' support decreased mental health problem such as anxiety and stress (13, 31).

Pregnancy Complication

Pregnancy complications such as threatened abortion, hyperemesis gravidarum, gestational diabetes mellitus, hypertensive disorder, placental previa, intrahepatic cholestasis of pregnancy, oligohydramnios, and intrauterine growth restriction ($P=0.01$) were found capable of predicting state anxiety (20,29). For example, vaginal bleeding during pregnancy was associated with higher maternal depression, anxiety, and stress risks ($P<0.05$) (21).

Prenatal Care

Access to antenatal care information was associated with a significantly lower risk of perceived stress ($P=0.001$), anxiety ($P<0.001$), and depression ($P=0.005$) (17). Moreover, the lack of informal childcare support and prenatal care was statistically associated with anxiety and depression symptoms ($P<0.001$) (26). According to Moyer et al, discontinued in-person prenatal care and using phone for prenatal care were significantly associated with greater changes in the pregnancy-related anxiety scale (34).

Selection of the Delivery Type

Beheshtinasab et al discovered the relationship of health anxiety and Prenatal Distress with the selection of delivery type before and during the COVID-19 epidemic ($P<0.001$) (14).

Gestational Age

According to results from three studies, mental health problems stress and anxiety were higher at older gestational ages. In the study by Moyer et al, being in the third trimester was significantly associated with greater changes in pregnancy-related anxiety scale (PRAS) scores (34) and "total health anxiety" (16). Stress levels were higher at older gestational ages ($P=0.008$) (18). Contrary to the results from above-mentioned studies, psychological impact of the COVID-19 outbreak was more severe in women in the first trimester of pregnancy(32).

The Number of Pregnancies

The number of pregnancies was significantly associated with anxiety (13,18,23) and depressive disorder (22).

Marriage Status

Being single or divorced/widowed was determined as a factor contributing to increasing the risks associated with anxiety and depression symptoms ($P<0.001$) (26,31).

Financial Difficulties and Household Income

Financial difficulties and household income were statistically associated with mental problem ($P<0.001$) (8,13,18,22,26,35,36,39).

Education Level

Level of education was another variable significantly associated with anxiety disorder (18,23,38,39) and depression (8,22). Higher maternal education was associated with mental health (31). In addition, spouse's education was the predictive factors of anxiety (13,18) depression (18).

Employment Status and Workload

Women not working (RR=1.40; $P=0.001$) or working part-time (RR=1.43; $P<0.01$) had a lower relative risk of depression compared to women working full-time (22, 26). Full-time working was statistically associated with anxiety symptoms ($P<0.05$). Unemployment of women was associated with mental health (31). Employment status of husband ($P=0.04$) (29) and spouse's job ($P<0.05$) were the predictors of anxiety level and depression level, respectively (18).

Household Size

A significant association was observed between prenatal anxiety ($P=0.009$) (30) with household size, stress scores (B=0.0454; 95% CI: 0.0035-0.0873) (37), and number of previous children in the family.

Knowledge Score

Getting information about COVID-19 (15,30) from television (35) and healthcare workers were related to anxiety level ($P<0.05$) (15).

Discussion

Our study showed that a higher educational level was associated with less anxiety and depression problems (18, 22,23,38,39). Mei et al illustrated two aspects of this result. First, a higher educational level was usually correlated with higher family income, which makes pregnant women less worried about the economic foundations as there is an expenditure caused by pregnancy, delivery, and raising the child. Second, women with higher educational levels may have had a better understanding of the pregnancy process, delivery, and raising child and, therefore, responded to emergencies more adequately (21).

Women with a BMI less than 18.5 were likely more vulnerable to developing depression and anxiety symptoms (22). Obese pregnant women might have had lower risks of depression, stress (21), and anxiety ($P<0.05$) (21,22,44) during the COVID-19 outbreak. Findings from another study suggested that maternal pre-pregnancy obesity had a protective effect on mental problems such as anxiety (21). These findings were inconsistent with the results of studies conducted on pregnant women in a period when the COVID-19 pandemic was not prevalent. Bogaerts et al detected a significant increase in anxiety from trimester one to trimester three in obese pregnant women; however, according to them, anxiety remained unchanged during the three trimesters in pregnancy of normal-weight women (42). Three studies included in our systematic review suggested that obese pregnant women may have been vulnerable to comorbid anxiety (12,21,22). Mei et al argued that the differences among the studies regarding the outcomes may have been attributed to the differences among cultures. There is an adage in Chinese "laugh and grow fat", which means that fat people tend to be more broad-minded, or there is a high possibility that broad-minded ones are fat. According to this adage, it may be easier for obese women to accept the emergency of the COVID-19 pandemic and suffer less from anxiety and depression (21).

Results from the study by Dagklis et al showed that female smokers presented significantly higher anxiety levels than pregnant non-smokers (28). The association between smoking and anxiety/depression may also be bidirectional. This necessitates future studies in which different methodologies (e.g., Mendelian randomization) are adopted, allowing the researchers to draw stronger causal inferences.

Several studies showed that the number of pregnancies was significantly associated with anxiety (13,18,22,23) and depressive disorder (22). Contrary to the above-mentioned studies, the study by Mei et al found no significant difference between the number of pregnancies and parity and depression, anxiety and stress (21). In Dagklis et al, no differences were observed in the incidences of anxiety among different parity (nulliparous vs multiparous) after the lockdown in Greece (28).

Beheshtinasab et al (14) revealed that higher health anxiety and prenatal distress significantly increased the probability of selecting cesarean in nulliparous women. It should be noted that the cesarean section increases postpartum anxiety, stress, and depression, which can produce outcomes such as decline in fertility, increase in pregnancy intervals, and increase in labor risk in further pregnancies. Beheshtinasab et al suggested several reasons for the selection of cesarean section during of COVID-19 epidemic including: higher distress in the prenatal period as well as higher concern about the fetus rather than themselves, and fear of injury to baby during attempted vaginal delivery (14).

According to several studies, mental health problems stress and anxiety were significantly associated with gestational ages (16,18,32,34). Contrary to the above-mentioned studies, the study by Dagklis et al discovered no differences among the three trimesters of pregnancy regarding the incidence of anxiety (28). In Beheshtinasab et al study, there was no significant statistical association between gestational age (0.370) and health anxiety or prenatal distress scores (14). In the study by Berthelot et al, multivariate regressions were performed but no significant associations were observed between gestational age and the mood and anxiety symptoms (P=0.72) (39). In Durankuş et al, no significant differences were detected among those with depression and those without it after weeks of pregnancy (8). In Mei et al, there was no significant difference between trimesters (P>0.05) in terms of anxiety, depression or stress rate (21).

Numerous studies reported that females tended to be more prone to developing the symptoms of various forms of mental disorders including depression, anxiety, PTSD, and stress during the pandemic. Greater psychological distress arises in women because they represent a higher percentage of the workforce in areas such as retail, service industry, and healthcare that may be negatively affected by COVID-19. In addition to the disproportionate effects on women caused by the disruption in the employment sector, several lines of research have also indicated that women exhibit differential neurobiological responses when exposed to stressors, perhaps providing the basis for the overall higher rate of select mental disorders in women. The results indicated an association between younger age with higher anxiety (26) and depression level (22,26,31).Contrary to the above-mentioned studies, other study found no significant difference between the incidences of anxiety and maternal age (28).

Conclusion

Clinical, economic, and socio-demographic physical health were found associated with mental health problem during COVID-19. Therefore, it was recommended that potential determining factors should be further explored and identified in order to help protect people against mental health problems.

Conflict of Interests

Authors have no conflict of interest.

Ethical Issues

Not applicable.

Supplementary files

Supplementary file 1 contains Table S1.

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