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Review of Factors Associated with Depression among Pregnant Women during the COVID-19 Pandemic

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Abstract

Purpose: This purpose of the study was to investigate the factors both risk and protective associated with depression among pregnant women during the coronavirus disease (COVID-19) pandemic. **Methods:** A literature search was conducted on July 2022, through PubMed, CINAHL, MEDLINE, CiNii, and the Japan Medical Abstract Society databases, with the keywords "COVID-19", "pregnant women", and "depression". The titles/abstracts were screened based on three selection criteria: 1) inclusion of pregnant women; 2) description of depression; and 3) description of the factors associated with depression among pregnant women during the COVID-19 pandemic. **Results:** Of the 213 articles extracted, 104 were excluded owing to duplication, and 14 were excluded because they comprised other article types, including reviews and commentaries. Finally, 40 were excluded by title, abstract, and full-text screening. Among the 45 articles for a total of 59,329 pregnant women that met the inclusion criteria, the risk factors were "distress from COVID-19-related experiences", "reduced/low income", "unemployment", "anxiety", "history of mental illness", "lack of social support", and "reduced/no exercise". The protective factors "greater/increased social support", "higher education level", "higher resilience", and "healthy lifestyle behaviors" were much less frequently reported than risk factors, and none were reported to be relevant for Japanese pregnant women. **Conclusion:** The findings indicate that preventive interventions should begin during pregnancy with a focus on these risk factors. In addition, the protective factors need to be strengthened. Further research is required to identify the protective factors associated with depression among Japanese pregnant women.

Keywords

COVID-19, Pregnant Women, Depression, Associated Factors

1. Introduction

Pregnant women have been shown to have a more pronounced increase in depressive symptoms during the coronavirus disease (COVID-19) pandemic compared to non-pregnant women [1]. Given pregnant women constitute a vulnerable group, they may be at higher risk of developing depressive symptoms due to anxiety about infection and social isolation.

Luo *et al.* [2], who reviewed 17 pieces of literature published from 2019 to 2021, reported that the risk factors of depression among pregnant women during the COVID-19 pandemic were being undereducated, being unemployed during pregnancy, having a chronic physical illness before pregnancy, a decrease in the perception of general support, difficulties in household finances, disobeying the isolation rules, and smoking during pregnancy. However, the review did not report the protective factors of depression among pregnant women.

Factors contributing to depression among pregnant women during the COVID-19 pandemic, which continued to linger after 2021, are being investigated internationally. During the COVID-19 pandemic in Japan, unplanned pregnancy and a history of psychiatric disorders were reported as factors associated with depression among pregnant women [3], and being 35 years of age or older was reported as a risk factor of depression among COVID-19-positive pregnant women [4]. This study aims to clarify the factors associated with depression among pregnant women during the COVID-19 pandemic that continued in 2022. Furthermore, to the best of our knowledge, no review studies have categorized the factors associated with depression among pregnant women during the COVID-19 pandemic into risk and protective factors; the present study sought to address this gap by investigating these factors separately.

2. Methods

2.1. Data Collection

A literature search was conducted in July 2022 (last search: July 19, 2022) through PubMed, CINAHL, MEDLINE, CiNii, and the Japan Medical Abstract Society. No search period was established, to allow for a broad search of factors related to the COVID-19 pandemic.

The keywords used were "COVID-19", "pregnant women", and "depression"; the word "factors" was not included as a keyword, to enable a broad search of factors associated with the COVID-19 pandemic. Table 1 shows the search terms and formulas for the database and search results.
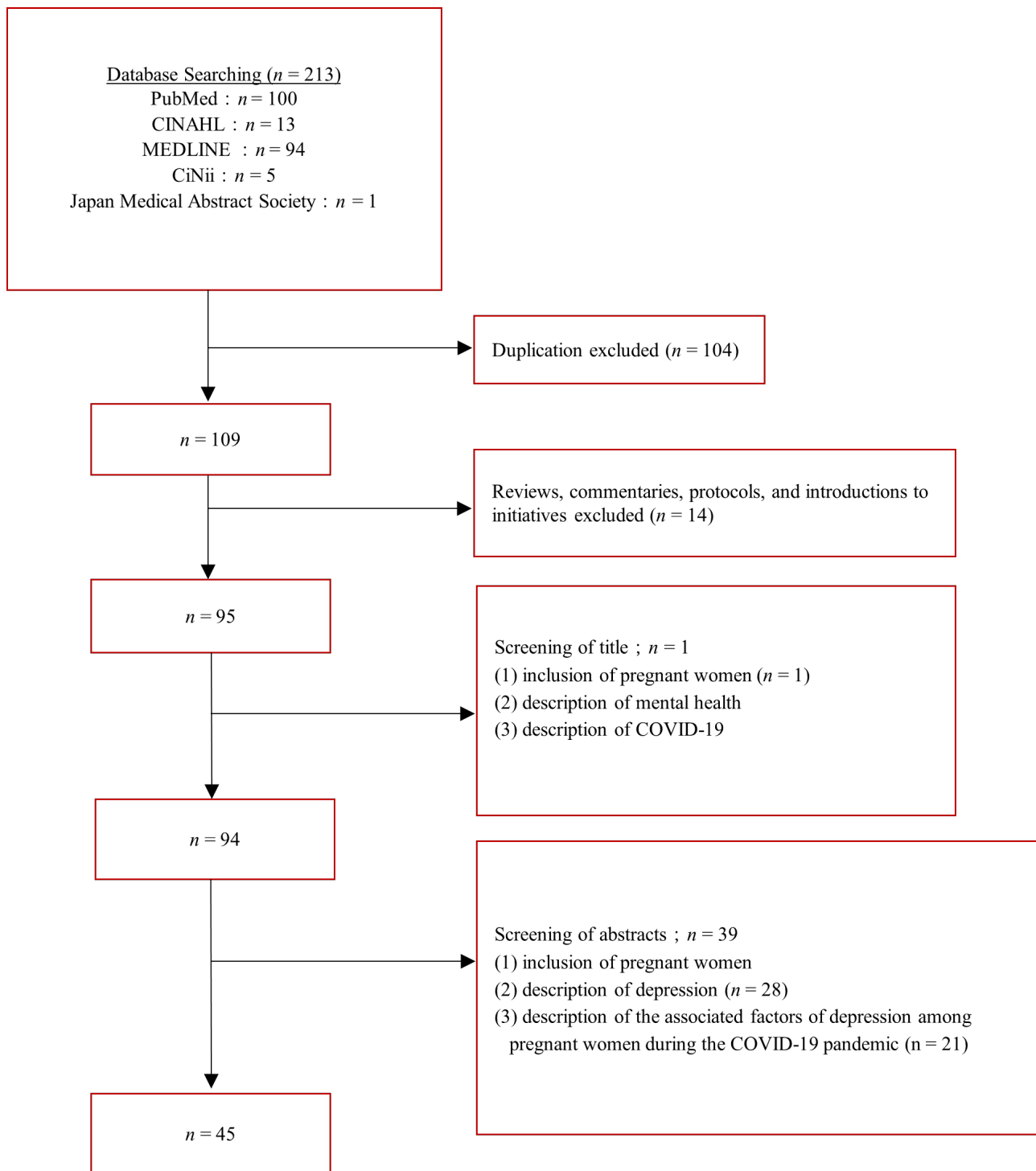
2.2. Inclusion and Exclusion Criteria

The literature selection process for this study is illustrated in Figure 1. The literature search yielded 213 references, of which 104 were excluded due to being duplicates and 14 were excluded due to being reviews, commentaries, protocols, or introductions to initiatives.

Table 1. The search results yielded from the terms and formulas used for the database search.

Database		Search Terms and Formulas	Number of Results	Search Date
PubMed	#1	COVID-19 [MH]	172,767	2022.7.19
	#2	Pregnant Women [MH]	12,492	
	#3	Depression [MH]	245,907	
	#4	#1 and #2 and #3	107	
	#5	(#4) and Abstract, English	100	
CINAHL	#1	MH "COVID-19+"	34,313	2022.7.19
	#2	MH "Expectant Mothers" or Pregnant Women	48,757	
	#3	MH "Depression+"	129,450	
	#4	#1 and #2 and #3	15	
	#5	(#4) and Abstract, English	13	
MEDLINE	#1	MH "COVID-19"	168,669	2022.7.19
	#2	MH "Pregnant Women"	12,380	
	#3	MH "Depression"	141,609	
	#4	#1 and #2 and #3	102	
	#5	(#4) and Abstract, English	94	
CiNii	#1	COVID-19	23,673	2022.7.19
	#2	Pregnant Women	11,087	
	#3	Depression	100,092	
	#4	#1 and #2 and #3	5	
Japan Medical Abstract Society	#1	COVID-19/TH or COVID-19/AL	27,783	2022.7.19
	#2	Pregnant Women/TH or Pregnant Women/AL	44,593	
	#3	Depression/TH	24,330	
	#4	#1 and #2 and #3	5	
	#5	(#4) and (AB = Y)	1	

Note: Abbreviations: MH = Medical Subject Headings; TH = Thesaurus Headings; AL = All Headings.

Title screening was based on three selection criteria: 1) inclusion of pregnant women; 2) description of mental health; and 3) description of COVID-19. Consequently, one article was excluded from the literature because it targeted postpartum mothers rather than pregnant women. Screening of abstracts was also conducted based on three criteria: 1) inclusion of pregnant women; 2) description of depression; and 3) description of the factors associated with depression among pregnant women during the COVID-19 pandemic. This process excluded 40 references that did not include pregnant women ($n = 1$), did not describe depression ($n = 28$), and did not describe the factors associated with depression among pregnant women during the COVID-19 pandemic ($n = 21$). Finally, a total of 45 references were found that met the objectives of this study, all of which were in English.

Database Searching ($n = 213$)
PubMed : $n = 100$
CINAHL : $n = 13$
MEDLINE : $n = 94$
CiNii : $n = 5$
Japan Medical Abstract Society : $n = 1$

Duplication excluded ($n = 104$)

$n = 109$

Reviews, commentaries, protocols, and introductions to initiatives excluded ($n = 14$)

$n = 95$

Screening of title ; $n = 1$
(1) inclusion of pregnant women ($n = 1$)
(2) description of mental health
(3) description of COVID-19

$n = 94$

Screening of abstracts ; $n = 39$
(1) inclusion of pregnant women
(2) description of depression ($n = 28$)
(3) description of the associated factors of depression among pregnant women during the COVID-19 pandemic (n = 21)

$n = 45$

Figure 1. The literature selection process for this study.

2.3. Analysis Method

From the selected literature, we extracted country, sample size, and depression scale used, and factors associated with depression among pregnant women during the COVID-19 pandemic. The identified factors were categorized based on content similarity and further grouped into risk and protective factors for com-

parison.

3. Results

A total of 45 references were selected for a total of 59,329 pregnant women (Table 2). Table 2 shows the summary of the references and associated factors [5]-[49].

Forty-five references described risk factors associated with depression among pregnant women during the COVID-19 pandemic; three of the references were for Japanese pregnant women. Furthermore, 14 references described protective factors; none of the references were for Japanese pregnant.

3.1. Risk Factors of Depression among Pregnant Women during the COVID-19 Pandemic

Table 3 shows the risk factors of depression among pregnant women during the COVID-19 pandemic.

The risk factors were "distress from COVID-19 related experiences", "reduced/low income", "unemployment/joblessness", "anxiety", "history of mental illness", "lack of social support", "reduced/no exercise", "unplanned of pregnancy", "insomnia", "family dysfunction", "concerned/poor of health", "higher stress", and "stressful life event" in 17, eight, six, six, five, five, four, three, three, three, three, two, and two literatures, respectively.

The "distress of COVID-19-related experiences" reported social distancing during the COVID-19 pandemic as a risk factor associated with depressive symptoms [16] [21] and changes in prenatal care due to the pandemic, with approximately 60% of pregnant women cancelling or reducing their medical appointments [29] and 89% not being allowed to be accompanied by a support person (90%). In Japan, about 35% of pregnant women wanted to go to their hometowns to give birth, but more than 30% reported being unable to do so due to safety measures to contain the COVID-19 pandemic [6]. Of the 31.9% who reported high levels of fear of COVID-19 infection [7], in addition to fear of COVID-19 infection, social distance such as travel restrictions and economic recession were reported to be significantly associated with depressive symptoms [12]. In addition, 32.1% and 36.4% of respondents felt that they or their family members were susceptible to COVID-19, respectively [7], and 74.6% and 85.9% of pregnant women were concerned about their own health or the health of their fetus, respectively [34].

There were some conflicting factors regarding income, with eight respondents reporting "decreased/low income", one reporting "middle", and one reporting "higher", but they also reported an increased risk of depressive symptoms as household income decreased [9] [45]. In addition, with respect to employment, there were conflicting reports of six respondents reporting "unemployment/unemployed" versus one respondents reporting "full time". However, it was noted that unemployment increased the probability of depression by 1.4 to

Table 2. Summary of literature and associated factors.

No.	Country	Sample Size	Scale	Associated Factors		References
				Risk Factors	Protective Factors	
1	China	19,515	PHQ-9	●		[5]
2	Japan	4798	EPDS, K6	●		[6]
3	China	4087	PHQ-9	●	★	[7]
4	China	3434	PHQ-9	●		[8]
5	China	3434	PHQ-9	●	★	[9]
6	America	2099	EPDS	●		[10]
7	America	1856	EPDS	●		[11]
8	Japan	1777	EPDS	●		[12]
9	Canada	1764	EPDS	●	★	[13]
10	China	1285	EPDS	●		[14]
11	Canada	1258	K10	●		[15]
12	Australia	1219	EPDS	●	★	[16]
13	Israel	1114	PHQ-2	●	★	[17]
14	Netherlands	1008	EPDS	●		[18]
15	China	751	PHQ-9	●		[19]
16	China	751	PHQ-9	●		[20]
17	America	715	EPDS	●	★	[21]
18	Iran	540	DASS-21	●		[22]
19	China	531	PHQ-9	●	★	[23]
20	America	524	BSI	●	★	[24]
21	Spain	514	EPDS	●	★	[25]
22	Vietnam	513	PHQ-9	●	★	[26]
23	Türkiye	497	EPDS	●		[27]
24	Sweden	470	EPDS	●	★	[28]
25	Iran	437	DASS-21	●		[29]
26	Türkiye	403	HADS	●		[30]
27	Iran	392	BDI	●		[31]
28	Japan	359	EPDS	●		[32]
29	Türkiye	336	BDI	●	★	[33]
30	Türkiye	327	DASS-21	●	★	[34]
31	Iran	318	EPDS	●		[35]
32	Romania	304	HADS	●	★	[36]
33	Türkiye	297	HADS	●		[37]
34	China	274	EPDS	●		[38]

Continued

35	Türkiye	269	BDI	●	[39]
36	Türkiye	260	EPDS, BDI	●	[40]
37	Spain	164	EPDS	●	[41]
38	Türkiye	149	BDI	●	[42]
39	United Kingdom	137	BDI-II	●	[43]
40	Spain	100	SCL-90-R	●	[44]
41	Türkiye	96	BDI	●	[45]
42	Brazil	79	PHQ-9	●	[46]
43	Italy	78	EPDS	●	[47]
44	Türkiye	63	IDAS II	●	[48]
45	America	33	CES-D	●	[49]
		59,329			

Note: Abbreviations: PHQ-9 = Patient Health Questionnaire-9, EPDS = Edinburgh Postnatal Depression Scale, BDI = Beck Depression Inventory, BDI-II = Beck Depression Inventory, HADS = Hospital Anxiety and Depression Scale, CES-D = Center for Epidemiologic Studies Depression Scale, DASS-21 = The Depression Anxiety Stress Scales-21, K6 = Kessler 6 Scale, SCL-90-R = Symptom Checklist-90-R, PHQ-2 = Patient Health Question naire-2, BSI = The Brief Symptom Inventory, IDAS II = Inventory of Depression and Anxiety Symptoms, K10 = Kessler 10 Scale. ● = Risk factors were reported. ★ = Protective factors were reported.

2.7 times [9] [28]. The week of gestation was also different, with four respondents indicating "first trimester/earlier" and three indicating "elevated/third trimester". Furthermore, age differed as well, with four respondents indicating "younger" and three indicating "younger". Educational level was also inconsistent, with "younger/<30 years/<35 years", "26 - 34 years (cared to 17 - 25 years)", and "older (≥35 years)/advanced" appearing in five, one, and two literatures, respectively. Educational level was also inconsistent, with "lower" and "higher" appearing in three and two literatures, respectively. Parity was also inconsistent, with "first/primiparous", "second or more", and "second" appearing in two, one, and one literature, respectively. Furthermore, "weight" was also inconsistent: "higher/obesity" in two and "underweight" in one literature. There was no uniformity.

3.2. Protective Factors of Depression among Pregnant Women during the COVID-19 Pandemic

Table 4 shows the protective factors of depression among pregnant women during the COVID-19 pandemic. The protective factors were reported much less frequently than the risk factors. In addition, there were no reports of protective factors related to Japanese pregnant women. The protective factors were "greater/increased social support" in four cases, "higher education level" in three cases, "higher resilience" in two cases, and "healthy living behaviors" in two cases.

Table 3. Risk factors of depression among pregnant women during the COVID-19 pandemic.

Risk Factors		*n*	References
Distress of COVID-19-related Experiences	Severity	17	[5] [7] [12] [13] [16] [17] [20] [21] [24] [27] [30] [31] [33] [37] [38] [42] [43]
Income	Decreased/Lower/Lost	8	[9] [10] [12] [15] [17] [25] [30] [45]
	Middle	1	[14]
	Higher	1	[24]
Anxiety		6	[18] [24] [27] [37] [38] [40]
Employed	Unemployment/Unemployed	6	[9] [12] [17] [25] [28] [45]
	Full Time	1	[14]
History of Mental Illness		5	[15] [16] [25] [39] [41]
Social Support	Lower/Lack of/Cancellation	5	[12] [41] [45] [46] [49]
Exercise/Physical Activity	Lack of/Decreased/Not Regular	4	[9] [11] [20] [30]
The Week of Gestation	The First Trimester/Earlier	4	[5] [9] [17] [38]
	Elevated/Third Trimester	3	[5] [26] [42]
Age	Younger/<30 Years/<35 Years	4	[5] [12] [14] [20] [25]
	26 - 34 Years (Compared to 17 - 25 Years)	1	[34]
	Older (≥35 Years)/Advanced)	2	[16] [37]
Plan of Pregnancy	Unplanned	3	[9] [25] [46]
Smoking		3	[9] [39] [26]
Sleeping	Insomnia/Poor	3	[19] [20] [44]
Family Function	Dysfunction	3	[9] [13] [48]
Time Spent on the Internet or Social Media	Increased	3	[5] [20] [24]
Health	Concerned/poor	3	[22] [27] [39]
Educational Level	Lower	3	[16] [30] [40]
	Higher	2	[20] [38]
Stress	Higher	2	[16] [17]
Life event	Stressful/Recently Suffered the Loss of a Loved One	2	[28] [44]
High-risk Pregnancy	Having	2	[17] [47]
Pregnancy Complications	Vaginal Bleeding	2	[9] [23]
Partner	Unmarried/Divorced/Widowed	2	[9] [12]
Sexual Function	Low/Sexual Dysfunction	2	[29] [45]
Living	Village/Countryside/Counties	2	[5] [34]
Parity	First/Primiparous	2	[5] [14]
	Second or More	1	[20]
	Second	1	[34]

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Weight	Higher/Obesity	2	[41] [48]
	Underweight	1	[14]
Intimate Partner Violence	Having	1	[7]
PTSD		1	[24]
Sick Family Member	Having	1	[28]
Coping	The Coping Strategy of Avoidance	1	[35]
Attachment to the Unborn Baby	Reduced	1	[43]
Relatives Were Diagnosed with COVID-19	Having	1	[45]
Levels of Loneliness	Higher	1	[49]
Worrying about Their Baby's Health		1	[34]
Health Insurance	Having	1	[20]
	None	1	[22]
Going to Their Hometown for Delivery	Restriction	1	[6]
High Epidemic Regions		1	[6]
Alcohol Consumption	Yes	1	[9]
Hygienic Practices	High	1	[38]
Children	Fewer	1	[17]
	With 1 - 2 (Compared to No Children)	1	[34]
Living Space	Appropriate	1	[14]
Maternity Harassment	Experienced	1	[32]

Table 4. Protective factors of depression among pregnant women during the COVID-19 pandemic.

Protective Factors		*n*	References
Social Support	Greater/Increased	4	[13] [16] [17] [19]
Educational Level	Higher	3	[9] [23] [28]
Resilience	Higher	2	[24] [25]
Lifestyle Behaviors	Eating Healthier	1	[26]
	Healthy	1	[17]
Age	Younger (26 - 30 years)	1	[28]
Adults Working from Home	Many	1	[21]
Appraisal of the Pregnancy	Positive	1	[17]
Coping	Negative Religious Coping	1	[34]
COVID-19 Infection	Without	1	[36]
Health Literacy	Higher	1	[26]
Self-efficacy	Higher	1	[7]
Sleep	Good	1	[24]
Spiritual Well-being Levels	Higher	1	[33]
Weight	Obesity	1	[23]

4. Discussion

In this study, risk factors of depression among pregnant women in the COVID-19 pandemic included "reduced income and low income", "unemployment/ unemployed", "lack of social support", "smoking", and "health: concerned/poor". Luo *et al.* [2] also reported factors such as under-education, difficulties in household finances, unemployment during pregnancy, a decrease in the perception of general support, smoking during pregnancy, and chronic physical illness before pregnancy, which were consistent with our results. In this study, risk factors included "history of mental illness", "unplanned pregnancy", "higher stress", and "stressful life events". Biaggi *et al.* [50] reported previous history of mental illness, lack of partner or social support, unplanned or unwanted pregnancy, stressful life events, and high perceived stress as risk factors of depression in pregnant women before the COVID-19 pandemic, which were similar before and during the pandemic.

The "distress of COVID-19-related experiences" are the various effects of the spread of this infectious disease; COVID-19 related concerns were also significantly higher than social support and work and financial concerns [18], which may have exacerbated depression among pregnant women. Thus, the "distress of COVID-19-related experiences" such as social distance due to the COVID-19 pandemic and fear and anxiety about infection may have contributed to increased depression among pregnant women.

Regarding "reduced/low income" and "unemployment/unemployed", 18.3% to 27.6% of pregnant women reported unemployment due to the COVID-19 pandemic [13] [29], possibly due to worsening work and income status. With regard to "reduced/lack of exercise", 71.6% of pregnant women reported not exercising, and 31.7% sat continuously for 1 - 3 hours per day [9], possibly due to isolation and behavioral restrictions caused by COVID-19 expansion. In addition to the effects of behavioral restrictions, the "time spent on the internet or social media: increased" situation may have arisen due to attempts to obtain information about the infection status. As for "sleeping: insomnia/poor", it was noted that sleep disturbances were more frequent among pregnant women during the pandemic [51], which may be influenced by a lack of exercise due to behavioral restrictions. In addition, anxiety symptoms were lower when more physical activity was performed [13], and there was a high correlation between anxiety and depression in pregnant women during the COVID-19 pandemic [18], which could explain the enhanced depression in pregnant women during the COVID-19 pandemic. As for "family function: dysfunction", family cohesion was impaired and the level of conflict increased during the pandemic [51]; 71.8% of adults in families worked at home because of COVID-19 [29], suggesting a possible negative impact of the increased time spent by pregnant women and their families at home. These findings suggest that the COVID-19 pandemic may have exacerbated the effects of risk factors that had been reported before the pandemic and contributed to the worsening of depression among pregnant women. This sug-

gests the need to focus on pregnant women with risk factors in the early stages of pregnancy and intervene to prevent depression.

While the protective factors were "greater/increased social support" in four cases, "high level of education" in two cases, "high resilience" in two cases, and "healthy lifestyle behaviors" in two cases, these factors were reported much less frequently than risk factors. In addition, since there were no reports of protective factors related to Japanese women, it is necessary to examine protective factors related to depression among Japanese pregnant women to develop preventive interventions in the future.

Among the protective factors, social support and resilience were reported to be protective factors of depression among pregnant women even before the COVID-19 pandemic [50], and the same was true during the COVID-19 pandemic. In addition, social support from partners and family members may be important during the COVID-19 pandemic, as it has been reported that the more adults working from home, the less depression there is among pregnant women [21]. Social and medical health support is also important, as there are reports of increased partner support but decreased social and medical health support compared to pre-pandemic levels [18]. The "education level" was reported to decrease depression with higher levels of education [23] [28], although there were conflicting reports [9]. Higher levels of education are usually correlated with higher family income, a better understanding of pregnancy, childbirth, and children, and being able to better respond to emergencies [23], although more research is needed. As for "healthy lifestyle behaviors", it was considered that during the COVID-19 pandemic, basic lifestyle rhythms such as exercise, eating, and sleep are easily disrupted due to activity restrictions such as refraining from unnecessary outings, and that leading a healthy lifestyle is an important point for the prevention of depression in pregnant women. Therefore, these protective factors, including the sufficiency of social support and healthy lifestyle behaviors, need to be strengthened by nursing intervention to prevent depression in pregnant women.

This study examined the factors associated with depression among pregnant women during the COVID-19 pandemic; however, a meta-analysis was not conducted. Therefore, a limitation of this study is that we were not able to take into account the strength of the impact of the associated factors on depression.

5. Conclusions

Among the 45 included studies on 59,329 pregnant women, an investigation of the factors associated with depression classified as risk and protective factors in pregnant women during the COVID-19 pandemic revealed the following.

1) The risk factors were "distress from COVID-19-related experiences", "reduced/low income", "unemployment", "anxiety", "history of mental illness", "lack of social support", and "reduced/no exercise". Focusing on these risk factors, preventive interventions beginning in the early stages of pregnancy are recommended.

2) The protective factors were "greater/increased social support", "higher education level", "higher resilience", and "healthy lifestyle behaviors". These protective factors need to be strengthened to prevent depression in pregnant women. Protective factors associated with depression among Japanese pregnant women have not been identified, and more research is needed.

Acknowledgements

Complement

This study was partially presented at the 26th East Asia Forum of Nursing Scholars Secretariat 2023.

Conflicts of Interest

The authors declare that there are no conflicts of interest to be disclosed for this research.

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