

Supplementary material

Supplementary Material 1 English version of the survey relevant to this manuscript

Supplementary Material 2 Recruitment tools utilized and internet penetration rates

Supplementary Material 3 Overview of the infection and vaccination rates in each country during the study period 10 June and 22 August 2021

Supplementary Table 1 Overview of prior European studies describing mental health in pregnant or postpartum women during the COVID-19 pandemic

Supplementary Table 2 Comparison between the general birthing population and the study sample of pregnant and postpartum women in each country

Supplementary Table 3 Representative statements to the open-ended questions regarding mental health and well-being

Supplementary Figure 1 Distribution of the scores on the scales (EDS & GAD-7) in pregnancy and postpartum women

Supplementary Material 1: English version of the survey relevant to this manuscript**Pregnancy-specific**

1. How many weeks pregnant are you right now? (dropdown menu: 0-42)
2. Was the pregnancy planned?
 - a. Yes
 - b. No
 - c. No, but it was not unexpected
3. Have you been pregnant before?
 - a. Yes
 - b. No
4. If yes to Q3: How many children do you already have (not including the current pregnancy)?

Postpartum-specific

5. Please indicate the age of your baby.
 - a. 6 weeks
 - b. Between 6 weeks and 12 weeks
6. Are you currently breastfeeding and/or giving expressed milk?
 - a. Yes
 - b. No
7. Did you ever breastfeed / give expressed milk before the coronavirus outbreak?
 - a. Yes
 - b. No

If currently not breastfeeding:

8. Did you breastfeed your baby and/or give expressed milk during the last three months?
 - a. Yes
 - b. No
9. If yes to Q8: Did you stop breastfeeding and/or giving expressed milk due to the coronavirus pandemic?
 - a. Yes
 - b. No

Coronavirus infection

In this section, you will be asked whether you and members of your household / close family have been infected with the new coronavirus and how it was diagnosed.

10. Did you have a positive test for coronavirus infection?

- a. Yes
- b. No

11. If no to Q10: Do you believe you were infected with the coronavirus although not confirmed by a test?

- a. Yes
- b. No

12. Has any member(s) of your household or close family tested positive for the coronavirus since the start of the pandemic?

- a. Yes
- b. No

Covid-19 and disease severity

In this section, you will be asked how COVID-19 affected you and the members of your household / family personally.

13. In what way do/did your symptoms due to COVID-19 influence your normal functioning?

- a. No influence at all
- b. Limited influence
- c. Rather large influence
- d. Very large influence

Covid-19 and pregnancy

In this section you will be asked about your perception about COVID-19 disease severity during pregnancy.

14. Do you believe coronavirus infection can be more severe during pregnancy than among non-pregnant women of the same age?

- a. Yes
- b. No

Coronavirus and your wellbeing

15. In this section, you will be asked about the impact of COVID-19 pandemic on your mental health and wellbeing.

	Not at all anxious	Slightly anxious	Anxious	Very anxious	Extremely anxious	Not applicable
a. Disrupted antenatal appointments						
b. Lack of information or inconsistent information from healthcare professionals						

c. Isolation						
d. Lack of antenatal classes						
e. The thought of not having my partner/ birth partner with me during birth						
f. The thought of my partner having to leave the hospital soon after birth						
g. The thought of being separated from my baby after delivery						
h. Not having support from family and friends						

16. We would like to know how you are feeling. Please indicate the answer, which comes closest to how you have felt in the past 7 days, not just how you feel today.

In this section of the questionnaire - the Edinburgh Postnatal Depression Scale (EPDS) was presented (Cox J, Holden J, Sagovsky R. Detection of postnatal depression. Development of the 10-item edinburgh postnatal depression scale. *The British Journal of Psychiatry*. 1987 June 1, 1987;150(6):782-6).

17. Please indicate the answer which comes closest to how you have felt in the past 14 days. Over the last 14 days, how often have you been bothered by the following problems?

In this section of the questionnaire - Generalized Anxiety Disorder 7-item scale (GAD-7) was presented (Spitzer RL, Kroenke K, Williams JBW, Löwe B. A Brief Measure for Assessing Generalized Anxiety Disorder: The GAD-7. *Archives of Internal Medicine*. 2006;166(10):1092-7).

18. Please indicate for which chronic illnesses you have used a medication in the past 3 months? (i.e., chronic illnesses are conditions that already existed before your pregnancy/postpartum) (multiple answers possible)?

- a. Asthma
- b. Allergy
- c. Cardiovascular disease (e.g., high blood pressure, high cholesterol, heart disease, etc.)
- d. Depression
- e. Diabetes
- f. Epilepsy
- g. Hypothyroidism (underactive thyroid)
- h. Rheumatic diseases (including rheumatoid arthritis, psoriatic arthritis, etc.)
- i. Inflammatory bowel disease (including Crohn's disease, Ulcerative colitis, etc.)
- j. Anxiety
- k. Other:
- l. None of the above

Personal background

In this final section, you will be asked a few questions about yourself as a participant of this study.

19. Year of birth? (Dropdown menu)

20. Where do you live? (country-specific adaption is needed for this question)

21. Do you currently have a partner?

- a. Yes
- b. No

22. Did you smoke before you got pregnant?

- a. Yes
- b. No

23. Have you smoked since you found out you were pregnant?

- a. Yes
- b. No

24. What is your highest level of education?

- a. Primary education
- b. Professional secondary education
- c. Technical secondary education
- d. Artistic secondary education
- e. General secondary education
- f. Professional bachelor
- g. Academic bachelor
- h. Master
- i. PhD
- j. Other:

25. What is your current professional status? (if you are currently not working because of pregnancy complications or maternity leave, please fill in the professional status you had before)

- a. Employee
Are/were you working in healthcare?
Does your employment put you at increased risk of catching COVID-19 ?
- b. Self-employed
Are/were you working in healthcare?
Does your employment put you at increased risk of catching COVID-19 ?
- c. Civil service employee
Are/were you working in healthcare?
Does your employment put you at increased risk of catching COVID-19 ?
- d. Student

- Are you following an education in healthcare?
- e. Homemaker
 - f. Jobseeker/unemployed
 - g. Incapacitated/disabled
 - h. Other:
- Are/were you working in healthcare?
- Does your employment put you at increased risk of catching COVID-19 ?

26. Finally, the coronavirus pandemic affected many people in many different ways, both negatively and/or positively. Please share any of your personal experiences or anything that has changed in your life due to the pandemic (optional question).

Supplementary Material 2 Recruitment tools utilized and internet penetration rates

Country	Websites used for recruitment	Internet penetration rates (%)
Norway	www.altformamma.no (i.e. pregnancy website); several Facebook sites (e.g., Facebook: Gravid i coronatider); pregnancy forums (e.g., Facebook: Termin september 2020); mobile application (Helseappen).	99.0 ¹
Belgium	www.gezondzwangerworden.be ; several Facebook sites and websites of perinatal organizations, midwives, lactation consultants, pharmacies	96.0 ²
Switzerland	www.letsfamily.ch ; www.chuv.ch ; www.swissmom.ch ; www.medela.ch ; several Facebook and Twitter pages; pregnancy forums	95.0 ³
The Netherlands	www.consumentenbond.nl ; www.24baby.nl ; several Facebook sites (e.g., ik ben zwanger, kindje klein); website for midwives (www.deverloeskundige.nl); Lareb website (www.lareb.nl and www.lareb.nl/tis-knowledge).	94.2 ⁴
UK	www.medicinesinpregnancy.org (i.e. the UKTIS patient facing website); Twitter (UKTIS account); Facebook (local maternity/mother and baby groups).	99.3 ⁵

Sources of internet penetration rates: ¹ Statistics Norway (<https://www.ssb.no/en>); ² Statistics Flanders, Belgium (www.statistiekvlaanderen.be); ³ Statistics Switzerland (www.bfs.admin.ch); ⁴ Statistics Netherlands (www.statistica.com); ⁵ Statistics UK (<https://www.ons.gov.uk>)

Supplementary Material 3 Overview of the infection and vaccination rates in each country during the study period 10 June and 22 August 2021

Country	Data collection time period (2021)	First reported COVID-19 case / death (2020)	Infection rates as inhabitants infected/day (July 1st 2021)	Percentage of the population (>18 years) with one vaccination dose (1 dose/ 2 doses) (July 1st 2021)
Norway	01.07 to 24.07	26 Feb/12 Mar	192	51% / 29%
Belgium	10.06 to 18.07	04 Feb/11 Mar	670	64% / 44%
Switzerland	14.06 to 22.08	27 Feb/6 Mar	172	51% / 37%
The Netherlands	11.06 to 18.07	27 Feb/6 Mar	1044	72% / 41%
UK	14.06 to 30.07	31 Jan/5 Mar	26527	85% / 63%

Supplementary Table 1 Overview of prior European studies describing mental health in pregnant or postpartum women during the COVID-19 pandemic.

Study & Country	Data collection	Pregnancy/ Postpartum (N)	Measures	Main Findings
Ceulemans et al.(1) Belgium	Online survey, April, 2020	n = 5866 Pregnant, n = 2421 PP, n = 3445	EDS (Score \geq 10, Score \geq 13, Score \geq 5), GAD-7 (Minimal 0-4, Mild 5-9, Moderate 10-14, Severe 15-21)	25.3% and 23.6% of pregnant and PP women reported depressive symptoms. 14% of all participating women met criteria for high Anxiety.
Ceulemans et al.(2) Multi-national	Online survey, 6 June - 14 July, 2020	n = 9041 Pregnant, n = 3907 PP, n = 5134	EDS (Score \geq 10, Score \geq 13, Score \geq 5), GAD-7 (Minimal 0-4, Mild 5-9, Moderate 10-14, Severe 15-21); PAS	15% and 13% of pregnant and PP women reported major depressive symptoms. 11% and 10% of pregnant and PP women reported moderate to severe generalized anxiety symptoms.
Lubian-Lopez et al.(3) Spain	Prenatal clinics & online survey, 15 April – 14 May, 2020	Pregnant, n = 454 GA: 26.10 (M) \pm 8.7 (SD) weeks	EDS (Score > 10), STAI, CD-RISC-10	35.9% of pregnant women showed depressive symptoms and 45.6% had anxiety symptoms.
Molgora & Accordini(4) Italy	Social media, 1 March – 3 May, 2020	n = 575 Pregnant, n = 389 PP, n = 186	EDS, State-Trait Anxiety Inventory–STAI, Y form, Wijma Delivery Expectancy Questionnaire–WDEQ (A & B), PPQ	60% of pregnant and 57.7% of PP women reported clinically significant state anxiety. 34.2% of pregnant and 26.3% of PP women reported clinically significant depression. 16.7% of postpartum women reported PTSD. <i>Risk factors:</i> lack of presence and social support from partner during delivery and early postpartum
Ostacoli et al.(5) Italy	1 hospital & online survey, 8 March – 15 June, 2020	PP, n = 163	EDS (Score < 11, Score \geq 11), RQ, IES - R	44.2% of PP women reported depressive symptoms and 42.9% reported PTSD symptoms. <i>Risk factors:</i> dismissive and fearful avoidant attachment, and perceived pain during

				birth. <i>Protective factors</i> : perceived support by healthcare staff and quietness due to lack of visitors
Ravaldi & Vannacci (6) Italy	Social media, March –May, 2020	N = 2448 Pregnant, n= 1307 PP, n= 1141	COVID-ASSESS questionnaire	45.7% of pregnant and PP women had personal experience of psychopathology, and 46.9% had family history of psychopathology
López-Morales et al. (7) Argentina	Online survey, 22 March - 10 May, 2020	Pregnant, n = 204	Beck Depression Inventory-II, State-Trait Anxiety Inventory	32.7% of pregnant women registered clinical indicators of moderate and severe depression (vs. 10% in the control group).
Grumi et al. (8) Italy	8 hospitals, 15 May - 28 December, 2020	PP, n = 281	Emotional stress questionnaire	26% of the PP women reported depressive symptoms and 32% reported anxious symptoms
Overbeck et al. (9) Denmark	Online questionnaires, 8 April - 6 May, 2020	Pregnant, n = 330	MDI, ASS	No change in depression; Higher levels of general anxiety

PP: postpartum. GA, gestational age; M, mean; SD, standard deviation; Med, median; R, range; PTSD, post-traumatic stress disorder; EDS, Edinburgh Depression Scale; GAD-7, the Generalized Anxiety Disorder 7-item Scale; STAI, State-Trait Anxiety Inventory, CD-RISC-10, the Connor-Davidson Resilience 10-items Scale; WDEQ, Wijma Delivery Expectancy Questionnaire; PPQ, Perinatal PTSD Questionnaire; RQ, Relationship Questionnaire, IES-R, Impact of Event Scale-Revised; MDI, Major Depression Inventory; ASS, Anxiety Symptom Scale; NR, not reported.

Supplementary Table 2 Comparison between the general birthing population and the study sample of pregnant and postpartum women for each country

	BELGIUM			NORWAY			THE NETHERLANDS			SWITZERLAND			UK		
	General ^a	Preg (n=360)	PP (n=235)	General ^b	Preg (n=2376)	PP (n=1113)	General ^c	Preg (n=175)	PP (n=155)	General ^d	Preg (n=210)	PP (n=176)	General ^e	Preg (n=290)	PP (n=120)
Maternal age (years)															
18-25	10.0	2.2	3.0	8.4	8.2	7.5	8.3	5.1	0.0	7.5	0.5	0.6	22.7	3.8	2.5
26-30	33.7	33.6	25.1	30.7	38.8	40.0	29.3	19.4	20.0	26.4	15.2	14.2	28.6	14.1	17.5
31-35	38.1	37.5	40.0	38.4	39.1	39.6	39.9	30.3	33.5	39.9	36.2	37.5	29.4	37.6	25.8
36-40	14.8	5.6	7.7	18.3	12.2	11.0	18.9	9.7	14.2	21.8	19.0	19.3	15.7	13.1	14.2
> 40	3.4	1.1	1.3	4.1	1.7	2.0	3.7	3.4	4.5	4.4	4.3	4.5	3.6	3.1	3.3
Relationship status															
Partner	81.5	79.2	74.9	94.2	97.9	98.7	91.0	66.3	71.6	83.2	75.2	75.6	94.8	71.4	63.3
No partner	19.5	0.8	2.1	5.8	2.1	1.3	9.0	1.7	0.6	16.8	0.0	0.6	5.2	0.3	0.0
Professional status															
Professionally active	75.3	76.1	71.5	76.5	87.4	87.8	82.0	62.9	67.1	82.5	69.0	67.6	72.8	66.6	51.7
Education level															
Low	12.0	0.6	0.0	24.0	2.9	2.2	10.7	1.1	3.9	42.7	0.5	0.6	45.7	0.70	2.5
Medium	40.0	11.7	12.3	36.2	17.0	17.3	33.8	16.6	10.3	12.0	17.6	19.9	18.6	10.0	15.0
High	48.0	67.5	64.3	39.8	80.3	80.6	53.6	49.7	58.1	45.3	48.6	49.4	30.4	61.0	45.0
Smoking in pregnancy/ breastfeeding**															
Yes	6.0	1.4	3.0	2.4/1.4 ^f	0.8	1.2	7.4	2.3	1.3	7.0	4.3	3.4	12.4	1.7	2.5
No	94.0	78.6	74.0	97.6/98.6 ^f	99.2	98.8	92.6	65.7	71.0	93.0	71.0	72.7	87.6	70.0	60.8

Preg = pregnant; PP = postpartum. Data are presented as %. N/A = not available. Numbers may not add up due to missing values. ^a**BELGIUM:** Statistics for the general birthing population were retrieved from Statbel (education level (25-44 years, 2019); professional status (25-49 years, 2016)), SPE (maternal age, 2020) and Sexpert (relationship status (18-39 years, 2013)). Age categories reported in the perinatal statistics report differ slightly from those reported in the table: <25 years, 25-29, 30-34, 35-39, >40. Smoking in pregnancy/breastfeeding has been estimated in the publication with PMID 31342605. ^b**NORWAY:** Statistics for the general birthing population in Norway were retrieved from the Medical Birth Registry of Norway in 2020 (age, relationship status, parity and smoking) (<http://statistikkbank.fhi.no/mfr/>). Official statistics from the Norwegian Medical Birth Registry have a slightly different age categorization; 18 to 24 years, 25 to 29 years, 30 to 34 years, 35 to 39 years, 40 to 44 years. Numbers reported follow this categorization. Statistics on educational level (women aged 16 years and older) were retrieved from from Statistics Norway in 2020 (<https://www.ssb.no/en/utdanning/utdanningsniva/statistikk/befolkningens-utdanningsniva>); Low = below upper secondary education; Medium = upper secondary education & vocational education; High = higher education. Statistics on professional status (women aged 25 – 39 years) were retrieved from Eurostat statistics (<https://ec.europa.eu/eurostat/>). ^c**THE NETHERLANDS:** Statistics for the general birthing population in the Netherlands were retrieved from Perined, the perinatal registry of the Netherlands (data for 2019) (maternal age, parity), from CBS StatLine, general statistics Netherlands (data for 2020) (education level, professional status and relationship status (2017)); and from Trimbose Institute for mental health (data for 2018) (smoking in pregnancy). ^d**SWITZERLAND:** Statistics for the general birthing population in Switzerland were retrieved from the Federal Statistical Office (FSO) in 2020 for maternal age, relationship status (aged 25-44 years), professional status (aged 25-54 years), education level (aged 25-34 years) and 2018 for parity (aged 25-44 years) (<https://www.bfs.admin.ch>). Smoking in pregnancy in

Switzerland has been monitored on behalf of FSO between 2011 and 2016 (<https://www.infoset.ch/fr/tabac.html>). **UK:** Statistics for the general birthing population are retrieved from various datasets provided by: (i) the Office of National Statistics including Conception Statistics for England and Wales (maternal age and relationship status – data from 2018), Labour Market Statistics (educational attainment in men and women aged 16-49 – data from 2011, and professional status in women aged 16-64 – data from Jan to Jun 2020) and Adult Smoking Habits in England (women aged 16-49 – data from 2019); (ii) NHS Digital Hospital Episode Statistics NHS Maternity Statistics (smoking at booking appointment – data from 2018-19); and (iii) population-based published estimates (maternal parity – PMID: 30464639). ^fstart of pregnancy / end of pregnancy. Missing data: Belgium (23.0%), Switzerland (23.9% - 24.4%), The Netherlands (27.7%), The UK (36.7% - 43.3%).

Supplementary Table 3 Representative statements to the open-ended questions regarding mental health

“I have been more isolated. This has affected my mental health challenges, such as anxiety and depression. Working from home has been hard.”

– *Norway*

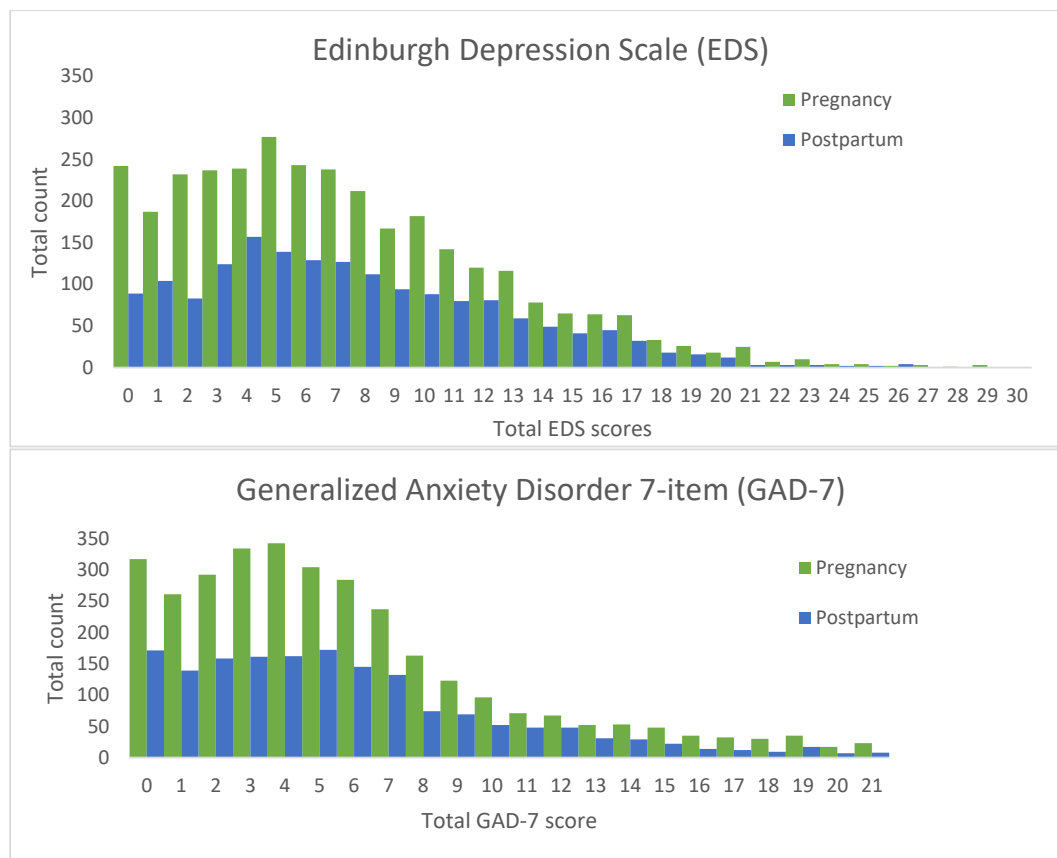
“The pandemic has affected me negatively; I felt very isolated and developed anxiety and fear of contamination.” – *The Netherlands*

“A lot of fear, sometimes more conflict with family and in-laws. Working from home also created more rest during pregnancy and fewer obligations.” – *Belgium*

“I was very scared at first. I got panic attacks, and I just wanted to isolate. Gradually, I have gotten used to a new sort of normal during the last year. I am not that scared anymore, but I have narrowed down the number of people I spend time with.” – *Norway*

“Being pregnant during the COVID-19 pandemic is mentally tough (few moments you can share, combination work and household without support of the family, pregnancy follow-up and childbirth without full support of social network...)” – *Belgium*

“The hardest part was to attend IVF consults on my own. The OFSP (Federal Office of Public Health) should have allowed these steps to be carried out together; a child is not done only with a mother.” – *Switzerland*

Supplementary Figure 1 Distribution of the scores on the scales (EDS & GAD-7) in pregnancy and postpartum women

EDS total scores range from 0 to 30, with score of ≥ 13 as a cut-off for symptoms of severe depression. GAD-7 total scores range from 0 to 21. No recommended cut-off is available. Missing data: EDS <6%, GAD-7 7%.

References

1. Ceulemans M, Hompes T, Foulon V. Mental health status of pregnant and breastfeeding women during the COVID-19 pandemic: A call for action. *International Journal of Gynecology & Obstetrics*. 2020;151(1):146-7.
2. Ceulemans M, Foulon V, Ngo E, Panchaud A, Winterfeld U, Pomar L, et al. Mental health status of pregnant and breastfeeding women during the COVID-19 pandemic—A multinational cross-sectional study. *Acta Obstetrica et Gynecologica Scandinavica*. 2021;100(7):1219-29.
3. Lubián López DM, Butrón Hinojo CA, Arjona Bernal JE, Fasero Laiz M, Alcolea Santiago J, Guerra Vilches V, et al. Mood disorders and resilience during the first COVID-19 pandemic wave in Spain: Conclusions of the first Spanish survey. *J Psychosom Res*. 2021;140:110327.
4. Molgora S, Accordini M. Motherhood in the Time of Coronavirus: The Impact of the Pandemic Emergency on Expectant and Postpartum Women's Psychological Well-Being. *Front Psychol*. 2020;11:567155.
5. Ostacoli L, Cosma S, Bevilacqua F, Berchiolla P, Bovetti M, Carosso AR, et al. Psychosocial factors associated with postpartum psychological distress during the Covid-19 pandemic: a cross-sectional study. *BMC Pregnancy Childbirth*. 2020;20(1):703.
6. Ravaldi C, Vannacci A. The COVID-ASSESS dataset - COVID19 related anxiety and stress in prEgnancy, poSt-partum and breaStfeeding during lockdown in Italy. *Data Brief*. 2020;33:106440.
7. López-Morales H, del Valle MV, Canet-Juric L, Andrés ML, Galli JI, Poó F, et al. Mental health of pregnant women during the COVID-19 pandemic: A longitudinal study. *Psychiatry Research*. 2021;295:113567.
8. Grumi S, Provenzi L, Accorsi P, Biasucci G, Cavallini A, Decembrino L, et al. Depression and Anxiety in Mothers Who Were Pregnant During the COVID-19 Outbreak in Northern Italy: The Role of Pandemic-Related Emotional Stress and Perceived Social Support. *Frontiers in Psychiatry*. 2021;12.
9. Overbeck G, Rasmussen IS, Siersma V, Andersen JH, Kragstrup J, Wilson P, et al. Depression and anxiety symptoms in pregnant women in Denmark during COVID-19. *Scand J Public Health*. 2021;49(7):721-9.