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# Impact of COVID-19 pandemic on mental health of pregnant women: An observational study

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## Preface

This study was conducted to see if there might be an increase in mental health issues among pregnant women during the COVID-19 pandemic.

We were interested in women's health research and our supervisor Ganesh Acharya had the idea to do a study about pregnant women's mental health during the pandemic. After some brainstorming about the hypothesis, design, methodology, and discussing the feasibility of participant recruitment with relevant professionals, such as midwives and doctors working in the antenatal clinics, and consumer driven patient support organization, "*Landsforeningen 1001 dager*", we decided to perform this perspective study in Norway.

Our team consists of medical students Karine Stiberg Birkelund and Solrun Stiberg Rasmussen, our main supervisor Prof. Ganesh Acharya (Senior Consultant Obstetrician & Gynaecologist) and our co-supervisor Simone Eliane Schwank, PhD (Psychologist and Post-doctoral Fellow in Perinatal Mental Health). The project required no funding.

The team members contribution:

**Students:** Project development, drafting the proposal, drafting the survey questionnaires, information for research participants and consent form, deciding on outcomes measures and preparing the forms to collect survey and outcome data, helping the main supervisor to apply for ethical approval and TSD approval, data collection, data analyses, literature search and reference management, interpretation of results, drafting the report (thesis).

**Co-supervisor:** Significantly contributed to project development, choosing the study tools and instruments for survey, deciding on outcome measures to be collected and preparing the forms to collect survey and outcome data. Helped with the interpretation of results, reviewed critically and provided comments on the draft of the thesis.

**Main supervisor:** Study idea, hypothesis generation, choosing the study tools and instruments for survey, applying and obtaining ethical approval, project management and data management, instructing students on research methodology, providing analysis tools,

support and supervision throughout the project, revision of the thesis draft and final approval.

We would like to thank our supervisors as this study would not have been possible without them. We would also like to thank all the pregnant women willing to participate in our study, and everyone who helped us along the way. We are so grateful for the amazing response we received. An extra thank you to "*Tromsø ultralyd for gravide*", who helped us a lot with recruitment of participants.

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## Abstract

**Background:** COVID-19 pandemic has spread rapidly throughout the world, with a high number of infected and deaths. It has undoubtedly made a huge impact on people's lives, especially those more vulnerable.

**Aim:** The aim of this study was to explore the mental health of pregnant women in Norway during the COVID-19 pandemic.

**Method:** An online questionnaire in "*Nettskjema*" was spread through social media and midwife clinics. Important background information was collected, as well as self-reported impact of the pandemic on health and well-being. To assess mental health, two validated self-reporting questionnaires for depression and anxiety were incorporated; the Edinburgh Postpartum Depression Scale (EPDS) and the Generalized Anxiety Disorder - 7 item Scale (GAD-7).

**Results:** In total, 774 pregnant women were included. Participants had a median age of 25 (range 19 to 44) years, 53.5% were primiparous, 67.7% had a university degree, 35.4% worked in the healthcare system and 3.5% belonged to a minority group. The proportion scoring 13 or above on EPDS (indicative of depression) was 14.3% (n=111) while 21.4% (n=166) received a score of 10 or above on GAD-7 (indicative of anxiety). Risk factors for anxiety and depression found in this study are age under 25 years, lower education levels, belonging to a minority group and working outside the healthcare system. No difference between geographical regions in Norway was found. The women were more worried about the health of their child than themselves, and many isolated themselves to avoid infection.

**Conclusion:** The prevalence of anxiety and depression in the Norwegian pregnant population appears to be higher during the COVID-19 pandemic than before, but lower than what has been reported from other countries.

## Abbreviations

**BMJ** - British Medical Journal

**CI** - Confidence interval

**COVID-19** - Coronavirus disease 2019

**DSM-IV** - Diagnostic and Statistical Manual of Mental Disorders -IV

**EPDS** - Edinburgh Postnatal Depression Scale

**GAD-7** - Generalized Anxiety Disorder-7

**HADS** - Hospital Anxiety and Depression Scale

**HSCL** - Hopkins Symptom Checklist

**IBM SPSS** - software platform offering advanced statistical analysis

**MADRS** - Montgomery and Åsberg Depression Rating Scale

**MERS** - Middle East Respiratory Syndrome

**NIPH** - National Institute of Public Health

**NEL** - Norsk Elektronisk Legehåndbok

**NSD** - Norwegian Centre for Research Data

**PHQ-9** - Patient Health Questionnaire

**REK** - Regional committees for medical and health research ethics

**SARS** - Severe Acute Respiratory Syndrome

**SARS-CoV-2**: Severe Acute Respiratory Syndrome Coronavirus 2

**SSAI** - Spielberger State-Anxiety Inventory

**STAI** - State and Trait Anxiety Score

**TSD** - Services for sensitive data

**UiO** - University of Oslo

**WHO** - World Health Organization

# 1 Introduction

Mental health disorders is an increasing political, economic, and healthcare issue that account for a large portion of the society's non-fatal health loss. According to the *Norwegian Institute of Public Health* (NIPH) about 16-22% of the adult population suffer from a mental disorder over the course of a year (1). The most common among adults being depression, anxiety disorders, and substance use disorders (1). Depressive disorders account for about 10% (1) and are characterized by: loss of interest and enjoyment, reduced energy and depressed mood leading to reduced activity (2). A depressive episode can be categorized as mild, moderate or severe depending on the number and severity of the symptoms (2). About 15% of the Norwegian population will experience an anxiety disorder during the course of a year (1). This includes generalized anxiety disorder, phobias and panic disorder, all of which can cause great disability and difficulty in life. Many with a mental disorder will, over the course of a year, experience more than one disorder (3), and the comorbidity between anxiety and depression is especially strong (4). The reason why someone develops a mental disorder is unknown, but it is thought to be a mixture of genetic, socioeconomic, and environmental factors (1).

## 1.1 Antenatal mental health

Pregnancy, labour, and the postpartum period are critical periods where mental health issues can appear, and pre-existing psychological disorders may worsen. Antenatally and perinatally depression is also one of the most common disorders affecting approximately 10-15% of pregnant and postpartum women (5, 6). Studies report a wide range of prevalence of depression during pregnancy (5-20%), depending on the diagnostic tools used (7).

The prevalence of anxiety in pregnancy around 15%, which is similar to the rest of the population, but symptoms may worsen during pregnancy (8). An incidence of 7.3% for anxiety in pregnancy in a group with no prior anxiety or depression was found in a German study (9). A major risk factor for both anxiety and depression was previous episodes of



mental disorder. When including these women the absolute number of pregnant women living with anxiety or depression becomes even higher (9).

Both depression and anxiety are associated with adverse pregnancy outcomes. A systematic review and meta-analysis found that maternal depression was associated with preterm labour and less breastfeeding initiation, both of which can potentially increase the risk of ill-health and disease for the child later in life (10). Additionally, according to the *Norwegian Obstetric Guidelines*, maternal depression may increase the risk of bad nutrition, alcohol use or other drug use, not attending antenatal care appointments, and self-destructive behaviour (8), which again may affect perinatal outcomes. Anxiety in pregnancy has been associated with both short-term and long-term effect. Some of the consequences for the child may be lower birth weight and height, impaired mental development, emotional distress and diseases such as rash and asthma both as children and as adults (11).

Whether or not the prevalence is higher in the pregnant population than in the rest of society, the number of pregnant and postnatal women experiencing a mental illness is high. Early diagnosis is important to treat adequately and thereby avoid severe consequences for both mother and child. There are several screening tools that can be used to help identify women at risk for mental illness. Two such validated tools are the Edinburgh Postpartum Depression Scale (EPDS) and Generalized Anxiety Disorder 7-item Scale (GAD-7).

### **1.1.1 Edinburgh Postpartum Depression Scale**

The EPDS is a widely used screening tool for detecting postpartum and perinatal depression. It was developed by Cox, Holden and Sagovsky, it consists of ten questions, and can be answered by the pregnant women themselves in about five minutes, giving a score between 0-30 (12). The questions regard symptoms of depression in the past seven days, and each answer gives a score from 0 to 3. According to the developers, a total score of 12 points or more is an indication for further assessment by healthcare professionals (13). Different institutions use the screening tool differently. *The Australian Centre of Perinatal Excellence* use the cutoff 13 and above as a need for follow-up (14), while the *Norwegian electronic medical encyclopaedia* (NEL) recommends using 10 points as cutoff (15). The questionnaire

can be used for screening for perinatal depression (postpartum as well as antenatally), but it is important to remember that it is not a diagnostic tool (12).

The EPDS has been translated and validated for use in many countries. A study done by Eberhard-Gran et al. validated the EPDS scale against the diagnostic criteria, Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV), for major depression and looked at the correlation to other screening tools such as the Montgomery and Åsberg Depression Rating Scale (MADRS) and Hopkins Symptom Checklist (HSCL) (16). They concluded that the EPDS is valid for pregnant women in Norway.

### **1.1.2 Generalized Anxiety Disorder 7-item Scale**

To facilitate the clinician in diagnosing generalized anxiety disorder a brief self-report questionnaire was developed in 2006 by Spitzer et al. (17). The questionnaire has seven questions regarding mental health, for example worrying, feeling of restlessness and irritability during the past two weeks. The respondent answer on a 4-point Likert scale with the possibilities: “not at all”, “several days”, “more than half the days” and “nearly every day”, giving scores of 0 to 3. Depending on points received the patients are categorized into groups; no anxiety (0-4 points), minimal (5-9 points), moderate (10-14 points) and severe anxiety (15-21 points). A cutoff of 10 or above was recommended by Spitzer et. al as a reasonable indication of generalized anxiety disorder (17). The questionnaire has later been validated to strongly correlate to disability, healthcare attention and anxiety symptoms (18). It has also been validated for use during pregnancy (19-22). Both EPDS and GAD-7 can be found in Appendix 3.

## **1.2 COVID-19 pandemic**

In December 2019 an outbreak of pneumonia of unknown origin was reported in Wuhan, Hubei Province, China (23). Soon Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) was found to be the etiologic agent responsible for this highly contagious infection, named Coronavirus disease-19 (COVID-19). The disease spread quickly around the world, becoming a pandemic. Common symptoms of COVID-19 are dyspnoea, fever, cough, headache and myalgia, loss of smell and taste. In more severe cases the disease can progress

with severe vasculopathy of both the venous and the arterial system of the lungs, disseminated intravascular coagulation, heart failure, kidney failure and sepsis (24). As of 28<sup>th</sup> May 2021, more than three and a half million people have died worldwide (25), and many countries have applied extensive public health measures and social restrictions to prevent further spreading of the disease.

In Norway, the drastic infection control measures and social distancing were implemented on 12<sup>th</sup> March 2020. Schools, bars and stores (except grocery stores and pharmacies) were closed, all sporting and cultural events were postponed and people were asked to stay at home to prevent uncontrolled spreading of the SARS-CoV-2 (26). By May 2021, there have been three larger infection waves in Norway (27). The first wave came in March 2020 and dipped before the summer with very few cases for a couple of months. From autumn the number of positive cases started increasing again with a new big wave of infection. The latest wave came in March 2021 with the highest registered number of newly infected, with over 1000 new cases in one day. By 28<sup>th</sup> May 2021, 124 029 have tested positive for SARS-CoV-2 and 783 have lost their life to COVID-19 in Norway (27). The infection control restrictions have varied between counties in line with local virus outbreaks. The national restrictions have varied in line with the increasing and decreasing national infection rates, with the most liberal period with the fewest restrictions in summer of 2020, our study collection period.

### **1.2.1 Health risk of COVID-19 infection during pregnancy**

In the beginning of the pandemic, the discussion on whether pregnant women should be defined as a risk group or not was inconclusive. Because the risk of severe maternal morbidity and mortality associated with COVID-19 was unknown at the time, Westgren et al. feared that healthcare professionals and the public might be falsely reassured if the risks were downplayed (28). They concluded with the importance of the precautionary principle and encouraged more research on the topic.

The NIPH, a Norwegian state administrative body under the *Ministry of Health and Care Services*, have not defined pregnant women as a risk group during the COVID-19 pandemic in

Norway (29). Pregnant women have been advised to follow the same restrictions as the rest of the population, however pregnant healthcare workers are advised not to be in contact with suspected or confirmed COVID-19 patients, and their employers are asked to facilitate this. Regarding vaccination against SARS-CoV-2, the NIPH does not advise against it, but recommend pregnant women to wait to get vaccinated until after they have given birth, because of the limited research on pregnant population. They do however recommend getting the vaccine if the pregnant woman is at high risk of infection or at high risk of severe illness, e.g. with additional risk factors such as lung disease etc. NIPH recommend each pregnant woman to talk to their doctor for individual advise, weighing the pros and cons for vaccination. A comparison with policies in other countries is presented in table 1.

**Table 1:** Pregnant women as a risk group and recommendations regarding vaccine in selected countries

Country	Considered as risk group or not	Vaccination
<b>Denmark</b>	Risk group (30)	No vaccine for pregnant women (30)
<b>Finland</b>	At higher risk for disease, but not defined as a risk group (31)	No general vaccination advice, individual recommendations. Pregnant women can get the vaccine, if in risk group or at high risk of infection (32)
<b>Iceland</b>	Not a risk group (33)	Vaccination for pregnant women (33)
<b>Norway</b>	Not a risk group (29)	No general vaccination advice, individual recommendations. Pregnant women can get the vaccine (29)
<b>Sweden</b>	Risk group from gestational week 20 (34)	General vaccination advice as for the whole adult population. Pregnant women are recommended to wait until after week 12 of gestation to get the vaccine (35)
<b>Switzerland</b>	Risk group (36)	No general vaccination advice, individual recommendations. Pregnant women can get vaccine(37)
<b>UK</b>	Moderate risk group (38)	Vaccination for pregnant women (39)
<b>USA</b>	Risk group (40)	Vaccination for pregnant women (40)

A systematic review and meta-analysis published in April 2021 assessed 4473 pregnant women (41). In this study, they did not find increased rates of intrauterine fetal death or neonatal death with COVID-19 positive mothers. According to the *World Health Organization* (WHO) pregnant women are considered less likely to have symptoms than non-pregnant women, but are more likely to be needing intensive care if severely ill, and to give birth prematurely (42). WHO based the information on an ongoing systematic review and meta-analysis published in *British Medical Journal* (BMJ), which includes 192 studies (43). This review showed that 10% of pregnant women admitted to hospitals were diagnosed with confirmed or suspected COVID-19. Some factors associated with severe COVID-19 in pregnancy include increased age, high body mass index, chronic hypertension, pre-existing diabetes, pre-eclampsia and any pre-existing maternal comorbidity (43). Pregnant women with COVID-19 have higher risk for maternal death, and their babies are more likely to be admitted to the neonatal unit compared with those without COVID-19 (43). Fortunately, the risk for vertical transmission from mother to child is low, probably <1-2% (44). In the few reports on newborns infected by vertical transmission, the babies showed mild or no symptoms (44).

### **1.2.2 Antenatal mental health during a global pandemic**

In the beginning of the pandemic, *The Norwegian Directorate of Health* recommended that the maternity care should continue as normal, but in line with the infection control measures (45). In Tromsø municipality the pregnant women's partners are only allowed to attend the first antenatal consultation and the one in week 36 (46). At the *University hospital of North Norway* (UNN) partners are not allowed to join the routine ultrasound and are only allowed to stay with the delivering woman during active labour. After that he/she can visit two hours per day (47). If the partner has airway symptoms or is in quarantine for any reason, they cannot be present at the hospital at all. The restrictions are similar at other hospitals in Norway, see table 2 for examples from different regional health trusts. All these different restrictions may affect the well-being of women during the vulnerable periods of pregnancy, labour and postpartum and thus make pregnancy and childbirth at the time of the current COVID-19 pandemic challenging.

Hospital	Labour	Maternity ward	Patient hotel	Outpatient clinic
<b>Helse Bergen (48)</b>	Partners can stay for active labour.	Partners can visit for one hour per day between 17-20.	N/A	Partners are not allowed to join appointments. Exceptions are possible.
<b>Oslo Universitets-sykehus (49)</b>	Partners can stay for active labour.	Partners can visit between 16-20.	Partners can stay with the mother and child, the partner cannot leave the hotel.	Partners are not allowed to join appointments.
<b>St. Olavs (50)</b>	Partners can stay for active labour.	Partners can stay with mother and child, the partner cannot leave the department.	Partners can stay with mother and child, the partner cannot leave the hotel.	Partners are not allowed to join appointments. Exception: if the fetus has fetal anomalies/diseases.
<b>Sykehuset i Vestfold (51)</b>	Partners can stay for active labour and the first hours after delivery.	Partners can visit for two hours per day between 12-20. There are three family rooms where partners can stay with mother and child, if it is unoccupied.	N/A	A healthy partner can join appointments.
<b>Universitets-sykehuset Nord-Norge (47)</b>	Partners can stay for active labour.	Partners can visit for two hours per day.	Partners can stay with mother and child at the hotel.	Partners are not allowed to join appointments. Exception: some fetal medicine and genetic examinations.

In the beginning of the pandemic, it was important to figure out if pregnant women were more susceptible to the disease, such as it was with Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). Physical health was prioritized and therefore relatively few studies on how the pandemic impacts mental health were conducted. One of the earliest studies on mental health was done by Wu et al. during the outbreak of coronavirus in China in January 2020 (52). They found an increased rate of depression among pregnant women, using EPDS, and an association between the intensity

of depressive symptoms with the number of newly suspected or confirmed cases and the number of deaths per day. Worries and depressive symptoms are closely related, and this was explored by Haruna et al. in Japan during the pandemic (53). They found that the main concerns for pregnant women were fear for their fetus' and their own health, lack of any well-documented treatment for COVID-19 and fear of their newborn child getting infected.

By the end of April 2021 there were just under 200 articles in PubMed when searching for "pregnancy AND mental health AND COVID-19", among them meta-analyses. One example is the review by Hessami et al., who looked at eight different articles regarding mental health of pregnant women during the COVID-19 pandemic (54). In these eight research projects EPDS and The State-Trait Anxiety Inventory (STAI) scores were used to evaluate depression and anxiety perinatally. The results showed a statistically significant increase in anxiety symptoms during the pandemic, but even though the pooled EPDS scores were higher than before it did not reach statistical significance. Hessami et al. did not explore whether getting infected affects mental health, but one cross-sectional study from England did and could not find any evidence of correlation between the two (55). The pandemic impacts the everyday life of people around the globe. These mentioned studies suggest that pregnant women are more susceptible to anxiety and depressive symptoms during such a crisis.

## **2 Aims and objectives**

The objective of this study was to explore the effect of the COVID-19 pandemic on the mental health of pregnant women in Norway. We wanted to determine if the challenges associated with the isolation, social distancing and uncertainty for the future were connected with increased risk of depression and anxiety. This was measured with EPDS and GAD-7 self-reporting questionnaires.



## 3 Material and methods

### 3.1 Study design

**Study design:** This was a cross-sectional study.

**Study population:** Pregnant women aged 18-50 years, living in Norway.

**Inclusion criteria:** Pregnant woman who consents to participate in the study.

**Exclusion criteria:**

- Do not speak, read or understand Norwegian.
- Do not wish to be included in the study or withdrawal of consent.
- Women who have given birth during the pandemic but are not pregnant at the time of answering the questionnaire.

#### 3.1.1 Data collection

The dataset was based on a questionnaire distributed online to pregnant women all over Norway during the summer of 2020, from 7<sup>th</sup> June until 1<sup>st</sup> September.

The program used to make and distribute the questionnaire is called “*Nettskjema*”. It is developed and maintained by *The University of Oslo* (UiO). Since the information collected is person sensitive, all the data were saved directly in *Services for sensitive data* (TSD) which is also owned by UiO. By doing this the data are stored in a secure way and only the medical students and the main supervisor had access to the data through a two-step verification.

The questionnaire was developed by the medical students with help from the supervisor. It consists of three parts. The first part regards general information about the respondent, including work and social situation. In the second part the respondents' impressions about the COVID-19 pandemic, what type of measures they have been taking and how they have been using the media were collected. For the third part the validated self-reporting forms,

the EPDS and GAD-7 were used. The whole survey was in Norwegian and can be found as Appendix 3.

The questionnaire could be found through the link: <https://nettskiema.no/a/comehe>. The participants had the possibility to read the information about the study and the consent form before answering and could agree or disagree to participate in the study. This weblink was open, ready for use by the participants from the 7<sup>th</sup> June 2020. Recruitment was done through convenience sampling methods and the link was first spread through the researchers' Facebook-accounts and forwarded/shared through friends. It has also been posted in many Facebook-groups for pregnant women such as "*Termin November 2020 Norge*", "*Termin Rogaland 2020*" and "*Gravid i coronatider*". The link was also posted on two Snapchat groups and in two forums. Many ultrasound clinics and midwives were contacted throughout the summer and asked to help with recruitment. Several of them posted on their Web- or Facebook-page, some sent out emails to their clients or distributed the information letter in their clinics. A detailed list of all the Facebook-groups and clinics, known to the researchers, who helped spread the questionnaire can be found as Appendix 1. The questionnaire was kept open until 1<sup>st</sup> September 2020, approximately three months in total.

### **3.1.2 Methodological consideration**

There are many different screening tools available to identify the risk of perinatal mental health disorders. Two of the most commonly used for perinatal depression are the Patient Health Questionnaire (PHQ-9) and the EPDS. Both have been validated against diagnostic interviews by healthcare professionals (12, 56), but to our knowledge only EPDS has been validated for use on pregnant women in Norway (16). EPDS is commonly used in many of the studies exploring the same theme and we believed it to be a good choice of screening tool for our research. Different studies use different cutoffs for EPDS depending on which test properties are emphasized. When using the threshold value of 10 Eberhard-Gran et al. showed a sensitivity of 100%, and a specificity of 87%. These test properties give a higher risk of false positives than a higher threshold would have (16, 57). If the cutoff is 13 or above, the sensitivity goes down, but the specificity goes up and the positive predictive

value increases (16). Women scoring between 10-12 points can be regarded as having subclinical symptoms and usually will not require any treatment, while those scoring above 12 are more likely to be clinically depressed (57). To exclude false positives, we have chosen cutoff 13 (13 or above) to get an indication for the prevalence of major depression. Since this threshold value would give us a lower sensitivity (but higher specificity) we have also included results where a cutoff of 10 (10 or more) is used. Such a threshold value will give more false positives but will also include more of the women with milder depressions and give us an opportunity to compare the two different results. EPDS with a cutoff of 13 has been used by many of the other studies on mental health in pregnancy during the COVID-19 pandemic, and thus makes it easier to compare our results with results from other countries. In our study we will mainly focus on EPDS with a threshold of 13.

Regarding screening for anxiety there exist many possible tools other than GAD-7, such as State-Trait Anxiety Inventory (STAI), Hospital Anxiety and Depression Scale (HADS) and Spielberger State-Anxiety Inventory (SSAI). We have chosen to use GAD-7 since it has been used in many different studies, it has been validated for a pregnant population (19-22) and the Norwegian translation of GAD-7 was easily accessible through the *Norwegian Association for Cognitive Behavioral Therapy* (58). As mentioned before, according to the points received on the 7 questions in GAD-7 people can be classified into mild, moderate and severe anxiety. By only using the categories moderate and severe (10 or more points) the risk for false positives will be reduced, and the correlation to the actual diagnosis of anxiety, not only anxiety symptoms, might be higher. Furthermore, like with EPDS, many of the other studies on mental health of pregnant women during the COVID-19 pandemic have used a cutoff of 10 in GAD-7 making the comparison with results in our study easier.

### **3.2 Formal approval and applications**

An ethical approval from the *Regional Committee for Medical and Health Research Ethics* (REK) was obtained with reference number [135968] on 19<sup>th</sup> May 2020. The data protection and privacy protocol has been reviewed by *Norwegian Centre for research data* (NSD) and the conditions were found satisfactory.

**Funding:** No external funding was received for this project.

### **3.3 Ethical aspects**

The research project was conducted in accordance with the Declaration of Helsinki. All the participants were provided with written information about the study and were given the opportunity to withdraw their consent at any time before the data analysis started, without giving any reason. This study was solely observational and did not include any intervention. All the women participating in this study had their standard antenatal care, we expected that any mental health issues would be detected through their routine care and follow-up. If any of the participants experienced psychological difficulties and needed someone to talk to, the contact information of one of the researchers in our team Simone Schwank, a licensed Psychologist with a PhD in perinatal mental health, was provided in the information letter. Additionally, the letter recommended anyone struggling to contact a general practitioner or “Landsforeningen 1001 dager” (<https://www.landsforeningen1001dager.no/>).

### **3.4 Statistical analyses**

#### **3.4.1 Sample size estimation**

Using the sample size calculator from [clincalc.com](http://clincalc.com) (59), we needed at least 196 respondents to detect a 50% increase in prevalence of antenatal anxiety/depression. This was calculated using a population prevalence of 10-20 % (median 15%). There were two main factors limiting the time window for data collection: We could not predict how long the pandemic would last, and since this is a master thesis, we had a deadline. To reach our desired sample size we estimated a three-month data collection period would be sufficient.

#### **3.4.2 Data analysis**

Data were analysed using IBM SPSS Statistics 27. A general clean-up of the data was done first: Age was changed from the year they were born to their age.

*Example: “1996” was changed to “24”*

Since many of the counties in Norway were merged during the past years some wrote the old name of the county where they live, and this was changed to the new.

*Example: "Troms" was changed to "Troms og Finnmark"*

Some of the pregnant women had filled out how far along in gestation they were with both week and days and some only with weeks, therefore the days were removed from the dataset.

*Example: "21+6" was changed to "22", "32+0" was changed to "33".*

The normality of data distribution was checked using Shapiro-Wilk statistical test. None of the variables in the dataset were normally distributed which affected the choice of further statistical analyses and nonparametric methods were used as appropriate. For descriptive statistics, continuous variables are presented as median (range) and categorical variables as number (percent). Chi-square test was used to investigate differences between the number of women who scored over a defined cutoff value of EPDS and GAD-7 in different groups. A Bonferroni post-hoc test was done on the cross-tables larger than 2x2. This way we minimize the risk of a type 1 error and reduce the possibility of a false positive. Using the Bonferroni method may give a greater chance of a type 2 error but avoiding type 1 error is more important. Fisher exact test was used when the cross-tables had expected value <5 in over 20% of the cells.

## **4 Results**

### **4.1 Characteristics of the participants**

In total, 795 women answered the questionnaire. Women who had already given birth were excluded (n=21). The final sample consisted of 774 pregnant women, most of whom were in the second (n=407; 52.6%) and third (n=342; 44.2%) trimester. A large portion of the participants had a university degree as their last completed formal education (n=524; 67.7%) and more than a third of the participants worked in the healthcare system (n=274; 35.4%). The background characteristics of the pregnant women included in the study are summarized in table 3.

**Table 3:** Background characteristics of the study population (n=774)

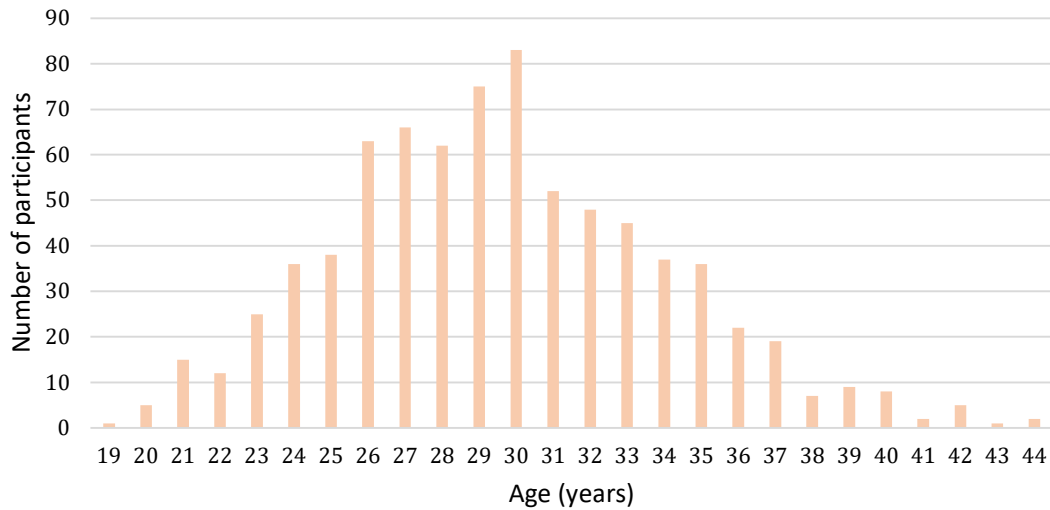
<b>Variable</b>	<b>Median (Range)</b>
Age (years)	29 (19-44)
Week of pregnancy	26 (5-41)
	<b>n (%)</b>
<b>Minority*</b>	27 (3.5)
<b>Marital status</b>	
Married	220 (28.4)
Partner	532 (68.7)
Single	19 (2.5)
Other	3 (0.4)
<b>Parity</b>	
Nullipara	414 (53.5)
Multipara	360 (46.5)
<b>Education</b>	
Compulsory (1 <sup>st</sup> to 10 <sup>th</sup> grade)	17 (2.2)
High school**	216 (27.9)
University	524 (67.7)
Other	17 (2.2)
<b>Healthcare workers</b>	274 (35.4)
<b>Negative economic consequences due to COVID-19</b>	
Yes, for me	89 (11.5)
Yes, for partner	96 (12.4)
Yes, for both	59 (7.6)
No	530 (68.5)

\*4 missing values

\*\*Including Vocational education and training

The participants' age distribution is shown in figure 1.

Figure 1: Bar chart demonstrating age distribution in study population



Since the questionnaire was distributed online, participants from all over Norway responded, their home counties are shown in figure 2.

Figure 2: Bar chart demonstrating the distribution of participants by county of residence compared to total population of county

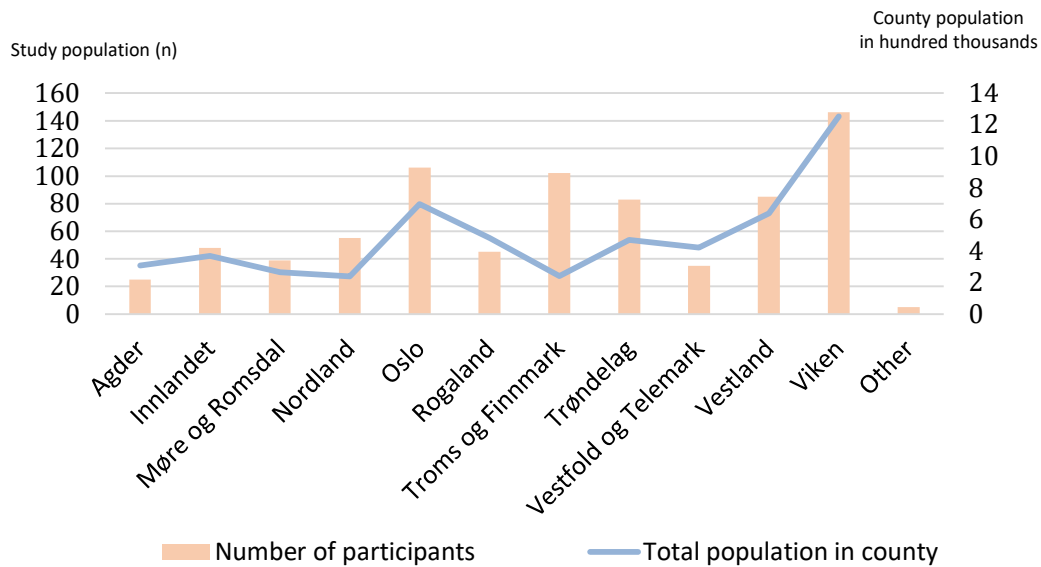




Figure 3 demonstrates which regional hospital trust the participants belong to.

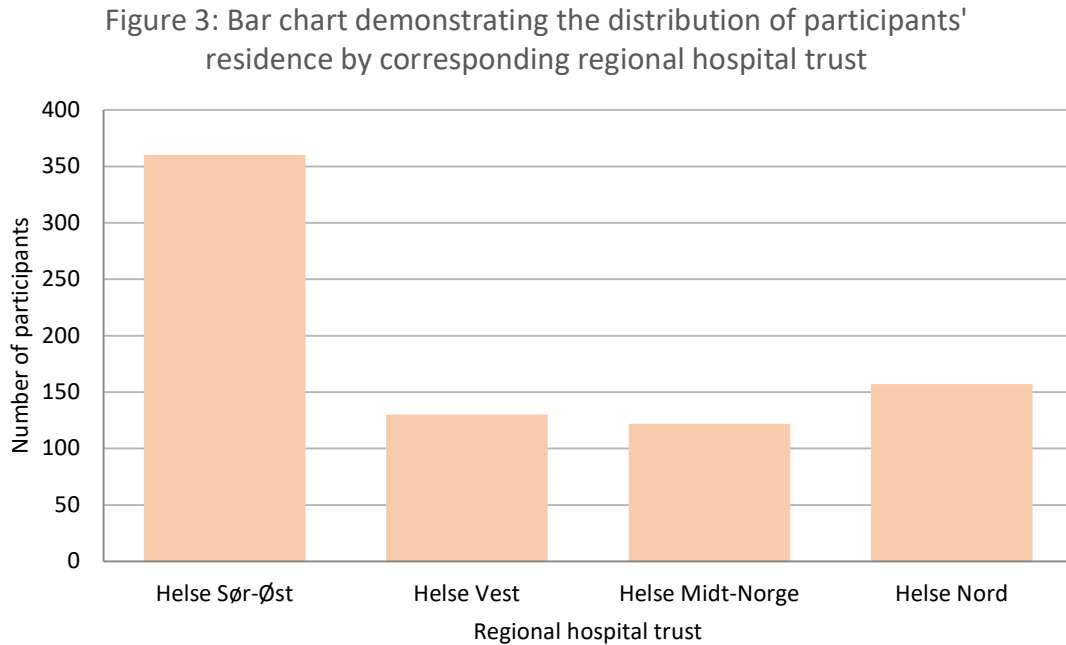


Table 4 shows the proportion of participants receiving psychiatric or psychological treatment before or during pregnancy. Most of the women participating in the study did not receive any form of psychiatric or psychological treatment neither before (n=591; 76.4%) nor during (n=712; 92%) this pregnancy.

**Table 4:** Proportion of participants receiving psychiatric or psychological treatment before or during pregnancy (n=774)

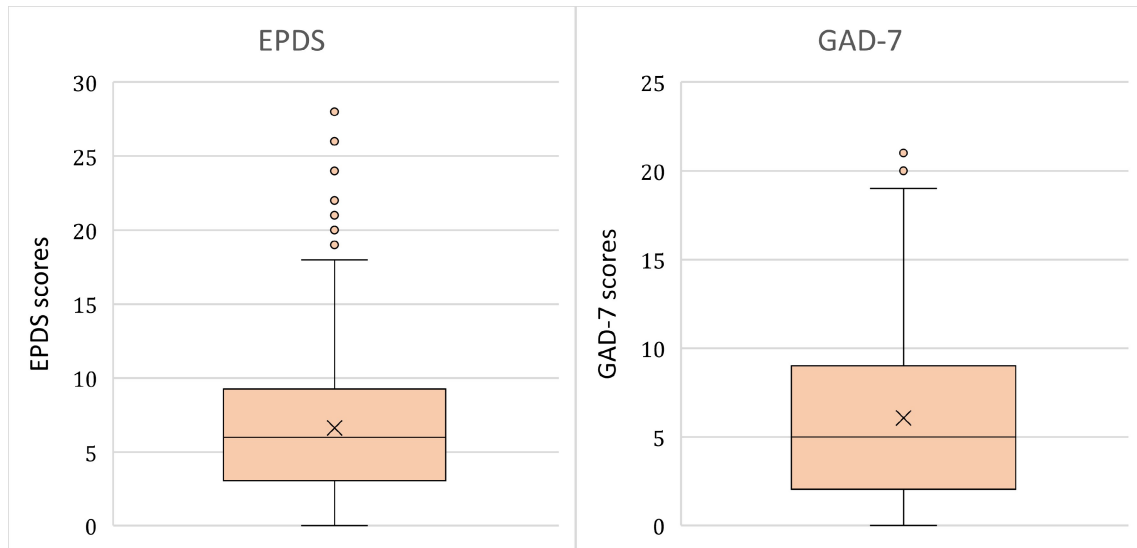
Treatment before pregnancy	n (%)	Treatment during pregnancy	n (%)
Medicinal	58 (7.5)	Medicinal	12 (1.6)
Psychotherapy	125 (16.1)	Psychotherapy	50 (6.5)
None	591 (76.4)	None	712 (92)

## 4.2 Depression and anxiety scores

The median EPDS score was 6, ranging from 0-28 with a mean of 6.61. The median GAD-7 score was 5, ranging from 0-21 with a mean of 6.06. A total of 193 (24.9%) women received a score on EPDS of 10 or above and 111 (14.3%) women scored 13 or above. When looking

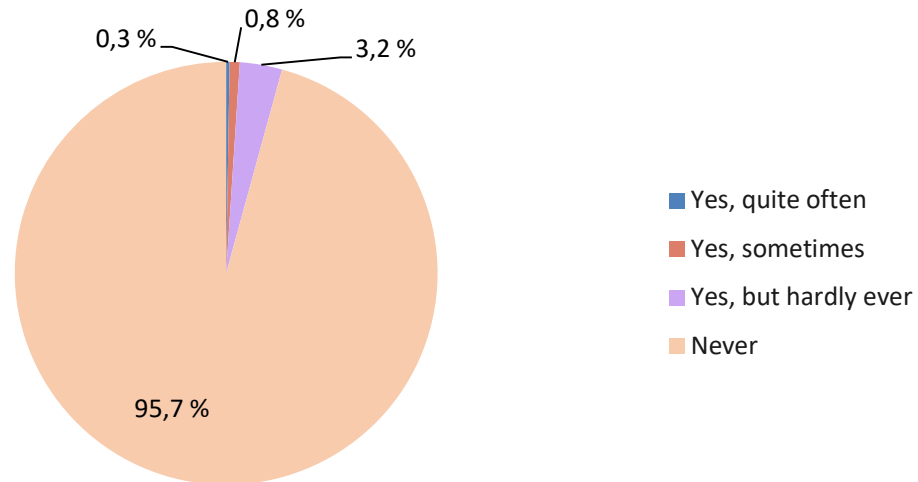
at GAD-7, 166 participants (21.4%) scored 10 or above. The EPDS and GAD-7 scores are shown in figure 4.

Figure 4: Box and Whisker plot demonstrating participants' EPDS and GAD-7 score  
X: mean value. Box: Interquartile range (0.25-0.75). Line: Median. Whiskers extend to 1.5 times the interquartile range. Circles: Outliers



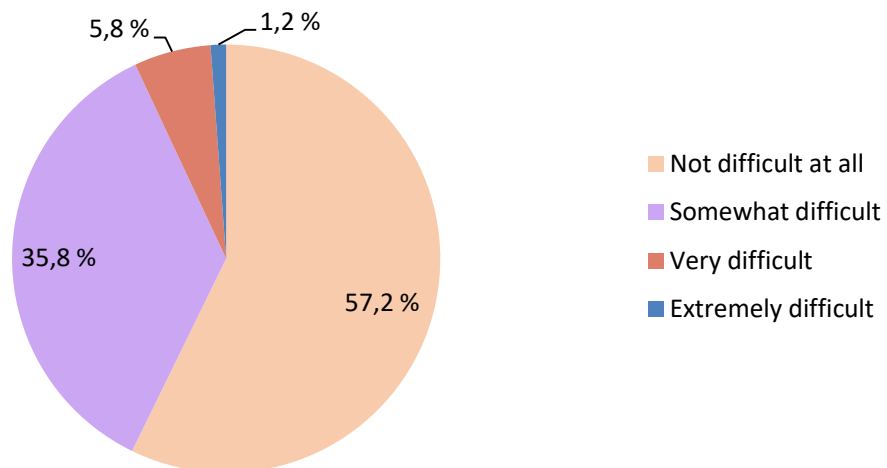
In EPDS question number 10 is about self-harm. 33 women had been having thoughts of harming themselves during the past two weeks, while 741 had no such thoughts. The frequency of self-harm thoughts is shown in figure 5.

Figure 5: Pie chart demonstrating the frequency of thought of self-harm among study population



The final question in GAD-7 asks about the symptom burden if answering yes to any of the previous seven questions. The results are shown in figure 6.

Figure 6: Pie chart demonstrating the proportion of participants who have found it difficult to go to work, take care of things at home or get along with other people



### **4.3 Differences in EPDS and GAD-7 scores according to background characteristics of the study participants**

EPDS and GAD-7 scores categorized by background characteristics such as age and parity are presented in table 5, 6, and 7.

**Table 5:** Comparison of EPDS and GAD-7 groups according to background characteristics of study participants (n=774)

Variables	EPDS<13 (n=663)	EPDS≥13 (n=111)		GAD7<10 (n=608)	GAD7≥10 (n=166)	
	n (%)	n (%)	p-value	n (%)	n (%)	p-value
<b>Age (years)</b>						
Under 25	72 (10.9)	22 (19.8)	0.007	58 (9.5)	36 (21.7)	<b>&lt;0.001</b>
25 to 29	264 (39.8)	40 (36)	0.424	242 (39.8)	62 (37.3)	0.569
30 to 34	231 (34.8)	34 (30.6)	0.368	215 (35.4)	50 (30.1)	0.207
35 or older	96 (14.5)	15 (13.5)	0.764	93 (15.3)	18 (10.8)	0.147
<b>Minority*</b>						
Yes	22 (3.3)	5 (4.5)	0.575	16 (2.6)	11 (6.7)	<b>0.013</b>
No	637 (96.7)	106 (95.5)	0.575	589 (97.4)	154 (93.3)	<b>0.013</b>
<b>Marital status**</b>						
Married	183 (27.7)	37 (33.3)	0.230	176 (29.1)	44 (26.5)	0.516
Partner	462 (70)	70 (63.1)	0.134	418 (69.1)	114 (68.7)	0.920
Single	15 (2.3)	4 (3.6)	0.424	11 (1.8)	8 (4.8)	0.027
<b>Parity</b>						
Nullipara	355 (53.5)	59 (53.2)	0.939	311 (51.2)	103 (62)	<b>0.013</b>
Multipara	308 (46.5)	52 (46.8)	0.939	297 (48.8)	63 (38)	<b>0.013</b>
<b>Education</b>						
University	453 (68.3)	71 (64)	0.363	431 (70.9)	93 (56)	<b>&lt;0.001</b>
Other	210 (31.7)	40 (36)	0.363	177 (29.1)	73 (44)	<b>&lt;0.001</b>
<b>Healthcare worker</b>						
Yes	242 (36.5)	32 (28.8)	0.118	231 (38)	43 (25.9)	<b>0.004</b>
No	421 (63.5)	79 (71.7)	0.118	377 (62)	123 (74.1)	<b>0.004</b>
<b>Negative economic consequences</b>						
Yes, for me	70 (10.6)	19 (17.1)	0.046	56 (9.2)	33 (19.9)	<b>&lt;0.001</b>
Yes, for partner	82 (12.4)	14 (12.6)	0.920	77 (12.7)	19 (11.4)	0.675
Yes, for both	41 (6.2)	18 (16.2)	<b>&lt;0.001</b>	36 (5.9)	23 (13.9)	<b>0.001</b>
None	470 (70.9)	60 (54.1)	<b>0.001</b>	439 (72.2)	91 (54.8)	<b>&lt;0.001</b>
The percentages shown are within EPDS and GAD-7 categories						
The significant p-values are shown in bold						
* Results shown from Fisher exact test and the minority variable has 4 missing values						
** Other (n=3; 0.5%) is excluded from the analysis						

**Table 6:** Comparison of EPDS and GAD-7 groups according to participants' trimester of pregnancy (n = 774)

Variables	EPDS<13 (n=663)	EPDS≥13 (n=111)		GAD7<10 (n=608)	GAD7≥10 (n=166)	
	n (%)	n (%)	<b>p-value</b>	n (%)	n (%)	<b>p-value</b>
<b>Trimester</b>						
First	23 (3.5)	2 (1.8)	0.368	21 (3.5)	4 (2.4)	0.503
Second	342 (51.6)	65 (58.6)	0.162	323 (53.1)	84 (50.6)	0.562
Third	298 (44.9)	44 (39.6)	0.317	264 (43.4)	78 (47)	0.412

The percentages shown are within EPDS and GAD-7 categories

The significant p-values are shown in bold

**Table 7:** Comparison of EPDS and GAD-7 groups according to participants corresponding region of healthcare (n=774)

Variables	EPDS<13 (n=663)	EPDS≥13 (n=111)		GAD7<10 (n=608)	GAD7≥10 (n=166)	
	n (%)	n (%)	<b>p-value</b>	n (%)	n (%)	<b>p-value</b>
<b>Regional Hospital trust*</b>						
Helse Sør-Øst	306 (46.4)	54 (49.5)	0.549	280 (46.3)	80 (48.8)	0.569
Helse Vest	107 (16.2)	23 (21.1)	0.194	100 (16.5)	30 (18.3)	0.596
Helse Midt-Norge	105 (15.9)	17 (15.6)	0.920	94 (15.5)	28 (17.1)	0.631
Helse Nord	142 (21.5)	15 (13.8)	0.057	131 (21.7)	26 (15.9)	0.103

The percentages shown are within EPDS and GAD-7 categories

The significant p-values are shown in bold

\* Other (n=5; 0.6%) is excluded from the analysis

There was little difference in the results of the analysis using cutoff 13 and cutoff 10 on EPDS. The main differences were found in age, minority, education, healthcare workers and relationship status, as they became statistically significant when using 10 as a threshold value. In the group of pregnant women under 25 years old a bigger proportion scored 10 or above on EPDS compared to those over 25 years old (EPDS≥10: 41.5% vs. 25%, p<0.001). When analysing the difference in the minority vs majority group, a similar result was found (EPDS≥10: 44.4% vs 24.4%, p=0.018). In the group of single pregnant women, a larger share scored 10 or higher on EPDS compared to those who were married or in a relationship

(EPDS $\geq$ 10: 52.6% vs. 25.9%, 23.7%,  $p=0.005$ ). Regarding education, the proportion scoring above threshold value was lower amongst those with higher education compared to non-university educated (EPDS $\geq$ 10: 22.3% vs. 30.4%,  $p=0.015$ ). There were also fewer working in the healthcare system that scored above cutoff than amongst those not working in the healthcare system (EPDS $\geq$ 10: 19% vs 28.2%,  $p=0.005$ ).

#### 4.4 COVID-19 pandemic: self-reported impact on health and well-being

On a 5-point Likert scale the women were asked questions about how worried they were about their own health and the health of their baby due to coronavirus. There were five alternatives ranged from “not at all” to “very scared”. In general, pregnant women were more worried about their child getting infected or sick than about their own health. The results are shown in figure 7 and 8.

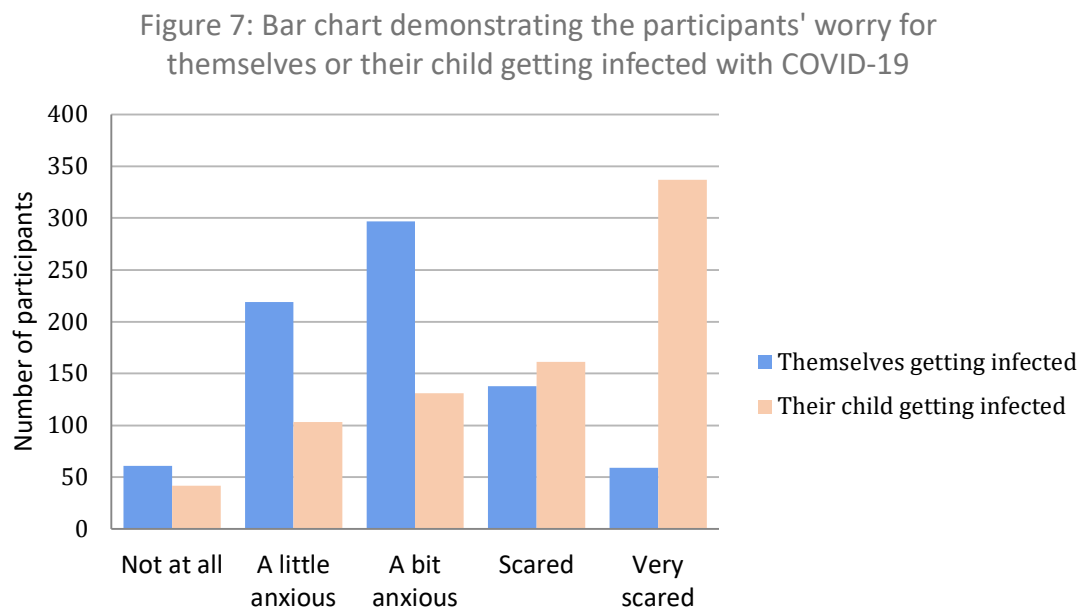
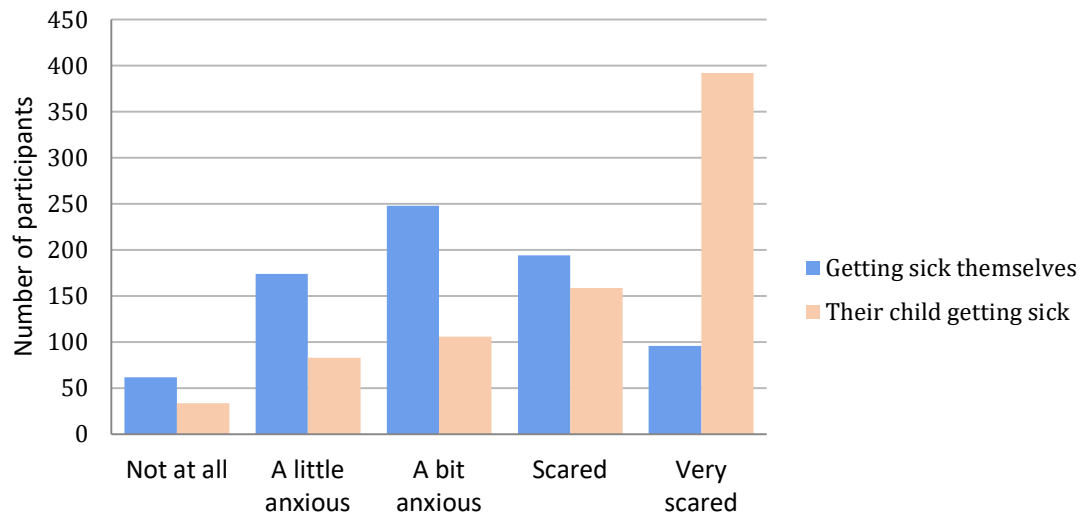


Figure 8: Bar chart demonstrating the participants' worry for themselves or their child getting sick



Quite a large number of the women (n=308; 39.8%) have the impression that their maternity care has been different compared to pre-pandemic times. Some participants (n=103; 13.3%) have avoided seeking healthcare due to fear of infection and a large proportion (n=122; 15.8%) of the participants have sought some form of healthcare, but not received it. In this question there were two example reasons for not receiving healthcare, which were “lack of staff” and “risk for infection”. There was a statistically significant difference between the EPDS score and the GAD-7 score in pregnant women with a perception of normal maternity care vs those who perceived it as abnormal. A similar difference could be found between those who avoided seeking medical care and those who did not receive it. The differences are shown in table 8.



**Table 8:** Pregnant women’s perception of medical assistance and follow up care during pandemic (n=774)

Variables	EPDS<13 (n=663)	EPDS≥13 (n=111)		GAD7<10 (n=608)	GAD7≥10 (n=166)	
	n (%)	n (%)	<b>p-value</b>	n (%)	n (%)	<b>p-value</b>
<b>Has maternity care proceeded as normal?</b>						
Yes	392 (59.1)	47 (42.3)	<b>0.001</b>	372 (61.2)	67 (40.4)	<b>&lt;0.001</b>
No	247 (37.3)	61 (55)	<b>0.001</b>	217 (35.7)	91 (54.8)	<b>&lt;0.001</b>
Uncertain	24 (3.6)	3 (2.7)	0.617	19 (3.1)	8 (4.8)	0.294
<b>Have you avoided seeking medical assistance due to fear of infection?*</b>						
Yes	76 (11.5)	27 (24.3)	<b>&lt;0.001</b>	64 (10.5)	39 (23.5)	<b>&lt;0.001</b>
No	587 (88.5)	84 (75.7)	<b>&lt;0.001</b>	544 (89.5)	127 (76.5)	<b>&lt;0.001</b>
<b>Have you sought healthcare but not received it?***</b>						
Yes	83 (12.5)	39 (35.1)	<b>&lt;0.001</b>	79 (13)	43 (25.9)	<b>&lt;0.001</b>
No	580 (87.5)	72 (64.9)	<b>&lt;0.001</b>	529 (87)	123 (74.1)	<b>&lt;0.001</b>
Percentages shown are within EPDS and GAD-7 - categories						
Significant p-values are shown in bold						
*Both physical and psychological						
**E.g. due to lack of staffing or risk of infection						

Quite a large proportion of the participants have isolated themselves either voluntarily or imposed by NIPH. Those who have been in voluntary isolation or imposed isolation/quarantine scored significantly higher on both EPDS and GAD-7. Very few have been infected (n=2; 0.3%) and the women knew few who had been infected (n=228; 29.4%), we found no significant difference in anxiety and depression score between those who knew someone who had been infected vs. those who knew no one. The results are summarized in table 9.

**Table 9:** Response of pregnant women regarding pandemic situation based on anxiety and depression (n =774)

Variables	EPDS<13 (n=663)	EPDS≥13 (n=111)		GAD7<10 (n=608)	GAD7≥10 (n=166)	
	n (%)	n (%)	p-value	n (%)	n (%)	p-value
<b>Volunteer isolation*</b>						
Yes	548 (82.7)	104 (93.7)	<b>0.003</b>	498 (81.9)	154 (92.8)	<b>0.001</b>
No	115(17.3)	7 (6.3)	<b>0.003</b>	110 (18.1)	12 (7.2)	<b>0.001</b>
<b>Quarantine or isolation**</b>						
Yes	113 (17)	27 (24.3)	0.065	97 (16)	43 (25.9)	<b>0.003</b>
No	550 (83)	84 (75.7)	0.065	511 (84)	123 (74.1)	<b>0.003</b>
<b>Have you or anyone you know been infected?***</b>						
Yes	200 (30.2)	30 (27)	0.503	187 (30.8)	43 (25.9)	0.225
No	463 (69.8)	81 (73)	0.503	421 (69.2)	123 (74.1)	0.225
Percentages shown are within EPDS and GAD-7 - categories						
Significant p-values are shown in bold						
* Yes consists of "yes, all the time" (n=33; 4.3%), "yes, quite often" (n=288; 37.2%) and "yes, some" (n=331; 42.8%). No consists of "no, seldom" (n=77; 9.9%) and "no, never" (n=45; 5.8%)						
** This is obligatory quarantine or isolation imposed by NIPH						
*** Yes consists of "yes, me" (n=2; 0.3%), "yes, someone in my family (n=28; 3.6%), "yes, someone I know" (n=200; 25.8%)						

## 5 Discussion

### 5.1 Main findings

In this study we found that pregnant women in our study population, during the pandemic, had a median EPDS score of 6, ranging from 0-28 and a mean of 6.61. In total, 193 (24.9%) participants scored 10 or above, and 111 (14.3%) scored 13 or above on EPDS. This indicates that 14.3% of pregnant women in Norway during the pandemic are likely to be depressed, when adding those scoring over 10, indicating subclinical symptoms, the total prevalence increases to 24.9%.

According to the *Norwegian Obstetric Guidelines*, approximately one out of ten women in Norway have depression symptoms perinatally (8). However, the reported prevalence varies considerably. A cross-sectional study, defining moderate-severe depression by  $EPDS > 16$ , found a prevalence of depression in pregnant women living in northern, European countries (Finland, Norway and Sweden) of 4.3% (60). When looking at numbers in postpartum women in Norway, three studies using  $EPDS \geq 10$  found a prevalence of 8.4%, 8.9% and 9.3%, (16, 61, 62). However, the study by Shakeel et al., had a large proportion of minority participants and when looking only at western population (most of whom were from Norway) the prevalence was even lower, 4.8% (62). Three studies report numbers from pregnant participants in Norway, before the COVID-19 pandemic. One used  $EPDS \geq 10$  and found a prevalence of depression during the first trimester of 5.6% and in the second and third of 11.1% (61). Two of the studies on Norwegian antenatal mental health use data from the “*Akershus Birth Cohort Study*” from November 2008 through April 2010, the study by Nordeng et al. used  $EPDS \geq 13$  (63) while Dørheim et al. used  $EPDS \geq 10$  (64). Nordeng et al. report a prevalence of 8.1%. and Dørheim et al. 14.6%. Our prevalence of 24.9% is approximately twice as high compared to the results of pre-pandemic studies using  $EPDS \geq 10$ . Also, comparing to the study using  $EPDS \geq 13$  by Nordeng et al. our prevalence of 14.3% is substantially higher than before the COVID-19 pandemic.

Looking at these studies from Norway it seems reasonable to believe that the pre-pandemic prevalence might be below 10%, but even if we consider 10% as the true pre-pandemic prevalence of antenatal depression in Norway, and the stricter cutoff value of 13, our findings of EPDS $\geq$ 13 among 14.3% of the study population, indicates that the COVID-19 pandemic has negatively influenced the mental well-being of pregnant women.

When it comes to GAD-7 the participants had a median score of 5 ranging from 0-21, and a mean of 6.06. The share scoring 10 or above for GAD-7 is 166 (21.4%). This indicates that 21.4% of pregnant women in Norway have anxiety during the pandemic. When it comes to anxiety antenatally the pre-pandemic prevalence was around 10% (8), but also here the reported prevalence varies substantially. Comparing the prevalence before and during the pandemic, our findings indicate that twice as many pregnant women experience anxiety symptoms during the pandemic than before.

Our findings are in line with another study on perinatal mental health during the COVID-19 pandemic that includes data about Norwegian women. Ceulemans et al. reported findings from a multinational study on mental health in pregnancy and three months postpartum during the COVID-19 pandemic; 31% (n=1344) of the respondents were from Norway (65). In the Norwegian pregnant group, 12% (n=161) scored 13 or above on EPDS which is in concordance with our findings of 14.3%. When it comes to anxiety, we found a higher prevalence than reported by Ceulemans et al. They found 12.4% (n=166) scoring 10 or above on GAD-7 in the Norwegian pregnant population, while our prevalence is 21.4% (n=166). The surveys were distributed almost at the same time, but we had a month longer data collection period. The study by Ceulemans et al. is multinational and report data from many different countries, the specific sociodemographic status for each country is not listed. Since we do not know the sociodemographic factors of the Norwegian participants in Ceulemans et al. it is difficult to compare their background characteristics to ours. There might be differences in their Norwegian study population compared to ours, which may explain some of the difference in prevalence regarding anxiety.

## 5.2 Antenatal mental health during the COVID-19 pandemic in other countries

Many cross-sectional online surveys have been performed during the past year to determine mental health effects caused by the COVID-19 pandemic. Several of these studies have used EPDS. Compared to five studies with cutoff 13 or above on EPDS (65-69), and one that used above 13 (70), we have found lower levels of depression in our study population. The six studies have results ranging from 14.7% to maximum 41.5%, while we found a prevalence of 14.3%. These studies were done in countries such as Canada, Japan, Turkey, Ireland, Switzerland and UK and most of them were cross-sectional. The study with the lowest prevalence (14.7%), except from ours, was done within 48 hours after the women gave birth (68), while the others were done earlier during pregnancy. The difference in study design might be the reason why the prevalence was found to be lower in this study compared to others.

Out of the six studies mentioned in the previous paragraph, Canada is probably the country most similar to and most often compared to Norway regarding their geography, living standard and healthcare system. The two studies from Canada with a large number of respondents reported a prevalence of depression of 37% (69) and 40.7% (66), which is substantially higher than in our study. Both have a study population with similar sociodemographic status as in our study, e.g. median age is around 30, most women are in a relationship and a large proportion are highly educated. The main difference, however, is that these two studies from Canada also have significant proportions of respondents from other countries and a larger share of mixed ethnicity. Since minorities tend to score higher when using screening tools such as EPDS (62, 71), this could account for some of the difference between our study and these two studies from Canada. The pre-pandemic depression prevalence in Canada was quite low, around 3% (72), although the variability among reported studies is substantial. Also, the number of cases and deaths by COVID-19 is a lot higher in Canada than in Norway, on 28<sup>th</sup> May 2021, they had 1378 993 confirmed cases and 25 393 deaths (25) and a population of 38 million. This gives an infection rate of 3.6% and a death rate of 1.84% compared to an infection rate of 2.2% and a death rate of

0.63% in Norway (27). Such a difference in infection numbers could indicate that the situation in Canada has differed from the situation in Norway and thereby account for some of the difference in prevalence of depression.

Most studies using GAD-7 have presented their results in categories; no anxiety 0-4, mild 5-9, moderate 10-14 and severe 15-21. Since we, in our study, have used cutoff 10 or above, we have chosen to focus on moderate and severe categories when looking at other studies. Two other studies found prevalence of 16% (73) and 43.3% (74). Our study's prevalence lies in the midst of the other studies, with a prevalence of 21.4%. The study from the USA by Preis et al. (74) was done in April 2020 when the pandemic was still quite new in the western population, whereas our study was done in the summer of 2020 at a time when things were opening up a bit in Norway, and this might explain some of the differences in the prevalence. Compared to a study from Qatar reported by Farrell et al., our prevalence is more similar (16% vs 21%), but the study populations are quite different. First of all, Qatar is a country dissimilar to Norway, both in terms of culture, climate and politics. Secondly, Farrell et al. had a multinational study population, while we had very few minorities in our study. Thirdly, they had fewer healthcare professionals and a large number of unemployed pregnant women (59%). The previously mentioned, multinational study by Ceuleman et al. with 3907 pregnant participants found a prevalence of 11% in the study population with respondents from many European countries (65). The background characteristics of their participants is more similar to our study population.

Almost all the studies done on this theme have a major limitation in common. Most are online surveys of a cross-sectional nature and are therefore vulnerable to selection bias. There are, however, some studies with other study designs. One longitudinal study with pregnant women and a non-pregnant control group was done in Argentina by López-Morales et al. (75). The levels of depression and anxiety were measured using Beck Depression Inventory-II (BDI-II) and STAI, and the women answered these questionnaires at three different times during the pandemic. In this study they found no difference between the pregnant and non-pregnant at the two first recordings, but a significant difference the

third time, indicating a larger increase in depressive and anxiety symptoms over time in the pregnant group vs. the non-pregnant group (75). Another longitudinal study looked at the same pregnant women before and during the pandemic (76). The first recording was done during the first trimester and then the same women answered the same questionnaire during the pandemic when they were in the second or third trimester. In this study an increase in both anxiety and depression was observed. A similar increase was found in Canada when looking at two different cohorts of pregnant women, one from before the pandemic and one during (77). Zanardo et al. did a non-concurrent case-control study, looking at data from women who had given birth in a specific hospital at the same time a year earlier, pre-pandemic, and comparing with a study group of pregnant women giving birth during the pandemic. They found a higher prevalence of depression in COVID-19 group compared to the control group (28.6% vs 11.9%,  $p=0.0006$ ) (78).

To our knowledge, only one study has found higher levels of anxiety and depression in the non-pregnant group compared to the pregnant group. A research group in China looked at pregnant women during the pandemic and included a control-group of non-pregnant women (79). By using PHQ-9 and GAD-7 they found significantly higher levels of depression and anxiety in the non-pregnant group compared to the pregnant-group. They discuss the possibility of closer contact with healthcare professionals, more emotional support from their family and that women tend to choose to get pregnant when they are healthy both physically and mentally as possible reasons for pregnant women having better mental health than non-pregnant women. These results are interesting and given we do not have a control group of non-pregnant women in our study, it is difficult to compare our results to theirs.

Three larger meta-analyses have looked at the prevalence of depression and anxiety in pregnancy and post-partum. Hessami et al. found a mean EPDS score of 9,84 and found no significant difference from pre-pandemic scores (54). The two others, Yan et al. (80) and Fan et al. (81), found high levels of depression with a pooled prevalence of 31% and 25%. These numbers are higher than what we found in our study (EPDS mean: 6.61. Prevalence: 14.3%). Similar difference is found when looking at anxiety. Yan et al. and Fan et al. found a

prevalence of 37% and 42% respectively, compared to 21.4% in our study. None of these included studies from Norway and most were done in Asia or America. From Europe only a couple studies from Italy, Belgium and Greece were included. This could indicate that the prevalence of anxiety and depression is lower in Norwegian pregnant women than in many other places in the world. This may be related to better availability of resources, social support, sense of security, more trust in public health policies and free national healthcare system. A summary of other studies on anxiety and depression during the COVID-19 pandemic is presented in table 10.



**Table 10:** Prevalence of antenatal and perinatal anxiety and depression in different studies during the COVID-19 pandemic

Author	Screening tool	Study design	Country	Number of participants	Results
Fan et al. (81)	N/A	Systematic review and meta-analysis	N/A	Includes 19 studies	Overall prevalence of depression: 25%; Overall prevalence of anxiety: 42%
Hessami et al. (54)	EPDS and STAI	Systematic review and meta-analysis	N/A	Includes 8 studies	Mean EPDS score: 9.84
Yan et al. (80)	N/A	Systematic review and meta-analysis	N/A	Includes 13 studies on anxiety and 13 on depression	Pooled prevalence of depression: 31% Pooled prevalence of anxiety: 37%
Davenport et al. (66)	EPDS $\geq$ 13	Cross-sectional - online survey	Canada*	520 pregnant and 380 in the first year after delivery	EPDS scores $\geq$ 13: 40,7%
Durankus et al. (70)	EPDS $>$ 13	Cross-sectional - online survey	Turkey	260 pregnant	EPDS scores $>$ 13: 35,4%
Lebel et al. (69)	EPDS $\geq$ 13	Cross-sectional - online survey	Canada	1987 pregnant	EPDS scores $\geq$ 13: 37%
Matsushima et al. (67)	EPDS $\geq$ 13	Cross-sectional - online survey	Japan	1777 pregnant	EPDS scores $\geq$ 13: 17%
Oskovi- Kaplan et al. (68)	EPDS $\geq$ 13	Cross-sectional	Turkey	223 women within 48h after birth	EPDS scores $\geq$ 13: 14,7%
Zanardo et al. (78)	EPDS $\geq$ 13	Non-concurrent case-control	Italy	91 within 48h after birth and a control-group of 101 women	EPDS scores $\geq$ 13: 28,6%
Ceulemans et al. (65)	EPDS $\geq$ 13 GAD7 $\geq$ 10	Cross-sectional - online survey	Multi-national**	3907 pregnant	EPDS scores $\geq$ 13: 15% GAD7 $\geq$ 10: 11%
Farrell et al. (73)	GAD7 $\geq$ 10	Cross-sectional - online survey	Qatar	288 pregnant	GAD7 $\geq$ 10: 16%
Preis et al. (74)	GAD7 $\geq$ 10	Cross-sectional - online survey	USA	788 pregnant	GAD7 $\geq$ 10: 43,3%
Zhou et al. (79)	GAD7 $\geq$ 7	Case-control - online survey	China	544 pregnant and 315 non-pregnant	GAD7 $\geq$ 7: 6,8% (17,5% in non-pregnant control group)

\* Some respondents were from: UK, USA, Australia, India, Brazil, Germany, China, France

\*\* Respondents were from Ireland, Norway, Switzerland, the Netherlands, UK

### **5.3 Economic consequences**

The participants were asked whether their economy had been impacted by the pandemic, the possible responses were: “Yes, for me”, “Yes, for partner”, “Yes, for both” and “None”. When analysing the results, we found a significantly higher EPDS score among women whose economy had been affected together with that of their partners, and a significantly lower among those who were not affected at all. The same was found when looking at the GAD-7 scores. Those who were personally affected scored significantly higher on GAD-7, but not on EPDS. This indicates, as previous studies have shown (82), that mental health and socioeconomic status are associated.

### **5.4 Young, first time mothers**

In our study population most women were around the mean age for first-time mothers in Norway, which was 29.9 in 2020 (83). When looking at the relationship between age and depressive symptoms, it appears that women under 25 years score higher on EPDS compared to the other age groups (EPDS $\geq$ 13: 23% vs. 13.2%,  $p=0.007$ ), but the difference was not statistically significant when using a Bonferroni correction. However, there was a significant difference when using cutoff 10 on EPDS. When looking at anxiety in participants in the different age groups, we found that more participants in the youngest age group scored 10 or above on GAD-7 compared to those over 25 years (GAD-7 $\geq$ 10: 38.3% vs. 18.5%,  $p<0.001$ ). Similarly, Berthelot et al. found higher levels of psychological symptoms in younger mothers than older mothers (77), while Ceulemans et al. found the opposite: increasing levels of stress with increasing age (65). When looking at primigravida vs multigravida, a review by Yan et al. found a higher level of anxiety with multigravida compared to primigravida using a subgroup analysis on two articles (80). In our study we found the opposite, higher levels of anxiety in nullipara compared to multipara (GAD-7 $\geq$ 10: 24.9% vs. 17.5%,  $p=0.013$ ). We found no difference in level of depressive symptoms related to parity. The same was found by Lebel et al. (69). There was a statistically significant higher proportion of those who were single that scored 10 or above on EPDS compared to those

who were married or had a partner, but no difference in those scoring 13 or above or when looking at GAD-7 scores.

## **5.5 The impact of education on depression and anxiety**

In our study we found that the prevalence of depression using EPDS $\geq$ 13 was 13.6% among those with a university degree, and 16.0% among others. These numbers are not statistically significant. When using the cutoff for EPDS of 10 or above, there is a statistically significant difference, with a lower prevalence among those with a university degree (EPDS $\geq$ 10: 22.3% vs. 30.4%,  $p=0.015$ ). When it comes to anxiety the prevalence among those with higher education were also lower than the rest (GAD-7 $\geq$ 10: 17.7% vs. 29.2%,  $p<0.001$ ). Education has previously been shown to have a significant impact on mental health (82). A study by Badellino et al. showed no difference in anxiety between participants with university level education and non-university education (84). They did however find a significant difference in depression prevalence between the two groups with 17.1% with moderate depression in the university group compared to 21.9% in the non-university group, for severe depression the rates were 5.1% and 7.7% respectively. Those with higher education usually have a stable economy and are not likely to lose their jobs during a crisis like the COVID-19 pandemic, such factors could influence their mental health.

## **5.6 Healthcare workers and mental health**

When looking at healthcare workers compared to non-healthcare workers, we have a statistically significant difference when using the threshold of 10 for EPDS, but not when using cutoff 13 (EPDS $\geq$ 10: 19% vs. 28.2%,  $p=0.005$ . EPDS $\geq$ 13: 11.7% vs. 15.8%  $p=0.118$ ). We found that the prevalence of anxiety among healthcare workers was significantly lower than non-healthcare professionals (GAD-7 $\geq$ 10: 15.7% vs 24.6%,  $p=0.004$ ). Badellino et al. showed that there is no significant difference in anxiety and stress between non-healthcare professionals and healthcare professionals (19.7% vs. 12.3%), but there is a significantly higher prevalence of moderate and severe depression in non-healthcare professionals compared to healthcare professionals (6.3% vs. 3.4%) (84). An article by Pappa et al. showed a different result (85). They reviewed findings in 13 different studies, from China and

Singapore, using different assessment methods with an overall prevalence of 23.3% of anxiety in healthcare workers. They comment that this is broadly comparable to the general population in China during the same period, showing the effects of the crisis on the whole population, and does not conclude on any significantly higher rates of anxiety among healthcare workers during this time of pandemic than the general population (85). During a pandemic, healthcare workers might be less likely to lose their jobs compared to other occupations. Additionally, more knowledge about the risks and complications of COVID-19 could lead to less worry among healthcare providers and thereby lower prevalence of anxiety and depression.

## 5.7 Minorities

In our study we found a difference in prevalence of anxiety between minorities and the rest of the population (GAD-7 $\geq$ 10: 40.7% vs. 20.7%,  $p=0.013$ ). The difference was not statistically significant when comparing those scoring 13 or above on EPDS, only when looking at those scoring 10 or above. Since we only had 27 (3.5%) women belonging to a minority population group, the low number of respondents may have influenced the outcome of the statistical analysis. An article by the Norwegian Directorate for Children, Youth and Families reports that compared with the rest of the population, immigrants, especially female immigrants, have a higher share of mental health issues (71). A similar difference was found by Shakeel et al. when comparing the prevalence and new onset of postpartum depression symptoms between a minority group and the western population, using EPDS (62). It might be reasonable to believe that such a difference between minority and majority populations may also exist during the pandemic.

## 5.8 Differences between counties

Participants in our study were located all over Norway. Compared to county population, the highest proportion came from *Troms og Finnmark*. This is as expected since the study is based at the *Arctic University of Norway*, in Tromsø.

We found no regional difference in EPDS and GAD-7 scores in Norway, even though the burden of disease and the number of positive cases vary among the counties. This is

consistent with findings from other studies. For example, in China, Wu et al. found no difference in the rate of depressive symptoms regardless of number of confirmed cases in the region (52). They believed that the rapid spread of information in the country neutralized the potential difference due to disease burden. In Italy a group of scientists found equally elevated worries through all regions, possibly even more in regions with low numbers of infected (86). The opposite was found by Zhang et al., they observed a difference between regions according to infection pressure (87). Whether or not there is a real regional difference, county of residence is probably not the most important factor affecting antenatal mental health during a pandemic. Media coverage, information flow, national levels of infection, societal acceptance of public health measures and social restrictions can be potential reasons for reduced differences in mental health issues between counties, despite regional differences in COVID-19 cases. The timing of the questionnaire might have impacted the results since the infection rate was quite low all over the country during the data collection period.

## **5.9 Isolation**

A review of 28 studies done by Brooks et al. studied the impact of quarantine on mental health (88). They found that quarantine can lead to a number of long-lasting psychological symptoms, such as depression, stress, low mood, insomnia, post-traumatic stress symptoms and anger.

In our study a high number of participants (n=652; 84%) reported having isolated themselves to a varying degree. The ones who had been in voluntary isolation scored higher on both depression and anxiety scores compared to the ones who had not isolated themselves (EPDS $\geq$ 13 16% vs. 5.7%, p=0.003. GAD-7 $\geq$ 10 23.6% vs. 9.8%, p=0.001). Considering this is a cross-sectional study, we do not know what is the cause and what is the effect - do the ones with poor mental health isolate themselves, or do they get poor mental health because of isolation?

In a cross-sectional study from Canada, researchers found increased levels of anxiety and depression associated with self-isolation and self-quarantine during the COVID-19 pandemic (89). They also found that elderly, who might be at higher risk for undesirable outcomes of COVID-19 infection are more likely to self-isolate and self-quarantine (89). Maybe an explanation for the high number of self-isolations among pregnant women in our study, might be that they feel at higher risk, even though they are not defined as a risk group in Norway. The participants who have been quarantined or isolated (not voluntary) showed significantly higher levels of anxiety than the ones who had not (GAD-7 $\geq$ 10: 30.7% vs. 19.4%,  $p=0.003$ ). They did not have a significantly higher prevalence of depression.

Only 2 (0.3%) pregnant women had been infected with the coronavirus, 28 (3.6%) women had someone in the family who had been infected and 200 (25.8%) knew someone who had been infected. These numbers are quite low, as expected considering the time the study was conducted.

## **5.10 Fear for the child's health**

Early on in the pandemic a research group in Italy identified different worries pregnant women had going into the new everyday life of infection control and quarantine (86). In general, pregnant women were more worried about the health of their family and unborn child, than fear for their own health. In our study 96 (12.4%) women answered that they were very worried about getting sick compared to 392 (50.6%) who were very worried about their child getting sick. This is in concordance with a Danish study that used a similar questionnaire (90).

## 5.11 Changes to the antenatal care

Almost 40% in this study had the impression that their maternity care has not proceeded as normal<sup>1</sup>. In a study from Denmark the researchers found that few of the pregnant women had missed a consultation with their midwife or general practitioner during the first month of lockdown: 5% of pregnant women had cancelled their appointment themselves, 3% had an appointment cancelled by their general practitioner and 15% by their midwife (90). Our numbers are a lot higher, but “normal” is not only related to the number of consultations. “Normal” could be that the consultations have been done online, that they could not bring their partner with them or that there were extra infection control measures leading to the women’s perception of the maternity care not being normal. The interesting part is that the women who had a “not-normal maternity care” also scored higher on both EPDS and GAD-7 compared to the group with perceived normal maternity care (EPDS $\geq$ 13: 19.8% vs. 10.7%,  $p=0.001$ . GAD-7 $\geq$ 10: 29.5% vs. 15.3%,  $p<0.001$ ). A similar difference was found in the group refraining from seeking healthcare compared to those who had not avoided seeking healthcare (EPDS $\geq$ 13: 26.2% vs. 12.6%,  $p<0.001$ . GAD-7 $\geq$ 10: 37.9% vs. 18.9%,  $p<0.001$ ) and in the group who reported not receiving healthcare when asking for it compared to the group who had received the healthcare they wanted (EPDS $\geq$ 13: 32% vs. 11%,  $p<0.001$ . GAD-7 $\geq$ 10: 35.2% vs. 18.9%,  $p<0.001$ ). Since this is a cross-sectional study, it is very difficult to say something about causality. Therefore, it is difficult to know if the women not receiving the healthcare they are searching for, have more depressive and anxiety symptoms or if those with more depression and anxiety symptoms avoid seeking healthcare. More detailed research on what is perceived abnormality in the antenatal care is needed to know how to improve maternity care during a pandemic.

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<sup>1</sup> The women themselves had to define what they perceived as normal and there were no follow up questions asking what had been abnormal.

## 5.12 The timing of the research and its impact on the results

The data collection period for this study was from June to September 2020, this was the time of the year with the fewest newly infected and most liberal restrictions. Using numbers from the NIPH (27) the mean of new daily positive tests in Norway during the data collection period was 29, with higher numbers towards the end of summer and the highest being 148 new cases on 31<sup>st</sup> August. Compared to the rest of the pandemic where the mean number of positive tests is 267 and the highest was reached on 22<sup>nd</sup> March 2021 with 1105 new cases<sup>2</sup>, we can see that the situation during the summer was very different from the rest of the year.

Many different epidemiological factors of the pandemic can affect the mental well-being of the population. A large cross-sectional study done by Zhang et al. found an increased odds ratio for depressive symptoms for people living in communities with a high number of infected compared to communities with lower numbers of confirmed cases (87). In Argentina a high prevalence of depressive symptoms was found by Badellino et al. even at a time with low number of confirmed cases (84). The authors' theory is that other factors, such as large number of positive cases in Europe, many travellers, and a suboptimal healthcare system, increase the depressive symptoms even though Argentina had few infected. Infection control measures, such as social isolation, may impact mental well-being. Benke et al. found: *"A higher level of restriction due to public health measures was associated with higher loneliness, higher psychosocial distress, and lower life-satisfaction"* (91). Similarly, in a study sample from Asia, Africa and Europe, Ammar et al. found an increase in depressive symptoms and lower mental well-being related to restrictions such as home confinement (92).

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<sup>2</sup> The dates used are 21<sup>st</sup> February 2020, when the first case in Norway was detected, until 25<sup>th</sup> May 2021. See Appendix 2 for infection graphs.



Both restrictions and the number of positive cases may impact the well-being of the population. Low number of positive cases and few restrictions during the data collection period might have impacted our results.

## **5.13 Study sample**

### **5.13.1 The impact of education on depression and anxiety**

Among the participants of our study there is an unusually high number of participants with a university degree. In Norway about 34.6% of the population have higher education, meaning college and university (93), compared to 67.7% among the respondents in our study.

### **5.13.2 Healthcare workers and mental health**

We also have a high percentage of healthcare workers (35.4%) among our respondents. In Norway about 22.3% of the finished degrees in higher education in 2019 were in health-, social- and sports subjects (94). When comparing the number of healthcare personnel with an authorization in 2018 with the population between 18 and 66 years old, the share of healthcare professionals in Norway was 14.5% (95, 96). It is hard to find the exact number of healthcare workers, as everyone working in healthcare sector does not have/need authorization, but either way we can see that we have a quite high number of healthcare workers in our study population compared to the general Norwegian population.

### **5.13.3 Minorities**

Another factor that might have an impact on our results is the fact that only 3.5% of the participants answered that they belong to a minority. In the term minority we have both the national minorities<sup>3</sup> and immigrants (97). 18.5% of the Norwegian population are immigrants or children of immigrants (98). Given these numbers, we would have expected a higher share of minorities in the study population.

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<sup>3</sup> In Norway these are Kvens/Norwegian Finns, Jews, forest Finns, Romans and Romani people

We acknowledge some selection bias in our study. Since those with lower education, non-healthcare workers and minorities tend to score higher on EPDS and GAD-7, the proportion of those scoring above cutoff might have been higher if we had more respondents belonging to these categories.

### **5.14 Internal validity**

Our study might be generalizable to Norwegian pregnant population. However, we had a larger share of participants with university level education and healthcare workers, and a small number of minorities, which makes the study population differ slightly from the general population. The fact that we have participants from all over the country makes the internal validity stronger.

### **5.15 External validity**

Our study might be valid for other Scandinavian countries, such as Sweden, Denmark and Finland, or other countries similar to Norway regarding economic status and healthcare system. However, our findings are unlikely to be generalizable in countries with larger multi-ethnic populations, lower and lower-middle income countries, or countries with significantly different healthcare systems.

### **5.16 Strengths and limitations**

One important limitation of our study is that we have no control-group of non-pregnant women. Our findings can only be compared to other studies and pre-pandemic prevalence of anxiety and depression among pregnant populations. This makes it difficult to conclude whether or not pregnant women have more anxiety and depression than other women during the COVID-19 pandemic.

With a cross-sectional study design, it is impossible to say something about causality since both exposure and outcome are recorded at the same time. Such a study design is suitable to find the prevalence, but not to find the reasons leading to it.

Another limitation is that the questionnaire was administered online. This makes it vulnerable for self-selection bias. Pregnant women identifying themselves with the researchers or those who are passionate about pregnant women's situation during the pandemic might be more inclined to participate than other women. This might be a reason why the proportion of healthcare professionals was higher in our sample population. In general people with higher education and greater socioeconomic status have a greater tendency to participate in such studies. Furthermore, the questionnaire was in Norwegian and a language barrier might make answering more difficult for non-Norwegian speaking, minority women. With an online questionnaire it is also difficult to confirm or deny desirability and ascertainment bias.

EPDS and GAD-7 are both validated self-reporting questionnaires and have been widely used both before and during the pandemic. However, the questions regarding women's self-reported impact of COVID-19 pandemic on their health and well-being were developed by the medical students and have not been validated. Some of those questions were deficient and were not suitable for further analysis.

The strengths with it being an online survey was that it allowed for rapid recruitment of pregnant women from many different geographic areas in Norway, not only from *Troms og Finnmark* county. Internet-based convenient sampling method was chosen due to the limited time and uncertainty of the duration of the pandemic. Another strength is that a large sample size was reached, almost four times larger than estimated in May 2020. Furthermore, the responses to the questions provided by the participants were complete and there were very few missing values.

## **6 Implications**

Pregnant women are known to be at increased risk for anxiety and depression, and this study indicates that risk is further aggravated by the COVID-19 pandemic. It highlights the importance of healthcare professionals recognizing pregnant women at risk for developing a mental illness. Especial care should be taken for young, lower educated women or women belonging to a minority, as they appear to be at higher risk for anxiety and depression. It is important to acknowledge pregnant women's fears for example for their child and help them cope with it in the best way possible. Women living with anxiety or depression should be identified to be able to treat them and thereby prevent severe consequences for mother and child.

## 7 Conclusion

In this study, we found a high prevalence of depression and anxiety symptoms in a population of pregnant women in Norway during the COVID-19 pandemic. Especially high prevalence was found in the youngest age group, those with lower education levels and those working outside the healthcare system. It appears that women in Norway have been less affected by the pandemic than women in many other countries. Nevertheless, this study indicates that a large number of pregnant women experience mental health issues during the COVID-19 pandemic, possibly due to the isolation, restrictions and changes to the antenatal care that the pandemic has brought on.

Other findings were that the pregnant women were more worried about their unborn child than their own health. Even though the study was conducted at a time with low levels of infection in Norway, a substantial proportion of pregnant women chose to isolate themselves from other people to avoid infection. Many felt their antenatal care had not been normal and some have avoided contact with healthcare professionals due to fear of infection.

Pregnant women are at a vulnerable period in life with many changes occurring physically and mentally. We suspect that the prevalence of anxiety and depression in our study might have been higher if we had a study population consisting of more participants with lower education, less healthcare workers and more minorities, and also if the study had been done at a different time during the pandemic. More research is needed in this field with larger population samples that include more marginalized groups both during and after the pandemic. Some studies have indicated that pregnant women cope with the pandemic better than non-pregnant women, and it would be interesting to explore such differences in Norway by doing a similar study, using a control group of non-pregnant women. Such a study would provide more accurate information about the effects of COVID-19 on pregnant women's mental health.

## 8 References

1. Reneflot A, Skurtveit, S., Handal, M., Torvik, F., Torgersen, L., Gustavson, K., et al. Mental illness among adults [Online document]. Oslo: Norwegian Institute of Public Health; 2019 [updated 04. September 2019; cited 09. April 2021. Available from: <https://www.fhi.no/en/op/hin/mental-health/psykisk-helse-hos-voksne/>.
2. World Health Organization. Depression [Online document]. World Health Organization; 2020 [updated 30. January 2020; cited 25. april 2021. Available from: <https://www.who.int/news-room/fact-sheets/detail/depression>.
3. Jacobi F, Höfler M, Strehle J, Mack S, Gerschler A, Scholl L, et al. Twelve-months prevalence of mental disorders in the German Health Interview and Examination Survey for Adults - Mental Health Module (DEGS1-MH): a methodological addendum and correction. *Int J Methods Psychiatr Res.* 2015;24(4):305-13.
4. Kessler RC, Chiu WT, Demler O, Merikangas KR, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry.* 2005;62(6):617-27.
5. Woody CA, Ferrari AJ, Siskind DJ, Whiteford HA, Harris MG. A systematic review and meta-regression of the prevalence and incidence of perinatal depression. *J Affect Disord.* 2017;219:86-92.
6. National Institute for Health and Care Excellence. Antenatal and postnatal mental health: clinical management and service guidance [Online document]. National Institute for Health and Care Excellence; 2014 [updated 11. February 2020; cited 06. April 2021. NICE clinical guideline 192:[Available from: <https://www.nice.org.uk/guidance/cg192>.
7. Larun L, Lyngstadaas A, Wiik I, Mørland B. Svangerskap og psykisk helse. Kvinners psykiske helse i forbindelse med svangerskap og første året etter fødsel. Oslo: Nasjonalt kunnskapssenter for helsetjenesten; 2005. Contract No.: 2:2005.
8. Steen TB, Nordeng H, Nerum H, Eberhard-Gran M, Lyng S. Mental helse i svangerskapet [Online document]. Norsk gynekologisk forening; 2020 [updated 17. February 2020; cited 06. April 2021. Available from: <https://www.legeforeningen.no/foreningsledd/fagmed/norsk-gynekologisk-forening/veiledere/veileder-i-fodselsjelp/mental-helse-i-svangerskapet/>.
9. Martini J, Petzoldt J, Einsle F, Beesdo-Baum K, Höfler M, Wittchen H-U. Risk factors and course patterns of anxiety and depressive disorders during pregnancy and after delivery: A prospective-longitudinal study. *J Affect Disord.* 2015;175:385-95.
10. Grigoriadis S, VonderPorten EH, Mamisashvili L, Tomlinson G, Dennis CL, Koren G, et al. The impact of maternal depression during pregnancy on perinatal outcomes: a systematic review and meta-analysis. *J Clin Psychiatry.* 2013;74(4):e321-41.
11. Shahhosseini Z, Pourasghar M, Khalilian A, Salehi F. A Review of the Effects of Anxiety During Pregnancy on Children's Health. *Mater Sociomed.* 2015;27(3):200-2.
12. Cox JL, Holden JM, Sagovsky R. Detection of Postnatal Depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry.* 1987;150(6):782-6.
13. Cox J. Perinatal mental health : a guide to the Edinburgh Postnatal Depression Scale (EPDS). Holden J, editor. London: Gaskell; 2003.
14. Centre of Perinatal Excellence. Using the EPDS as a screening tool [Online document]. Australia: Centre of Perinatal Excellence; 2021 [cited 25. April 2021. Available from:

<https://www.cope.org.au/health-professionals/health-professionals-3/calculating-score-epds/>.

15. Norsk Elektronisk Legehåndbok. Edinburgh postnatal depresjonsskår (EPDS) [Online document]. Norsk Elektronisk Legehåndbok; 2021 [updated 10. December 2020; cited 25. April 2021]. Available from: <https://legehandboka-no.mime.uit.no/handboken/skjema-kalkulatorer/skjema/psykiatri/edinburgh-postnatal-depresjonsskar/>.
16. Eberhard-Gran M, Eskild A, Tambs K, Schei B, Opjordsmoen S. The Edinburgh Postnatal Depression Scale: validation in a Norwegian community sample. *Nord J Psychiatry*. 2001;55(2):113-7.
17. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A Brief Measure for Assessing Generalized Anxiety Disorder: The GAD-7. *Ann Intern Med*. 2006;166(10):1092-7.
18. Ruiz MA, Zamorano E, García-Campayo J, Pardo A, Freire O, Rejas J. Validity of the GAD-7 scale as an outcome measure of disability in patients with generalized anxiety disorders in primary care. *J Affect Disord*. 2011;128(3):277-86.
19. Gong Y, Zhou H, Zhang Y, Zhu X, Wang X, Shen B, et al. Validation of the 7-item Generalized Anxiety Disorder scale (GAD-7) as a screening tool for anxiety among pregnant Chinese women. *J Affect Disord*. 2021;282:98-103.
20. Soto-Balbuena C, Rodríguez-Muñoz MF, Le HN. Validation of the Generalized Anxiety Disorder Screener (GAD-7) in Spanish Pregnant Women. *Psicothema*. 2021;33(1):164-70.
21. Zhong QY, Gelaye B, Zaslavsky AM, Fann JR, Rondon MB, Sánchez SE, et al. Diagnostic Validity of the Generalized Anxiety Disorder - 7 (GAD-7) among Pregnant Women. *PLoS One*. 2015;10(4):e0125096.
22. Simpson W, Glazer M, Michalski N, Steiner M, Frey BN. Comparative efficacy of the generalized anxiety disorder 7-item scale and the Edinburgh Postnatal Depression Scale as screening tools for generalized anxiety disorder in pregnancy and the postpartum period. *Can J Psychiatry*. 2014;59(8):434-40.
23. Ciotti M, Angeletti S, Minieri M, Giovannetti M, Benvenuto D, Pascarella S, et al. COVID-19 Outbreak: An Overview. *Chemotherapy*. 2020:1-9.
24. Stasi C, Fallani S, Voller F, Silvestri C. Treatment for COVID-19: An overview. *Eur J Pharmacol*. 2020;889:173644.
25. Johns Hopkins Coronavirus Resource Center. Global map [Online document]. COVID-19 Map - Johns Hopkins Coronavirus Resource Center; [updated 28. May 2021; cited 28. May 2021]. Available from: <https://coronavirus.jhu.edu/map.html>.
26. Helsedirektoratet. Helsedirektoratet har vedtatt omfattende tiltak for å hindre spredning av Covid-19 [Online document]. Oslo: Helsedirektoratet; 2020 [updated 12. April 2020; cited 19. April 2021]. Available from: <https://www.helsedirektoratet.no/nyheter/helsedirektoratet-har-vedtatt-omfattende-tiltak-for-a-hindre-spredning-av-covid-19>.
27. National Institute of Public Health. Statistikk om koronavirus og covid-19 [Online document]. Oslo: National Institute of Public Health; 2020 [updated 28. May 2021; cited 19. April 2021]. Available from: <https://www.fhi.no/sv/smittsomme-sykdommer/corona/dags--og-ukerapporter/dags--og-ukerapporter-om-koronavirus/>.
28. Westgren M, Pettersson K, Hagberg H, Acharya G. Severe maternal morbidity and mortality associated with COVID-19: The risk should not be downplayed. *Acta Obstet Gynecol Scand*. 2020;99(7):815-6.

29. National Institute of Public Health. Råd og informasjon for gravide og ammende [Online document]. Oslo: National Institute of Public Health; 2021 [updated 03. March 2021; cited 24. April 2021]. Available from: <https://www.fhi.no/nettpub/coronavirus/fakta/rad-for-gravide-og-ammende/>.
30. Yngre Læger. Coronavirus / COVID-19 og din arbejdsplads [Online document]. Copenhagen: Yngre Læger; 2021 [updated 28. April 2021; cited 31. May 2021]. Available from: <https://www.laeger.dk/coronavirus-og-din-arbejdsplads#gravid%20-%20risikogruppe>.
31. Finnish institute for health and welfare. Pregnancy and coronavirus [Online document]. Helsinki: Finnish institute for health and welfare; 2020 [updated 24. September 2020; cited 31. May 2021]. Available from: <https://thl.fi/en/web/infectious-diseases-and-vaccinations/what-s-new/coronavirus-covid-19-latest-updates/pregnancy-and-coronavirus>.
32. Finnish institute for health and welfare. Suitability of COVID-19 vaccines for various groups [Online document]. Helsinki: Finnish institute for health and welfare; 2021 [updated 17. March 2021; cited 31. May 2021]. Available from: <https://thl.fi/en/web/infectious-diseases-and-vaccinations/what-s-new/coronavirus-covid-19-latest-updates/transmission-and-protection-coronavirus/vaccines-and-coronavirus/suitability-of-covid-19-vaccines-for-various-groups>.
33. Embætti landlæknis (Directorate of Health). Vaccination against COVID - FAQs [Online document]. Reykjavík: Landlæknir; 2021 [updated 15. February 2021; cited 31. May 2021]. Available from: <https://www.landlaeknir.is/um-embattid/greinar/grein/item44019/vaccination-against-covid-19>.
34. Folkhälsomyndigheten. Om covid-19 för gravida [Online document]. Folkhälsomyndigheten; 2021 [updated 28. April 2021; cited 31. May 2021]. Available from: <https://www.folkhalsomyndigheten.se/smittskydd-beredskap/utbrott/aktuella-utbrott/covid-19/skydda-dig-och-andra/gravida/>.
35. Folkhälsomyndigheten. Frågor och svar om vaccination mot covid-19 [Online document]. Folkhälsomyndigheten; 2021 [updated 27. May 2021; cited 31. May 2021]. Available from: <https://www.folkhalsomyndigheten.se/smittskydd-beredskap/utbrott/aktuella-utbrott/covid-19/vaccination-mot-covid-19/fragor-och-svar-om-vaccination-mot-covid-19/>.
36. Federal Office of Public Health. Coronavirus: People at especially high risk [Online document]. Federal Office of Public Health; 2021 [updated 6. April 2021; cited 31. May 2021]. Available from: <https://www.bag.admin.ch/bag/en/home/krankheiten/ausbrueche-epidemien-pandemien/aktuelle-ausbrueche-epidemien/novel-cov/krankheit-symptome-behandlung-ursprung/besonders-gefaehrdete-menschen.html#-955308326>.
37. Federal Office of Public Health. Coronavirus: Vaccination [Online document]. Federal Office of Public Health; 2021 [cited 31. May 2021]. Available from: <https://www.bag.admin.ch/bag/en/home/krankheiten/ausbrueche-epidemien-pandemien/aktuelle-ausbrueche-epidemien/novel-cov/impfen.html#-995735508>.
38. NHS. Pregnancy and coronavirus (COVID-19) [Online document]. NHS; 2021 [updated 29. April 2021; cited 31. May 2021]. Available from: <https://www.nhs.uk/conditions/coronavirus-covid-19/people-at-higher-risk/pregnancy-and-coronavirus/>.
39. Government Digital Service. COVID-19 vaccination: a guide for all women of childbearing age, pregnant or breastfeeding [Online document]. GOV.UK; 2021 [updated 23.



April 2021; cited 31. May 2021. Available from:

<https://www.gov.uk/government/publications/covid-19-vaccination-women-of-childbearing-age-currently-pregnant-planning-a-pregnancy-or-breastfeeding/covid-19-vaccination-a-guide-for-women-of-childbearing-age-pregnant-planning-a-pregnancy-or-breastfeeding>.

40. Centers for Disease Control and Prevention. Pregnant People. At increased risk for severe illness from COVID-19. [Online document]. Centers for Disease Control and Prevention; 2021 [updated 5. March 2021; cited 31. May 2021. Available from:

<https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/pregnant-people.html>.

41. Huntley BJF, Mulder IA, Di Mascio D, Vintzileos WS, Vintzileos AM, Berghella V, et al. Adverse Pregnancy Outcomes Among Individuals With and Without Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2): A Systematic Review and Meta-analysis. *Obstet Gynecol.* 2021;137(4):585-96.

42. World Health Organization. Increasing understanding of the impact of COVID-19 for pregnant women and their babies [Departmental News]. World Health Organization; 2020 [updated 1. September 2020; cited 1. May 2021. Available from:

<https://www.who.int/news/item/01-09-2020-increasing-understanding-of-the-impact-of-covid-19-for-pregnant-women-and-their-babies>.

43. Allotey J, Stallings E, Bonet M, Yap M, Chatterjee S, Kew T, et al. Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis. *BMJ.* 2020;370:m3320.

44. Lang A, Klingenberg C, Greve-Isdahl M, Rønnestad A. Rutiner for håndtering av barn av fødekvinne med påvist /mulig covid-19 infeksjon V-4 [Rutine]. Legeforeningen; 2020 [updated 16. November 2020; cited 24. April 2021. Available from:

[https://www.legeforeningen.no/contentassets/7fe2786b43cb44a9a3affe4a8f944d75/covid19\\_fode\\_nyfødt\\_v4\\_16.11.20.pdf](https://www.legeforeningen.no/contentassets/7fe2786b43cb44a9a3affe4a8f944d75/covid19_fode_nyfødt_v4_16.11.20.pdf).

45. Den Norske Jordmorforening. Nyttig informasjon om covid-19 [Online document]. Den Norske Jordmorforening2020 [updated 30. March 2020; cited 21. April 2021. Available from: <https://www.jordmorforening.no/informasjon-om-korona/nyttig-informasjon-om-covid-19>.

46. Tromsø kommune. Jordmortjenesten [Online document]. Tromsø: Tromsø kommune; 2012 [updated 21. December 2020.; cited 21. April 2021. Available from:

<https://www.tromso.kommune.no/jordmortjenesten.121916.no.html>.

47. Universitetssykehuset Nord-Norge. Besøksregler ved UNN [Online document].

Tromsø: Universitetssykehuset Nord-Norge; 2020 [updated 19. February 2021; cited 21. April 2021. Available from: <https://unn.no/koronavirus/besoksregler-ved-unn>.

48. Helse Bergen. Informasjon til fødende under koronapandemien [Online document].

Bergen: helse-bergen.no; 2020 [updated 12. March 2021; cited 13. May 2021. Available from: <https://helse-bergen.no/avdelinger/kvinneklubben/informasjon-til-fodende-under-koronapandemien#forskning-under-koronapandemien>.

49. Oslo Universitetssykehus. Fødeavdelingen [Online document]. Oslo: Oslo

Universitetssykehus; [updated 25. January 2021; cited 13. May 2021. Available from:

<https://oslo-universitetssykehus.no/avdelinger/kvinneklubben/fodeavdelingen#viktig-informasjon-om-koronasituasjonen-ved-fode--og-barselseksjonene-pa-ous>.

50. St. Olavs Hospital. Informasjon til fødende [Online document]. Trondheim: stolav.no; 2020 [updated 26. March 2021; cited 13. May 2021. Available from: <https://stolav.no/nyheter/2020/informasjon-til-fodende>.
51. Sykehuset i Vestfold. Informasjon til fødende [Online document]. Tønsberg: Sykehuset i Vestfold; 2020 [updated 12. May 2021; cited 28. May 2021. Available from: <https://www.siv.no/informasjon-om-koronavirus-til-pasienter-besokende-og-ansatte/informasjon-til-fodende>.
52. Wu Y, Zhang C, Liu H, Duan C, Li C, Fan J, et al. Perinatal depressive and anxiety symptoms of pregnant women during the coronavirus disease 2019 outbreak in China. *Am J Obstet Gynecol.* 2020;223(2):240.e1-e9.
53. Haruna M, Nishi D. Perinatal mental health and COVID-19 in Japan. *Psychiatry Clin Neurosci.* 2020;74(9):502-3.
54. Hessami K, Romanelli C, Chiurazzi M, Cozzolino M. COVID-19 pandemic and maternal mental health: a systematic review and meta-analysis.: *J Matern Fetal Neonatal Med.* 2020:1-8.
55. Kotabagi P, Fortune L, Essien S, Nauta M, Yoong W. Anxiety and depression levels among pregnant women with COVID-19. *Acta Obstet Gynecol Scand.* 2020;99(7):953-4.
56. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med.* 2001;16(9):606-13.
57. Eberhard-Gran M, Slinning K, Rognerud M. Screening for postnatal depression--a summary of current knowledge. *Tidsskr Nor Laegeforen.* 2014;134(3):297-301.
58. Norsk forening for kognitiv terapi. Generalisert angstlidelse [Online document]. Hønefoss: kognitiv.no; [cited 13. May 2021. Available from: <https://www.kognitiv.no/kognitiv-terapi/verktoykasse/gad-7/>.
59. Clinical.com. Sample Size Calculator Clinical.com [Available from: <https://clinical.com/Stats/SampleSize.aspx>.
60. Lupattelli A, Twigg MJ, Zagorodnikova K, Moretti ME, Drozd M, Panchaud A, et al. Self-reported perinatal depressive symptoms and postnatal symptom severity after treatment with antidepressants in pregnancy: a cross-sectional study across 12 European countries using the Edinburgh Postnatal Depression Scale. *J Clin Epidemiol.* 2018;10:655-69.
61. Eberhard-Gran M, Tambs K, Opjordsmoen S, Skrondal A, Eskild A. Depression during pregnancy and after delivery: a repeated measurement study. *J Psychosom Obstet Gynecol.* 2004;25(1):15-21.
62. Shakeel N, Sletner L, Falk RS, Slinning K, Martinsen EW, Jenum AK, et al. Prevalence of postpartum depressive symptoms in a multiethnic population and the role of ethnicity and integration. *J Affect Disord.* 2018;241:49-58.
63. Nordeng H, Hansen C, Garthus-Niegel S, Eberhard-Gran M. Fear of childbirth, mental health, and medication use during pregnancy. *Arch Womens Ment Health.* 2012;15(3):203-9.
64. Dørheim SK, Bjorvatn Br, Eberhard-Gran M. Insomnia and Depressive Symptoms in Late Pregnancy: A Population-Based Study. *Behav Sleep Med.* 2012;10(3):152-66.
65. 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 Obstet Gynecol Scand.* 2021.
66. Davenport MH, Meyer S, Meah VL, Strynadka MC, Khurana R. Moms Are Not OK: COVID-19 and Maternal Mental Health. *Front Glob Women's Health.* 2020;1(1).

67. Matsushima M, Horiguchi H. The COVID-19 Pandemic and Mental Well-Being of Pregnant Women in Japan: Need for Economic and Social Policy Interventions. *Disaster Med Public Health Prep.* 2020;1-6.
68. Oskovi-Kaplan ZA, Buyuk GN, Ozgu-Erdinc AS, Keskin HL, Ozbas A, Moraloglu Tekin O. The Effect of COVID-19 Pandemic and Social Restrictions on Depression Rates and Maternal Attachment in Immediate Postpartum Women: a Preliminary Study. *Psychiatr Q.* 2021;92(2):675-82.
69. Lebel C, MacKinnon A, Bagshawe M, Tomfohr-Madsen L, Giesbrecht G. Elevated depression and anxiety symptoms among pregnant individuals during the COVID-19 pandemic. *J Affect Disord.* 2020;277:5-13.
70. Durankuş F, Aksu E. Effects of the COVID-19 pandemic on anxiety and depressive symptoms in pregnant women: a preliminary study. *J Matern Fetal Neonatal Med.* 2020:1-7.
71. Barne- ungdoms- og familiedirektoratet. Helse og livskvalitet blant samer, nasjonale minoriteter og personer med innvandrerbakgrunn Bufdir: Bufdir; 2020 [updated 14 December 2020; cited 2021 May 6]. Available from: [https://bufdir.no/Statistikk\\_og\\_analyse/Etnisitet/helse\\_og\\_livskvalitet/#heading80029](https://bufdir.no/Statistikk_og_analyse/Etnisitet/helse_og_livskvalitet/#heading80029).
72. Leung B, Letourneau N, Bright K, Giesbrecht GF, Ntanda H, Gagnon L. Appraisal of the Psychiatric Diagnostic Screening Questionnaire in a perinatal cohort: The APrON study. *Scand J Public Health.* 2017;45(6):658-65.
73. Farrell T, Reagu S, Mohan S, Elmidany R, Qaddoura F, Ahmed EE, et al. The impact of the COVID-19 pandemic on the perinatal mental health of women. *J Perinat Med.* 2020;48(9):971-6.
74. Preis H, Mahaffey B, Heiselman C, Lobel M. Pandemic-related pregnancy stress and anxiety among women pregnant during the coronavirus disease 2019 pandemic. *Am J Obstet Gynecol.* 2020;2(3):100155.
75. 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 Res.* 2021;295:113567.
76. Ayaz R, Hocaoglu M, Günay T, Yardımcı Od, Turgut A, Karateke A. Anxiety and depression symptoms in the same pregnant women before and during the COVID-19 pandemic. *J Perinat Med.* 2020;48(9):965-70.
77. Berthelot N, Lemieux R, Garon-Bissonnette J, Drouin-Maziade C, Martel É, Maziade M. Uptrend in distress and psychiatric symptomatology in pregnant women during the coronavirus disease 2019 pandemic. *Acta Obstet Gynecol Scand.* 2020;99(7):848-55.
78. Zanardo V, Manghina V, Giliberti L, Vettore M, Severino L, Straface G. Psychological impact of COVID-19 quarantine measures in northeastern Italy on mothers in the immediate postpartum period. *Int J Gynaecol Obstet* 2020;150(2):184-8.
79. Zhou Y, Shi H, Liu Z, Peng S, Wang R, Qi L, et al. The prevalence of psychiatric symptoms of pregnant and non-pregnant women during the COVID-19 epidemic. *Transl Psychiatry.* 2020;10(1):319.
80. Yan H, Ding Y, Guo W. Mental Health of Pregnant and Postpartum Women During the Coronavirus Disease 2019 Pandemic: A Systematic Review and Meta-Analysis. *Front Psychol.* 2020;11(3324).

81. Fan S, Guan J, Cao L, Wang M, Zhao H, Chen L, et al. Psychological effects caused by COVID-19 pandemic on pregnant women: A systematic review with meta-analysis. *Asian J Psychiatr.* 2021;56:102533.
82. Rognerud M, Strand B, Dalgard O. Psykisk helse i Helse- og levekårsundersøkelsen i 1998. I. Sosioøkonomiske forskjeller i psykisk helse og livsstil. *Norsk Epidemiologi.* 2009.
83. Statistisk sentralbyrå. Fødte [Online database]. Statistisk sentralbyrå; [updated 11. March 2021; cited 26. April 2021. Available from: <https://www.ssb.no/fodte>.
84. Badellino H, Gobbo ME, Torres E, Aschieri ME. Early indicators and risk factors associated with mental health problems during COVID-19 quarantine: Is there a relationship with the number of confirmed cases and deaths? *Int J Soc Psychiatry.* 2020;20764020966020.
85. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsis E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain Behav Immun.* 2020;88:901-7.
86. Ravaldi C, Wilson A, Ricca V, Homer C, Vannacci A. Pregnant women voice their concerns and birth expectations during the COVID-19 pandemic in Italy. *Women Birth.* 2020.
87. Zhang X-R, Huang Q-M, Wang X-M, Cheng X, Li Z-H, Wang Z-H, et al. Prevalence of anxiety and depression symptoms, and association with epidemic-related factors during the epidemic period of COVID-19 among 123,768 workers in China: A large cross-sectional study. *J Affect Disord.* 2020;277:495-502.
88. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet.* 2020;395(10227):912-20.
89. Nkire N, Mrklas K, Hrabok M, Gusnowski A, Vuong W, Surood S, et al. COVID-19 Pandemic: Demographic Predictors of Self-Isolation or Self-Quarantine and Impact of Isolation and Quarantine on Perceived Stress, Anxiety, and Depression. *Front Psychiatry.* 2021;12:553468.
90. Overbeck G, Graungaard AH, Rasmussen IS, Andersen JH, Ertmann RK, Kragstrup J, et al. Pregnant women's concerns and antenatal care during COVID-19 lock-down of the Danish society. *Danish Medical J.* 2020;67(12).
91. Benke C, Autenrieth LK, Asselmann E, Pané-Farré CA. Lockdown, quarantine measures, and social distancing: Associations with depression, anxiety and distress at the beginning of the COVID-19 pandemic among adults from Germany. *Psychiatry Res.* 2020;293:113462.
92. Ammar A, Mueller P, Trabelsi K, Chtourou H, Boukhris O, Masmoudi L, et al. Psychological consequences of COVID-19 home confinement: The ECLB-COVID19 multicenter study. *PLoS One.* 2020;15(11):e0240204.
93. Statistisk sentralbyrå. Befolkningens utdanningsnivå ssb: ssb; 2020 [updated 19 June 2020; cited 2021 25 April]. Available from: <https://www.ssb.no/utniv/>.
94. Statistisk sentralbyrå. Fortsatt flest utdannet i helsefag: Statistisk sentralbyrå; 2019 [updated 8. May 2019; cited 25. April 2021. Available from: <https://www.ssb.no/utdanning/artikler-og-publikasjoner/fortsatt-flest-utdannet-i-helsefag>.

95. Helsetilsynet. Oversikt over helsepersonell [Online document]. Oslo: Helsetilsynet; 2019 [updated 5. May 2019; cited 6. May 2021. Available from: <https://www.helsetilsynet.no/tilsyn/om-tilsynssaker/oversikt-over-helsepersonell/>.
96. Helsedirektoratet. Årsrapport 2018. Oslo: Helsedirektoratet, Helsedirektoratet; 2020 3. December 2020.
97. Regjeringen. Nasjonale minoriteter [Online document]. Regjeringen; 2021 [cited 25. April 2021. Available from: <https://www.regjeringen.no/no/tema/urfolk-og-minoriteter/nasjonale-minoriteter/id1404/>.
98. Statistisk sentralbyrå. Innvandrere og norskfødte med innvandrerforeldre [Online document]. Statistisk sentralbyrå; 2021 [updated 9. March 2021; cited 25. April 2021. Available from: <https://www.ssb.no/befolkning/statistikker/innvbef/aar>.

## 9 Appendix

### 9.1 Appendix 1: Organizations and Facebook-groups sharing the questionnaire

#### Facebook-groups:

- Gravid i corona tider
- Termin September 2020
- Termin Oktober 2020
- Termin Bodø og omegn 2019/2020
- Termin 2020 Fauske
- Termin 2020 Haugalandet
- Termin Rogaland 2020
- Termin 2020 Mo i Rana
- Termin Harstad 2020
- Termin 2020 Aust-Agder
- Gravid Ørsta/Volda termin 2020
- Termin 2020 Mosjøen
- Tromsø Ultralyd for gravide på facebook
- Babyer 2020 (delt av Tromsø ultralyd)
- Termin November 2020 Norge
- Termin Desember 2020 Norge
- Termin Januar 2021 Norge

#### Snapchat:

- MOMS
- Foreldre squad

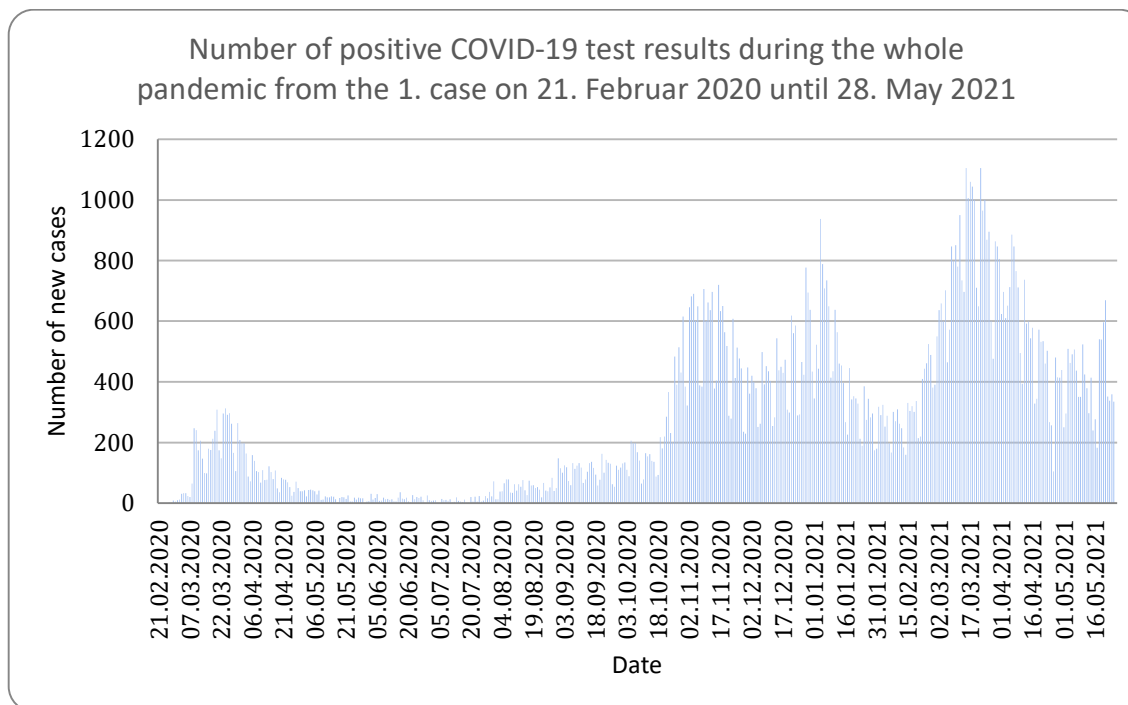
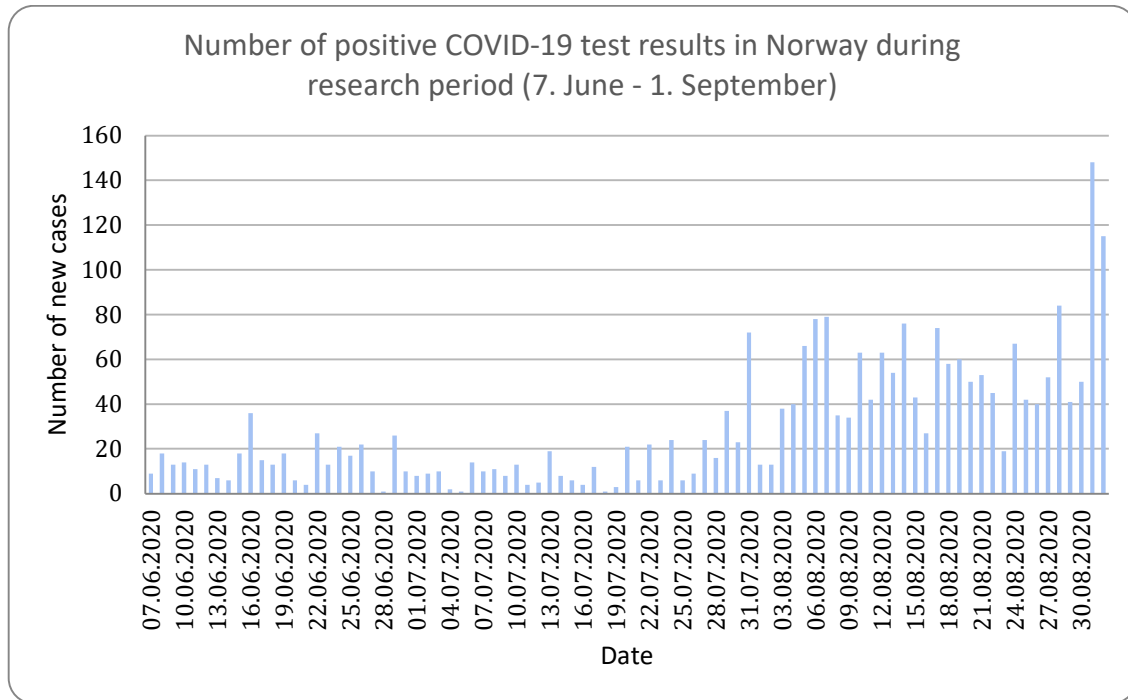
#### Forum:

- Kvinneguiden Forum
- Foreldreforum

#### Organizations:

- Tromsø Ultralyd for gravide
- Landsforeningen 1001 dager
- Fødselsfestivalen
- Jordmorteamet følger deg trygt gjennom graviditet, fødsel og barseltid -
- Jordmornaturligvis
- Ultralydklinikken AS - Ultralyd for gravide ([post@ultralydklinikken.no](mailto:post@ultralydklinikken.no))
- Ultralydjordmoren (Sandvika)
- Jordmorforbundet NSF
- Praxisklinikkene (Oslo)
- Jordmor Kjersti (Bergen)
- Frøyaklinikken
- LUB Hordaland
- Vansjøklinikken

## 9.2 Appendix 2: Graphs of positive COVID-19 tests



### 9.3 Appendix 3: Questionnaire



# COVID-19 pandemiens effekt på gravides mentale helse: en observasjonsstudie

Hva er din e-postadresse?

Hvor gammel er du?

År

Hvilket fylke bor du i?

Når var din siste menstruasjon?

Første dag i siste menstruasjon

Hvilken svangerskapsuke er du i?

Når har du termin?

Ultralyd bestemt dato

Hva er din sivilstatus?

Gift

Samboer

Enslig



Annet

Hvor mange barn har du?

Ikke inkludert denne graviditeten



Ingen



Et barn



To eller flere

Hvilket utdanningsnivå har du?

Siste fullførte



Grunnskole



Videregående



Universitet



Yrkesfag



Annet

Jobber du innenfor helsevesenet?



Ja



Nei

Før graviditeten - har du mottatt psykiatrisk behandling?

Ja, medikamentell

Ja, psykoterapi

Nei

Under graviditeten - har du mottatt psykiatrisk behandling?

Ja, medikamentell

Ja, psykoterapi

Nei

## Spørsmål knyttet til Covid-19

Har du eller noen du kjenner vært smittet med coronavirus?

Ja, jeg

Nei, ingen

Ja, noen i min familie

Ja, noen jeg kjenner

Har du vært i karantene eller isolasjon pålagt av Folkehelseinstituttet?

Ja

Nei

Har du frivillig isolert deg fra andre mennesker?

Ja, hele tiden

Ja, ganske ofte

Ja, noe

Nei, sjeldent

Nei, aldri

På en skala fra 1-5 hvor engstelig er du for følgende.

1= ikke i det hele tatt

5= veldig redd

	1	2	3	4	5
Å bli smittet *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Å bli syk *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Å smitte barnet ditt *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At barnet ditt skal bli syk *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At partner ikke får være med på fødsel *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Har viruspandemien hatt noen økonomiske konsekvenser for deg eller partner?



Ja, for meg



Ja, for partner



Ja, for begge



Nei

Hvor ofte utfører du følgende tiltak for å unngå smitte?

	Flere ganger om dagen	Hver dag	Annen hver dag	Sjeldnere	Aldri
Handvask *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Handsprit *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprite over overflater *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vaske over overflater *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bruker munnbind *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Hvor enig er du med følgende påstander?

	Helt enig	Delvis enig	Nøytral	Litt uenig	Helt uenig
De som blir syk blir stort sett frisk *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hvis jeg blir syk kommer jeg til å bli frisk *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jeg stoler på at helsevesenet håndterer pandemien med COVID-19 på best mulig måte *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jeg stoler på at myndighetene håndterer pandemien med COVID-19 på best mulig måte *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jeg følger mye med i media *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jeg påvirkes av det media skriver *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jeg tror media gir et riktig bilde av alvorlighetsgraden av COVID-19 *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Har din svangerskapsoppfølging gått som normalt?

Følges plan for oppfølging som i en vanlig situasjon, uten en pandemi

Ja

Nei

Vet ikke

Har du unngått å søke helsehjelp på grunn av frykt for smitte?

Her gjelder all form for helsehjelp, både fysisk og psykisk.

Ja

Nei

Har du søkt helsehjelp, men ikke fått det?

For eksempel på grunn av manglende bemanning, fare for smitte etc.

Ja

Nei

## Edinburgh postnatal depresjonsskår (EPDS)

1. Har du de siste 7 dager kunnet le og se det komiske i en situasjon?

Like mye som vanlig

Ikke riktig så mye som jeg pleier

Klart mindre enn jeg pleier

Ikke i det hele tatt

2. Har du de siste 7 dager gledet deg til ting som skulle skje?

Like mye som vanlig

Noe mindre enn jeg pleier

Klart mindre enn jeg pleier

Nesten ikke i det hele tatt

3. Har du siste 7 dager bebreidet deg selv uten grunn når noe gikk galt?

Ja, nesten hele tiden

Ja, av og til

Ikke særlig ofte

Nei, aldri

4. Har du siste 7 dager vært nervøs eller bekymret uten grunn?

Nei, slett ikke

Nesten aldri

Ja, iblant

Ja, veldig ofte

5. Har du siste 7 dager vært redd eller fått panikk uten grunn?

Ja, svært ofte

Ja, noen ganger

Sjelden

Nei, aldri



6. Har du siste 7 dager følt at det har blitt for mye for deg?

Ja, jeg har stort sett ikke fungert i det hele tatt

Ja, iblant har jeg ikke klart å fungere som jeg pleier

Nei, for det meste har jeg klart meg bra

Nei, jeg har klart meg like bra som vanlig

7. Har du siste 7 dager vært så ulykkelig at du har hatt vanskeligheter med å sove?

Ja, for det meste

Ja, iblant

Ikke særlig ofte

Nei, ikke i det hele tatt

8. Har du siste 7 dager følt deg nedfor eller ulykkelig?

Ja, det meste av tiden

Ja, ganske ofte

Ikke særlig ofte

Nei, ikke i det hele tatt

9. Har du siste 7 dager vært så ulykkelig at du har grått?

Ja, nesten hele tiden

Ja, veldig ofte

Ja, det har skjedd iblant

Nei, aldri

10. Har tanken på å skade deg selv streifet deg, de siste 7 dagene?

Ja, nokså ofte

Ja, av og til

Ja, så vidt

Aldri

# GAD-7

Hvor ofte har du vært plaget av de følgende problemene i løpet av de siste to ukene.

0= ikke i det hele tatt

1= noen dager

2= mer enn halvparten av dagene

3= nesten hver dag

	0	1	2	3
1. Følt deg nervøs, engstelig eller på tuppet *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Ikke klart å stoppe eller kontrollere bekymringene dine *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Bekymret deg for mye om ulike ting *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Hatt vansker med å slappe av *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Vært så rastløs at det har vært vanskelig å sitte stille *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Blir lett irritert eller ergret deg over ting *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Følt deg redd som om noe forferdelig kunne komme til å skje *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hvis du har opplevd ett eller flere av problemene som nevnes. I hvor stor grad har problemene gjort det vanskelig for deg å utføre arbeidet ditt, ordne med ting hjemme eller komme overens med andre?

Ikke vanskelig i det hele tatt

Litt vanskelig

Svært vanskelig

Ekstremt vanskelig

## 9.4 Appendix 4: GRADE

<b>Reference:</b> 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 Obstet Gynecol Scand. 2021.		<b>Design:</b> Cross-sectional
		GRADE
		Middle
Objective	Material and method	Results
The aim of this study was to figure out the prevalence of stress, depression and anxiety in pregnant and breastfeeding women and their associated background factors.	<b>Population:</b> Pregnant and breastfeeding women were recruited through hospital websites, social media and forums <b>Main outcome:</b> Depression: EPDS ≥13 Anxiety: GAD-7 ≥10 Stress: Perceived Stress Scale (PSS), scores range from 0-40, higher score indicate higher levels of stress	<b>Background characteristics:</b> In total there were 3907 pregnant respondents and 5134 breastfeeding participants. Around 70% were between 26-35 years old, and 53.9% were nulliparous. In the pregnant group 68.8% had high education, 90.5% were professionally active, 2.6% smoked, 18.6% had a chronic somatic illness and 2.2% had a chronic mental illness In the breastfeeding group 68.0% had high education, 88.7% were professionally active, 3.4% smoked, 15.8% had a chronic somatic illness and 1.1% had a chronic mental illness
<b>Conclusion</b>	<b>Important confounding factors:</b> An adjustment for country, professional status, smoking, chronic mental illness and planned pregnancy was performed on the pregnant group while analyses on the breastfeeding group were adjusted for country,, smoking, chronic somatic/mental illness and breastfeeding	<b>Main results</b> EPDS ≥13: 15% in pregnant group and 13% in breastfeeding group GAD-7 ≥10: 11% in pregnant group and 10% in breastfeeding group PSS: mean score 14.1 ± 6.6 in pregnant group and 13.7 ± 6.6 in breastfeeding group
During the COVID-19 pandemic high levels of depression and anxiety were found in both pregnant and breastfeeding groups. Chronic mental or somatic illness, smoking, unplanned pregnancy and professional status are some of the risk factors for developing mental illness	<b>Statistical method:</b> Univariate and multivariate linear regressions were used and the results presented as crud or adjusted OR and unstandardized regression coefficient. A 95% CI is used.	<b>Other results:</b> The risk for mental illness was higher for inhabitants in Ireland and the UK. Associate factors for depression, anxiety and stress were chronic mental illness, smoking, no breastfeeding, having an unplanned pregnancy and having a chronic somatic illness in the postpartum period. Additionally anxiety was associated with unemployment, and a negative association was found with women working in health care and stress was associated with age in the pregnant group, decreasing stress was observed with increasing age. No association to parity or trimester was found
<b>Country</b>		<b>What does the authors discuss as:</b> <b>Strengths:</b> Large sample with respondents from many European countries and using the same, validated questionnaire in all countries. Women's personal experiences were recorded which might be of use for health care professionals <b>Weaknesses:</b> Online study with risk for selection bias. They had no control group and since it was not longitudinal it is difficult to say something about long term effects. Few respondents from the UK. The anxiety and stress scale were considered continuous variable due to lack of validated cutoff
Ireland, Norway, Switzerland, the Netherlands, UK		
<b>Year for data collection</b>		
16. June to 14. July, 2020		

<p><b>Reference:</b> Davenport MH, Meyer S, Meah VL, Strynadka MC, Khurana R. Moms Are Not OK: COVID-19 and Maternal Mental Health. <i>Frontiers in Global Women's Health.</i> 2020;1(1)</p>		<p><b>Design:</b> Cross-sectional - online survey</p> <p><b>GRADE</b> Low-Middle</p>
<p><b>Objective</b></p> <p>This survey aimed to rapidly assess the influence of the COVID-19 pandemic and subsequent physical distancing/isolation measures on the mental health and physical activity of pregnant and postpartum women.</p>	<p><b>Material and method</b></p> <p><b>Population</b> Pregnant women or women within the first year after giving birth were recruited through an online survey.</p> <p><b>Main outcome:</b> EPDS of 13 or above. STAI of 40 or above.</p> <p><b>Important confounding factors:</b> No confounding factors are discussed.</p> <p><b>Statistical method:</b> All data were checked for accuracy, and invalid data were removed. Pre-pandemic versus current mental health and physical activity metrics were compared using paired t-tests or Kruskal-Wallis-H tests as appropriate according to the normality of their distribution. Effect size was determined using Cohen's d. Women were stratified based on physical activity pattern during the pandemic to assess its influence on mental health using ANOVA. Post-hoc comparisons were assessed using Dunns Method. Statistical significance was defined as <math>p &lt; 0.05</math> and analyzed using SigmaStat (Systat Software Inc., USA).</p>	<p><b>Results</b></p> <p><b>Background characteristics:</b> In total they had 900 women, 520 were pregnant and 380 were in the first year after delivery. Participant's median age was 33 years (17-49, <math>n=862</math>), 75.5% lived in cities (<math>n=651</math>), and 69% (<math>n=595</math>) lived in a single family home with an average of one child (0-5) living with them in the household. Most women were from North America (<math>n=779</math>), were Caucasian (<math>n = 736</math>), and had some postsecondary education (<math>n = 520</math>). At the time of the survey, 2.8% and 6.7% of women had a pre-existing clinical diagnosis of depression and anxiety, respectively.</p> <p><b>Main results:</b> An EPDS score <math>&gt;13</math> (indicative of depression) was self-identified in 15% respondents pre-pandemic and in 40.7% currently (mean <math>\pm</math> SD; <math>7.5 \pm 4.9</math> vs. <math>11.2 \pm 6.3</math>, respectively; <math>p &lt; 0.01</math>, Cohen's <math>d</math> 0.66; moderate effect). Moderate to high anxiety (STAI-state score <math>&gt;40</math>) was identified in 29% of women before the pandemic (mean STAI = <math>34.5 \pm 11.4</math>) vs. 72% of women currently (mean STAI = <math>48.1 \pm 13.6</math>; <math>p &lt; 0.01</math>, Cohen's <math>d</math> 1.08; large effect). However, women engaging in at least 150 min of moderate intensity physical activity (meeting current guidelines) during the pandemic had significantly lower scores for both anxiety (large effect) and depression (small effect) than those who did not (<math>p &lt; 0.01</math>)</p>
<p><b>Conclusion</b></p> <p>This rapid response survey identifies a substantial increase in self-reported maternal depression and anxiety from pre- to during-pandemic. These data highlight the strong need for heightened assessment and treatment of maternal mental health. However, these data also suggest that remaining active during the pandemic is associated with a reduced likelihood of anxiety and depression. These data highlight a potential intervention for all pregnant and postpartum women to improve or maintain mental health during this extremely stressful period where access to diagnosis and treatment is more challenging.</p>	<p><b>Discussion/commentaries</b></p> <ul style="list-style-type: none"> <li>• <b>Is the objective clearly formulated?</b> Yes</li> <li>• <b>Were the individuals representative for a defined population/group?</b> Yes, but the respondents were older and a higher percentage were married/cohabiting than Canadian average</li> <li>• <b>Validated screening tool?</b> Yes</li> <li>• <b>Are important confounding factors taken into account when designing/doing analysis?</b> No</li> <li>• <b>Do you believe in the results?</b> Yes</li> <li>• <b>Can the results be transferred into the general population?</b> Yes</li> <li>• <b>Does literature support their findings?</b> They have similar results as other studies during the COVID-19 pandemic, strengthening their findings.</li> </ul> <p><b>What does the authors discuss as:</b>  <b>Strengths:</b> Their findings consist with previous findings.  <b>Weaknesses:</b> Study design, online survey may be at risk for careless responding, bias and the change in prevalence from pre-pandemic to current times may be subject to recall bias.</p>	
<p><b>Country</b></p> <p>Canada</p>	<p><b>Year for data collection</b></p> <p>April 14th to May 8th 2020</p>	

<p><b>Reference:</b> Durankuş F, Aksu E. Effects of the COVID-19 pandemic on anxiety and depressive symptoms in pregnant women: a preliminary study. The journal of maternal-fetal &amp; neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstet. 2020:1-7</p>		<p><b>Design:</b> Cross-sectional - online survey</p>	
		<p>GRADE</p>	
		<p>Low</p>	
Objective	Material and method	Results	Discussion/commentaries
<p>The present study investigated the effects of the COVID-19 pandemic on depression and anxiety in pregnant women.</p>	<p><b>Population:</b> The study was initiated with the design of an anonymous survey for assessing depression and anxiety in the target population. Prospects who were pregnant and willing to participate in the survey were recruited, whereas those who returned incomplete surveys and had a history of psychiatric disorders were excluded from the research. A link to the online questionnaire (SurveyMonkey) was sent to the participants, who were being treated in a private medical center.</p> <p><b>Main outcome:</b> Depression: EPDS &gt;13, BDI giving a score from 0 to 63. Anxiety: BAI giving a score from 0 to 63.</p> <p><b>Statistical method:</b> T-tests, Pearson's chi-square, stepwise multiple regression to determine associations, and significance of which. <math>p</math>-values &lt; .01 and &lt; .05 were considered statistically significant.</p>	<p><b>Background characteristics:</b> A total of 269 women were included, with a mean age of 29.6 years, mean week of pregnancy 7, 70.8 % were nullipara, 76.2% were working, with a mean education of 13.9 years</p> <p><b>Main results:</b> Among the pregnant women, 35.4% (<math>n = 92</math>, case group) scored higher than 13 on the EPDS. The comparison of the groups by years of education reflected that COVID-19 exerted statistically significant effects on psychology, social isolation, and BDI and BAI scores. The effects of COVID-19 on psychology (<math>8.369 \pm 2.003</math>), social isolation (<math>8.000 \pm 2.507</math>), mean BDI scores (<math>20.565 \pm 6.605</math>), and mean BAI scores (<math>22.087 \pm 8.689</math>) were greater in the case group than in the control group (Table 2).</p>	<ul style="list-style-type: none"> <li>• <b>Is the objective clearly formulated?</b> Yes</li> <li>• <b>Were the individuals representative for a defined population/group?</b></li> <li>• <b>Validated screening tool?</b> Yes</li> <li>• <b>Are important confounding factors taken into account when designing/doing analysis?</b> Removing participants with preexisting mental illness</li> <li>• <b>Do you believe in the results?</b> Yes</li> <li>• <b>Can the results be transferred into the general population?</b></li> <li>• <b>Other literature that strengthens or weakens the results?</b> They have similar results as other studies during the COVID-19 pandemic, strengthening their findings</li> <li>• <b>What do the results mean for changing practice?</b> They highlight the urgent need to provide psychological support to the aforementioned population during pregnancy and thereby affect both mother and fetus.</li> </ul> <p><b>What does the authors discuss as:</b> <b>Strengths:</b> Compensate for online survey by using EPDS scores instead of referring to them as suffering from a depressive disorder. <b>Weaknesses:</b> Online survey. Selfmade questionnaire regarding COVID-19 pandemic, the instrument can thus be regarded as subjective.</p>
<p><b>Conclusion</b> This study elucidated the effects of the COVID-19 pandemic on the depression and anxiety levels of pregnant women. Our results highlight the urgent need to provide psychosocial support to the aforementioned population during this crisis. Otherwise, adverse events may occur during pregnancy and thereby affect both mother and fetus.</p>			
<b>Country</b>	Turkey		
<b>Year for data collection</b>	2020		

<b>Reference:</b> Farrell T, Reagu S, Mohan S, Elmidany R, Qaddoura F, Ahmed EE, et al. The impact of the COVID-19 pandemic on the perinatal mental health of women. Journal of perinatal medicine. 2020;48(9):971-6.		<b>Design:</b> Cross-sectional
		<b>GRADE</b> Low-Middle
<b>Objective</b>	<b>Material and method</b>	<b>Discussion/commentaries</b>
The aim of the study was to determine the effects of the COVID-19 pandemic on mental health of pregnant women by comparing the prevalence to pre-pandemic data, they also want to determine supportive strategies	<b>Population:</b> All pregnant and puerperal women attending the antenatal clinics, obstetric emergency unit and inpatient maternity unit at a state tertiary care maternity hospital in Qatar were asked to participate. Recruitment continued until 288 responses were reached  <b>Main outcome:</b> Depression and anxiety: Patient Health Questionnaire Anxiety-Depression Scale (PHQ-ADS). This questionnaire combines the PHQ-9 scale, which is indicative of depression, and the GAD-7, which is indicative of anxiety  <b>Important confounding factors:</b> Previous mental health history  <b>Statistical method:</b> Descriptive statistics were used, as well as non-parametric analysis on continuous variables cross referenced with nationality, occupation, education, pregnancy complication and previous mental health issues	<b>Is the objective clearly formulated? Yes</b> <b>Were the individuals representative for a defined population/group? Yes</b> , for the population in Qatar <b>Validated screening tool? Yes</b> <b>Are important confounding factors taken into account when designing/doing analysis? Yes</b> <b>Do you believe in the results? Yes</b> <b>Can the results be transferred into the general population? Yes</b> <b>Other literature that strengthens or weakens the results? Similar prevalences were reported in three other studies during the pandemic</b> <b>What do the results mean for changing practice? They emphasize the need for public health initiatives, especially by giving televised public health information. In addition the important role of healthcare workers in reducing anxiety and depression is highlighted. Screening for mental health issues among pregnant women during a health crisis should be considered.</b> <b>What does the authors discuss as:</b> <b>Strengths:</b> None discussed <b>Weaknesses:</b> They rely on self-reported data, social stigma might therefore influence the participants' responses. Since it is a cross-sectional study it can only give a point-prevalence and not the longitudinal effects of the pandemic.
<b>Conclusion</b>	<b>Results</b>	
Pandemic related stresses and concerns appear to significantly increase anxiety and depressive symptomatology. The main concern for the participants was the health of their child and family	<b>Background characteristics:</b> 288 women participated in this study, 238 pregnant and 50 postnatal. The mean age was 30.5 (SD: 5.3), men weeks of gestation was 21.6 (SD 14.3) and they had a mean of 1.7 (SD:1.7) for children from before. Only 18.4% were from Qatar, 11.5% were from Philippines, 14.6% from India and 55.6% from other countries. 73.2% had a college or university education, 16.7% worked in healthcare and 59% were unemployed. 59% had no pregnancy complications. 3.1% had previous mental health problems.  <b>Main results</b> PHQ-9≥5: 39.2% indicating depression GAD-7≥5: 34.4% indicating anxiety GAD-7≥10: 16% indicating moderate or severe anxiety  <b>Other results:</b> They found no association between anxiety and depression score with previous mental health issues, pregnancy complications or gestational age. College educated women scored significantly lower on both PHQ-9 and GAD-7 than university educated women. Postnatal women scored higher than pregnant women. The women were more worried about the health of others than their own. Information from healthcare workers and national televised information were most helpful to reduce stress while few reported using exercise as stress relief.	
<b>Country</b>		
Qatar		
<b>Year for data collection</b>		
June to July 2020		



<p><b>Reference:</b> Lebel C, MacKinnon A, Bagshawe M, Tomfohr-Madsen L, Giesbrecht G. Elevated depression and anxiety symptoms among pregnant individuals during the COVID-19 pandemic. Journal of affective disorders. 2020;277:5-13</p>		<p><b>Design:</b> Cross-sectional</p>	
		<p>GRADE</p>	
		<p>Middle</p>	
Objective	Material and method	Results	Discussion/commentaries
<p>To determine the prevalence of anxiety and depression during the COVID-19 pandemic. They also want to figure out which factors are associated with less symptoms.</p>	<p><b>Population:</b> Pregnant women in Canada were recruited through social media (Twitter, Facebook and Instagram) and ads were shared with groups with pregnant women, young parents and midwifery and obstetric groups</p> <p><b>Main outcome:</b> Depression: EPDS≥13 Anxiety: PROMIS ≥60 for moderately and severely elevated anxiety symptoms. And Pregnancy-related anxiety scale, the median score was used to define groups with high and low anxiety symptoms thus allowing for further analysis.</p> <p><b>Important confounding factors:</b> Age and gestation are controlled for</p> <p><b>Statistical method:</b> ANCOVA, bivariate correlation, multivariate binomial logistic regression and logistic regression were used to compare the scores in the different groups, the alpha level was set using the Bonferroni correction</p>	<p><b>Background characteristics:</b> In total they had 1987 respondents. Mean age was 32.4 +/- 4.2 years, 51% had children from before, the majority were married (77.9%) or cohabitating with a partner (19.4%). 87.1% identifies as Caucasian others include for example First Nations, Metis and Inuit. Most were highly educated with trade or community college (23%), bachelor's degree (41%) or higher (28%).</p> <p><b>Main results</b> 37% have an EPDS score of 13 or above indicating clinically elevated symptoms of depression. 56.6% score above 70 on PROMIS indicating moderately or severely elevated symptoms of anxiety</p> <p><b>Other results:</b> Nulliparous had higher pregnancy-related anxiety symptoms, but no significant difference was found in EPDS or PROMIS. An increased OR for clinically elevated depression symptoms was found for elevated COVID-19-related worries such as perceived threat to own life and harm to baby, an increase was also found for partner relationship strain, but not for loss of employment. A reduced risk for depression and anxiety symptoms was found in those with perceived better social support and reduced risk for anxiety was observed in respondents with more physical activity.</p>	<ul style="list-style-type: none"> <li>● <b>Is the objective clearly formulated?</b> Yes</li> <li>● <b>Were the individuals representative for a defined population/group?</b> Yes, though the respondents were older and a higher percentage were married/cohabiting than Canadian average</li> <li>● <b>Validated screening tool?</b> Yes</li> <li>● <b>Are important confounding factors taken into account when designing/doing analysis?</b> Mostly, but previous mental illness was not taken into consideration nor was pregnancy complications</li> <li>● <b>Do you believe in the results?</b> Yes</li> <li>● <b>Can the results be transferred into the general population?</b> Yes</li> <li>● <b>Other literature that strengthens or weakens the results?</b> They have similar results as other studies during the COVID-19 pandemic, strengthening their findings</li> <li>● <b>What do the results mean for changing practice?</b> Their results emphasize the need for high quality maternity care especially during a pandemic and the need to reduce psychological distress</li> </ul> <p><b>What does the authors discuss as:</b> <b>Strengths:</b> Their finding consists with previous findings <b>Weaknesses:</b> It is not a longitudinal study and they have not looked at history of mental illness</p>
<p><b>Conclusion</b> Elevated levels of anxiety and depression were found during the pandemic, which may have long term consequences for their children. Increased social support and exercise were associated with less symptoms and might reduce the consequences.</p>			
<p><b>Country</b> Canada</p>			
<p><b>Year for data collection</b> April 5-20, 2020</p>			

<b>Reference:</b> Matsushima M, Horiguchi H. The COVID-19 Pandemic and Mental Well-Being of Pregnant Women in Japan: Need for Economic and Social Policy Interventions. Disaster medicine and public health preparedness. 2020:1-6.		<b>Design:</b> Cross-sectional	
		<b>GRADE</b>	<b>Low-Middle</b>
<b>Objective</b>	<b>Material and method</b>	<b>Results</b>	<b>Discussion/commentaries</b>
The aim is to assess depressive symptoms in pregnant women during the time of the COVID-19 pandemic and identify associated factors	<p><b>Population:</b> Pregnant and postpartum women were recruited by sending emails to service users of two companies (Kardanote Inc. and Baby calendar Inc.)</p> <p><b>Main outcome:</b> Depression: EPDS≥13</p> <p>The EPDS questionnaire was also divided in factor scores indicating anhedonia (item 1 and 2), anxiety (item 3-5) and depression (item 7-9)</p> <p><b>Important confounding factors:</b> An adjustment for sociodemographic and economic factors was performed</p> <p><b>Statistical method:</b> Logistic regression analysis was used to analyze risk for depressive symptoms according to background factors and other variables such as changes to antenatal care. Ordinary least square regressions were used to regress on each factor (anhedonia, anxiety and depression) score.</p> <p>95% Confidence intervals were used.</p>	<p><b>Background characteristics:</b> 1777 participants. 5.35% were under 25, 29.21% were between 25-29 years, 37.20% were 30-34 years and 28.25% were over 35 years old. 65.17% were nulliparous and the mean number of children from before was 0.5273. 19.30% had over 16 years of education, 48.68% were full-time employed and most were married (96.40%)</p> <p><b>Main results</b> EPDS≥13 : 17% Mean scores for anhedonia, anxiety and depression were 0.73, 3.68 and 1.82 respectively</p> <p><b>Other results:</b> No difference in EPDS score was found between trimesters. An increased OR for depressive symptoms was found in those who experienced cancellation of planned informal support (OR:1.79 CI:1.22-2.61), those who experiences financial difficulties (OR: 1.19 CI: 1.10-1.28), those with a COVID-19 infection (OR: 1.12 CI:1.02-1.25) and those who were not able to receive informal childcare support (OR: 1.13 CI: 1.03-1.23). Background characteristics that were associated with increased depressive symptoms were age under 25 years, lower income, full-time housewife/student, unemployment and having no partner (never married, divorced or widowed).</p>	<ul style="list-style-type: none"> <li>• <b>Is the objective clearly formulated?</b> Yes</li> <li>• <b>Were the individuals representative for a defined population/group?</b> Yes</li> <li>• <b>Validated screening tool?</b> Yes</li> <li>• <b>Are important confounding factors taken into account when designing/doing analysis?</b> Economic and sociodemographic factors are considered, but not previous mental health and physical health</li> <li>• <b>Do you believe in the results?</b> Yes</li> <li>• <b>Can the results be transferred into the general population?</b> Yes</li> <li>• <b>Other literature that strengthens or weakens the results?</b> They have similar results as studies from other countries such as China, Turkey and Canada</li> <li>• <b>What do the results mean for changing practice?</b> Interventions to prevent further increase in prevalence of prenatal depression is needed, additionally they discuss the importance of economic stability and sufficient childcare to minimize the impact on mental health</li> </ul> <p><b>What does the authors discuss as:</b>  <b>Strengths:</b> strengths are not discussed  <b>Weaknesses:</b> Since it is an online survey only an approximation of response rates can be given, and those with more severe depression might not participate. Additionally they discuss that data on past mental diseases, past pregnancy experiences and physical health, which could be possible confounding factors, have not been collected.</p>
<b>Conclusion</b>			
A high prevalence of depression during the pandemic was found. Health care professionals and social/community workers must cooperate and social policies must be applied to improve the wellbeing of pregnant women.			
<b>Country</b>			
Japan			
<b>Year for data collection</b>			
31. of May to 6. of June, 2020			

<b>Reference:</b> Oskovi-Kaplan ZA, Buyuk GN, Ozgu-Erdinc AS, Keskin HL, Ozbas A, Moraloglu Tekin O. The Effect of COVID-19 Pandemic and Social Restrictions on Depression Rates and Maternal Attachment in Immediate Postpartum Women: a Preliminary Study. The Psychiatric quarterly. 2021;92(2):675-82		<b>Design:</b> Cross-sectional	
		GRADE	Middle
<b>Objective</b>	<b>Material and method</b>	<b>Results</b>	<b>Discussion/commentaries</b>
Aimed to evaluate the postpartum depression rates and maternal-infant bonding status among immediate postpartum women, whose last trimester overlapped with the lock-downs and who gave birth in a tertiary care center which had strong hospital restrictions due to serving also for COVID-19 patients, in the capital of Turkey.	<p><b>Population:</b> The low-risk term pregnant women who gave birth were given the surveys Edinburgh Postpartum Depression Scale (EPDS) and Maternal Attachment Inventory (MAI) within 48 h after birth.</p> <p><b>Main outcome:</b> EPDS over 12 and MAI, giving a score between 26 and 104.</p> <p><b>Statistical method:</b> Statistical analysis was performed by SPSS (Statistical Package for the Social Sciences) 22 (SPSS Inc., Chicago, IL). The distribution of parameters was assessed by the Kolmogorov-Smirnov normality test. Descriptive analyses were given (using tables of frequencies for the categorical variables and) using medians and interquartile range for the non-normally distributed and categorical variables and mean and standard deviation for the normally distributed variables. Mann Whitney-U test was performed for non-normal distributions. The comparison of categorical variables was performed by the chi-square test. P values &lt;0.05 were considered statistically significant. For the power calculation, we accepted the post-partum depression prevalence as 7.8% for our population based on the previous literature, and the effect size as 0.3. The total sample size of 205 was calculated by G-POWER 3.1.9.7 software with the alpha probability of 0.05 and a power of 0.95</p>	<p><b>Background characteristics:</b> A total of 223 postpartum women within 48 h of birth participated in the study. The median (interquartile range) age of the women was 26 (9) years and the parity was 1 (2). The median gestational age was 39 (2) weeks and the median birth weight was 3290 (505) grams.Regarding the educational status, 81 (36.3%) women were illiterate or finished primary school, 119 (53.4%) were high school graduates and 23 (10.3%) were university graduates. Seventy-five (33.6%) women were working while 148 (66.3%) were housewives.</p> <p><b>Main results:</b> The median score obtained from the EPDS was 7 (7) and 33 (14.7%) of the women were determined to have a risk for postpartum depression. The median scores of the EPDS inventory of depressive women were 15 (3). The median MAI score of 223 women was 100 (26); and the MAI scores of women with depression were significantly lower than the controls [73 (39) vs. 101 (18) respectively, p &lt;0.001].</p>	<ul style="list-style-type: none"> <li>● <b>Is the objective clearly formulated?</b> Yes</li> <li>● <b>Were the individuals representative for a defined population/group?</b> Yes</li> <li>● <b>Validated screening tool?</b> Yes</li> <li>● <b>Are important confounding factors taken into account when designing/doing analysis?</b></li> <li>● <b>Do you believe in the results?</b> Yes</li> <li>● <b>Can the results be transferred into the general population?</b> Yes</li> <li>● <b>Other literature that strengthens or weakens the results?</b> Similar results as other studies during the COVID-19 pandemic.</li> <li>● <b>What do the results mean for changing practice?</b> They emphasize the importance of appropriate isolation in hospitals for pregnant women.</li> </ul> <p><b>What does the authors discuss as:</b>  <b>Strengths:</b> The strength of our study is the face-to-face evaluation of the patients.  <b>Weaknesses:</b> The limitations of this study are the absence of a control group that was evaluated before the onset of pandemic and due to ongoing cases with a high incidence, it is uncertain when a control group will be available in near future. Also, a lack of any validated questionnaire for COVID-19 infection on psychological status would be a limitation for correlating the results with the pandemic.</p>
In conclusion, providing appropriate isolation in hospitals for pregnant women may have a positive impact on the depressive symptoms of new mothers. Attention for the psychological status of pregnant and postpartum women may help for the improvement of psychosocial support. Evaluation of the factors that affect the psychological status of pregnant and postpartum women will lead the healthcare system to improve the implementations during the COVID-19 pandemic.			
<b>Country</b>	Turkey		
<b>Year for data collection</b>	June 2020		

<b>Reference:</b> Preis H, Mahaffey B, Heiselman C, Lobel M. Pandemic-related pregnancy stress and anxiety among women pregnant during the coronavirus disease 2019 pandemic. American journal of obstetrics & gynecology MFM. 2020;2(3):100155		<b>Design:</b> GRADE	Low
Objective	Material and method	Results	Discussion/commentaries
The COVID-19 pandemic has created an urgent need to examine the extent to which pandemic-related stress predicts heightened anxiety in women pregnant during this crisis.	<p><b>Population:</b> Pregnant women in the USA were recruited through social media to complete an online questionnaire.</p> <p><b>Main outcome:</b> The questionnaire included sociodemographic factors (maternal age, ethnicity and race, financial status, health insurance, lifetime experience of emotional or physical abuse), current use of psychiatric medications, obstetrical factors (parity, gestational age, pregnancy risk, chronic medical conditions, planned pregnancy, fertility treatments), prenatal behaviors (eg, vitamins, exercise, enough sleep), alterations to prenatal care appointments (cancellation or rescheduling owing to COVID-19), and anxiety (generalized anxiety disorder-7 [GAD-7] with the following clinical cutoff values: 0-4, no to minimal; 5-9, mild; 10-14, moderate; and 15-21, severe).</p> <p><b>Important confounding factors:</b> Older maternal age, racial and ethnic minority, marital status, financial insecurity, abuse history and private insurance are controlled for.</p> <p><b>Statistical method:</b> Logistic regression predicted moderate or severe anxiety from all sociodemographic and obstetrical background variables and the 2 PREPS scales.</p>	<p><b>Background characteristics:</b> Participants were on average aged 29.2 +/- 5.3 years and their average gestational age was 25.3 +/- 9.1 weeks. Approximately three-quarters were white and non-Hispanic (n = 608, 77.2%); almost half were primiparas (n = 362, 45.9%).</p> <p><b>Main results:</b> A total of 166 women (21.1%) reported no to minimal anxiety symptoms (GAD-7 = 0-4), 280 (35.6%) reported mild anxiety symptoms (GAD-7 = 5-9), 170 (21.6%) reported moderate anxiety symptoms (GAD-7 = 10-14), and 171 (21.7%) reported severe anxiety symptoms (GAD-7 &gt;= 15).</p>	<p><b>Checklist:</b></p> <ul style="list-style-type: none"> <li>● <b>Is the objective clearly formulated?</b> Yes</li> <li>● <b>Were the individuals representative for a defined population/group?</b> Yes.</li> <li>● <b>Validated screening tool?</b> Yes</li> <li>● <b>Are important confounding factors taken into account when designing/doing analysis?</b> Yes</li> <li>● <b>Do you believe in the results?</b> Yes</li> <li>● <b>Can the results be transferred into the general population?</b> Yes</li> <li>● <b>Other literature that strengthens or weakens the results?</b> They have similar results as other studies during the COVID-19 pandemic</li> <li>● <b>What do the results mean for changing practice?</b> Their results emphasize the need for high quality maternity care especially during a pandemic and the need to reduce psychological distress</li> </ul> <p><b>What does the authors discuss as:</b>  <b>Strengths:</b> Not discussed  <b>Weaknesses:</b> Not discussed</p>
<b>Conclusion</b>			
Pregnant women during the COVID-19 pandemic experienced substantial anxiety as indicated by the high prevalence of mild, moderate, and severe anxiety in this sample. Stress related to preparation for birth during the pandemic and worries about COVID-19 infection to self and the baby can elevate women's risk of experiencing moderate or severe anxiety over and above sociodemographic, obstetrical, and other health relevant factors.			
<b>Country</b>			
USA			
<b>Year for data collection</b>			
April 2020			

<b>Reference:</b> Zanardo V, Manghina V, Giliberti L, Vettore M, Straface G. Psychological impact of COVID-19 quarantine measures in northeastern Italy on mothers in the immediate postpartum period. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2020;150(2):184-8.		<b>Design: Non-concurrent case-control</b>	
		GRADE	
		Middle	
<b>Objective</b>	<b>Material and method</b>	<b>Results</b>	<b>Discussion/commentaries</b>
To explore whether quarantine measures and hospital containment policies among women giving birth in a COVID-19 “hotspot” area in northeastern Italy enhanced psycho-emotional distress in the immediate postpartum period.	<b>Population:</b> Women aged over 18 years who could read and understand Italian, who had delivered a singleton, healthy neonate at term at Policlinico Abano Terme between March 8 (start of nationwide quarantine) and May 3 (quarantine measures eased), 2020 were consecutively asked to participate. A control group of women was also recruited, comprising women aged over 18 years (able to read and understand Italian) who lived in the same geographic area and had delivered at the hospital in the same time period as the study group but in the previous year (2019). <b>Main exposure:</b> EPDS above 12. The EPDS questionnaire was also divided in factor scores indicating anhedonia (item 1 and 2), anxiety (item 3-5) and depression (item 7-9)	<b>Background characteristics:</b> 192 participants, 91 of them in the COVID-19 study group with a mean age of 33.7 years, gestational week 39.4, 53.8% were nulliparous, 29.7% with an educational degree, 57.1% were married and 81.3% were working. 101 participants were in the control group with mean age of 33 years, gestational week 39.4, 51.5% were nulliparous, 31.7% with an educational degree, 60.4% were married and 85.1% were working. <b>Main results</b> Mean EPDS scores were significantly higher in the COVID-19 study group compared with the control group (8.5 ± 4.6 vs 6.34 ± 4.1; P<0.001). The percentage of high-risk women, those with a global EPDS score above 12, was also significantly higher in the COVID-19 group compared with the control group (28.6% vs 11.9%; P=0.006). EPDS subscale analysis showed that mean scores for anhedonia, anxiety, and depression were all higher in the COVID-19 study group compared with the control group, although the differences were only significant for anhedonia (0.60 ± 0.61 vs 0.19 ± 0.36; P<0.001) and depression (0.58 ± 0.54 vs 0.35 ± 0.45; P=0.001). <b>Other results:</b> There were no significant differences between the groups for all variables except neonatal birth weight, which was significantly lower in the babies born during the COVID-19 pandemic compared with the previous year (3354.51 ± 374.2 vs 3478.60 ± 409.8 g; P=0.031).	<ul style="list-style-type: none"> <li>● Is the objective clearly formulated? Yes</li> <li>● Is the case-control design suitable for the objective? Yes</li> <li>● Are the cases and controls recruited in a “good” way? They are not from the same time period</li> <li>● Validated screening tools? Yes</li> <li>● Is it certain that the control group is free of the disease? The disease in this case is the COVID-19 pandemic, so yes.</li> <li>● Were the case-control groups recruited from comparable populations? Yes</li> <li>● Are the groups comparable regarding background characteristics? Yes, very much so</li> <li>● Have the authors taken into account the most important confounding factors in design/analysis? Yes</li> <li>● Do you believe in the results? Yes</li> <li>● Can the results be transferred into practice? Yes</li> <li>● Does literature support their findings? Yes</li> </ul> <p><b>What does the authors discuss as:</b></p> <p><b>Strengths</b> <b>Weaknesses:</b> did not confirm the diagnosis of postpartum depression in our sample using specific criteria defined in the medical literature. Given its small sample size, this study may have been underpowered to demonstrate a significant effect of the COVID-19 pandemic on neonatal birth weight. Questions remain regarding the significance of these findings for clinical practice. Furthermore, an intrinsically observational study such as this cannot guarantee that the observed relationships represent causal factors. Finally, the study sample is limited, geographically specific, and not generalizable.</p>
<b>Conclusion</b>	Concerns about risk of exposure to COVID-19, combined with quarantine measures adopted during the COVID-19 pandemic, adversely affected the thoughts and emotions of new mothers, worsening depressive symptoms.		
<b>Country</b>	Italy		
<b>Year for data collection</b>	2020		

<b>Reference:</b> Zhou Y, Shi H, Liu Z, Peng S, Wang R, Qi L, et al. The prevalence of psychiatric symptoms of pregnant and non-pregnant women during the COVID-19 epidemic. <i>Translational psychiatry</i> . 2020;10(1):319.		<b>Design:</b> Case-control	
		<b>GRADE</b>	<b>Middle</b>
<b>Objective</b>	<b>Material and method</b>	<b>Results</b>	<b>Discussion/commentaries</b>
The aim of this study was to determine the prevalence of mental health issues (depression, anxiety, physical discomfort, insomnia and post-traumatic stress disorder) in pregnant women compared to non-pregnant women during the time of the COVID-19 pandemic.	<b>Population</b> A social media app (Wechat) was used to invite both pregnant and non-pregnant women to participate. The notifications were also spread through hospital webpages. <b>Main outcome:</b> Depression: PHQ-9>10 Anxiety: GAD-7≥7 Physical discomfort: SCL-90≥36 Insomnia: ISI≥15 PTSD: PCL-5≥33	<b>Background characteristics:</b> 554 pregnant women and 315 non-pregnant women participated in the study. Pregnant group: mean age was 31.1±3.9, most were married (98.9%) and well educated (college 72.8%, bachelor or above 16.7%). Additionally, 75% were employed, 22.1% had a chronic disease and 0% smoked. Control group: mean age was 35.4±5.7, many were married (83.5%) and well educated (college 67.9%, bachelor or above 15.9%). Additionally, 67.9% were employed, 15.9% had a chronic disease and 3.5% smoked. <b>Main results:</b> Pregnant group: depression 5.3%, anxiety 6.8%, insomnia 2.6%, PTSD 0.9%, somatic symptoms 2.4% Control group: depression 17.5%, anxiety 17.5%, insomnia 5.4%, PTSD 5.7%, somatic symptoms 2.5% Pregnant women scored statistically significantly higher on all screening tools except somatic symptoms. When adjusting for other covariables the OR for mental illness for pregnant women compared to non-pregnant control was: depression (OR=0.23; 95% CI:0.12–0.45; p<0.001), anxiety (OR=0.26; 95% CI:0.16–0.42; p<0.001), insomnia (OR=0.19; 95% CI:0.06–0.58; p=0.003) and PTSD (OR=0.15; 95% CI: 0.04–0.53; p=0.003). <b>Other results:</b> They found no statistically significant difference between sociodemographic factor and score on screening tools. The only exception was the scores of somatic symptoms in participants with different education levels and occupation.	<b>Checklist:</b> <ul style="list-style-type: none"><li>● <b>Is the objective clearly formulated?</b> Yes</li><li>● <b>Is the case-control design suitable for the objective?</b> Yes</li><li>● <b>Are the cases and controls recruited in a “good” way?</b> Since both are recruited in the same way the same selection bias could occur in both groups</li><li>● <b>Validated screening tools?</b> Yes</li><li>● <b>Is it certain that the control group is free of the disease?</b> If some in the control group are pregnant they are so short along that they did not know it.</li><li>● <b>Were the case-control groups recruited from comparable populations?</b> Yes</li><li>● <b>Are the groups comparable regarding background characteristics?</b> Mostly, there is some difference in age, marital status and proportion living with chronic disease in the two groups</li><li>● <b>Have the authors taken into account the most important confounding factors in design/analysis?</b> Yes</li><li>● <b>Do you believe in the results?</b> Yes</li><li>● <b>Can the results be transferred into practice?</b> Yes</li><li>● <b>Does literature support their findings?</b> The authors present different studies some support their finding and some have found the contrary</li></ul> <b>What does the authors discuss as:</b> <b>Strengths:</b> None discussed <b>Weaknesses:</b> Cross-sectional design, most participants were from Beijing limiting generalization, no data on psychological interventions used by participants
<b>Conclusion</b>	<b>Important confounding factors:</b> Respondents with a known mental illness were excluded. Economic and sociodemographic factors were adjusted for. <b>Statistical methods:</b> A comparison of continuous variables was done by using Student's t-test. The non-parametric data were compared by using Mann-Whitney U test, while categorical data were compared using chi-square test. To look at the independent association between pregnancy and mental health multivariable logistical regression was used.		
In this study a reduced risk for mental illness such as anxiety and depression during the COVID-19 pandemic was found in the pregnant group compared to the control group of non-pregnant women.			
<b>Country</b>	China		
<b>Year for data collection</b>	28. February to 12. March, 2020		

