Introduction
Since coronavirus disease 2019 (COVID‑19) was first recognized in late 2019, the virus has rapidly spread throughout the world. To stop the spread of this deadly virus, various restrictions were implemented throughout the world, including India. This has affected the mental health of all age‑groups, but the worst hit are those who are already in a vulnerable state. Numerous studies show increasing rates of anxiety, depression, and stress levels in various populations. Some studies report higher prevalence of mental distress among women compared to men. Pregnant females and lactating mothers form an important vulnerable group in the context of the prevailing pandemic. Pregnant and lactating females face numerous life changes that make them particularly vulnerable to mental health disorders. It is said that depression and anxiety affect one in five to one in seven women during the perinatal period and are associated with increased risk of adverse consequences for the child as well as the mother. There can be low birthweight, premature delivery, problems in bonding, and various behavioral issues that persist in adulthood. It has been seen that the majority of females

Maternal mental health and its determinants during COVID‑19, experience from Kashmir, Northern India

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Abstract
Background: Since the start of the pandemic due to coronavirus 2019, stresses and anxiety have increased in all age‑groups. We aimed to study the common mental disorders in pregnant and lactating females and study their fears and coping during the pandemic. Materials and Methods: Purposive sampling was employed in our study. We included all pregnant and lactating females who consented to participate in the study. A total of 95 females were included in our study. We used a semi‑structured questionnaire with questions regarding socio‑demographic variables and questions related to apprehensions due to COVID‑19, belonging to high‑risk group, and structured instruments like Edinburgh Postnatal Depression Scale, Hamilton Anxiety Rating Scale, Yale‑Brown Obsessive Compulsive Scale. Results: The mean age of our study population was 30.8 ± 3.67 years. The majority of our patients were married (93) and homemakers (61) and studied up to 12th grade. Among our patients, 33 tested positive for COVID‑19 and 12 patients were hospitalized for COVID‑19‑related symptoms. Thirty‑nine females were pregnant and 56 were lactating. Preexisting medical illness was seen in 23, and psychiatric illness was already present in 19 patients. Major depression was seen in 43% of females, mild anxiety symptoms in 69%, severe anxiety in 8%, mild obsessive compulsive disorder in 16%, and moderate in 10% of cases. Conclusion: In our cases, anxiety and depression were seen in increased prevalence as compared to pre‑pandemic levels. Being hospitalized for COVID‑19 symptoms, social isolation and apprehensions regarding the baby increased the risk of depression.

Keywords: Anxiety, COVID‑19, depression, maternal mental health, pregnant females

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suffering from depression or anxiety do not take help and continue to suffer. One reason could be the stigma attached to mental illnesses, especially in females who are expected to be fit in all ways. Another study conducted at a multinational level also showed increased rates of anxiety and depression, but they were conducted during the early stages of the pandemic. There are high chances of overrepresentation of such disorders because there could be adjustment-related issues which would only subside with time. Therefore, we did a study almost a year after the pandemic started to see the effects it has caused in an already vulnerable group of pregnant and lactating females. We studied the effects of various factors like copings used by patients, belonging to high-risk groups, working during pandemic, having apprehensions regarding the baby, and being COVID-positive or being hospitalized for COVID-19 infection, on maternal mental health. Also, we assessed the relation between different clinical variables.

### Material and Methods

We enrolled all pregnant and lactating females who wished to enter our study and consented for the same. Each female was assigned a number; thus, their confidentiality was maintained. We used both online and offline modes for our study. Since most of the females in our population are illiterate or have read up to primary level, they could not access the questionnaire online and we had to administer the questionnaire ourselves. The patients were presented the questionnaire online through WhatsApp and Facebook and the snowballing technique was used, but the number of responses was less even after 3 months of the study. We questioned the remaining females in gynecology outpatient department once a week for almost 3 months. Also, we used telephonic interviews in patients who were having COVID-19 infection and were in isolation or hospitalized for the same. Thus, our data collection started in October 2020 and ended in March 2021. Only those females who provided written informed consent were included. Our questionnaire was a semi-structured one with questions regarding the socio-demographic variables, questions specific to COVID-19, the copings used during the pandemic, and pre-designed questionnaires like Edinburgh Postnatal Depression Scale, Hamilton Anxiety Rating Scale, Yale-Brown Obsessive Compulsive Scale, and Saltin-Grimby Physical Activity Level Scale. Depressive symptoms were measured by the EDS, which is a self-report 10-item scale. Each question has four different options that are scored 0, 1, 2, or 3. The scale rates the intensity of depressive symptoms over the last 7 days. Total score ranges between 0 and 30; major depressive symptoms were defined as women having a total EDS score of ≥13. The HAM-A was one of the first rating scales developed to measure the severity of anxiety symptoms. The scale consists of 14 items, each defined by a series of symptoms, and measures both psychic anxiety (mental agitation and psychological distress) and somatic anxiety (physical complaints related to anxiety). Each item is scored on a Likert scale from 0 (not present) to 4 (severe). The scale has a total score range of 0–56, where <17 indicates mild, 18–24 mild to moderate, and 25–30 moderate to severe.

Yale-Brown Obsessive Compulsive Scale helps us to know about obsessions and compulsions and their interference with everyday life. It is a ten-item scale to measure obsessions and compulsions, and each item is rated from 0 (none) to 4 (severe). The scores of 8–15 = mild OCD; 16–23 = moderate OCD; 24–31 = severe OCD; and 32–40 = extreme OCD.

We also assessed our cases regarding various aspects of COVID-19, such as type of copings used, whether infected with COVID-19, whether hospitalized due to COVID-19, being apprehensive regarding the baby, belonging to high-risk group like medical profession, banker, police, and working during the pandemic to see whether these factors had an effect on maternal mental health. Information on socio-demographic characteristics and reproductive characteristics was collected through the questionnaire. They were also asked about any medical or psychiatric illness already present in them. Ethical clearance would ensure that the participants are well informed about the study and can make an informed decision whether to participate or not.

Studies conducted on pregnant and lactating females have shown an increased rate of anxiety and depression, but they were conducted during the early stages of the pandemic. The overall percentage was somewhat higher than the prevalence estimates reported among pregnant and postpartum women living in high-income countries before COVID-19 (10%–13%).

Studies conducted on pregnant and lactating females show an increased rate of depression and anxiety due to the pandemic. A large number of studies show that pregnant women experiencing symptoms of COVID-19 are at higher risk of adverse outcomes than those who are not pregnant. A large multinational study on perinatal mental health conducted before the COVID-19 era showed that between 4% and 8% of women have moderate-to-severe depressive symptoms during pregnancy and in the postnatal period. Also, due to limited knowledge regarding the effects of COVID-19 on infants and babies, mothers have a lot of apprehensions and some even temporarily stopped breast-feeding their infants, thereby increasing the problems in bonding and further increasing stress for the females. The methods employed to avoid babies being infected have detrimental effects on the health of babies and infants. The physical and social isolation due to coronavirus has increased stress and anxiety among new mothers. The reasons for an increase in postpartum mental disorders during COVID-19 are constant fear because of COVID-19, uncertainty of the pandemic, less social support because of nuclear family, being not able to visit near ones because of pandemic, getting exhausted easily due to household work, lack of adequate sleep, insecurity to opt for medical facilities during any emergency because of COVID-19 situation, and fear of losing job in these unprecedented times. In a study conducted in Canada, about 40% of pregnant and lactating females had depression after COVID-19 pandemic and anxiety was seen in about 70% of females. Another study conducted at multi-national level also showed increased rates of depression, which was about 14%, with higher scores observed among women living in the UK and Ireland. The overall percentage was somewhat higher than the prevalence estimates reported among pregnant and postpartum women living in high-income countries before COVID-19 (10%–13%).

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was sought for the present study from the institutional ethical committee under reference no. IEC- GMC-Sgr/28 of 2020.

**Statistical analysis**

Data were entered into tables, and categorical variables were calculated as mean and percentages.

For assessing the association between various clinical variables, Pearson's correlation was used. We estimated the risk of depression and anxiety by using an odds ratio. Independent samples t test was used to compare pregnant and lactating females for various clinical variables. *P* value < 0.05 was taken to be statistically significant. SPSS version 20.0 was used for the analysis.

**Results**

A total of 95 patients were included in our study. The mean age of our study population was 30.8 ± 3.67 years. The majority of our females belonged to the age-group 31–35 years. The majority of our patients were married (93) and homemakers (61) and studied up to 12th grade. Among our patients, 33 tested positive for COVID-19 and 12 patients were hospitalized for COVID-19-related symptoms. Thirty-nine females were pregnant and 56 were lactating. Preexisting medical illness was seen in 23, and psychiatric illness was already present in 19 patients [Table 1].

Major depression was seen in 43% of females, mild anxiety symptoms in 69%, severe anxiety in 8%, mild obsessive compulsive disorder in 16%, and moderate in 10% of cases [Table 2]. Eighty-eight percent of our study population used involvement in family activities as a coping mechanism during the pandemic followed by social coping in 71% and religious coping in 37% of patients. About 20% of patients used reading, writing, or art as coping during the pandemic [Table 3]. In our study, females who were less involved in social activities, hospitalized for COVID-19 infection, isolated themselves due to fear of getting infected or were apprehensive regarding their baby were having depression more than those involved in social activities, not hospitalized, not isolating themselves, or without any apprehensions regarding their baby [Table 4]. Among our cases, depression was positively correlated with anxiety and obsessions, whereas anxiety was positively correlated with obsessions and compulsions [Table 5]. Also, anxiety was seen to be more in cases with a larger family, belonging to high-risk group like the medical profession, police, bankers, or in those who frequented their place of work during the pandemic [Table 6].

While comparing pregnant and lactating females with respect to depression, anxiety, and obsessive compulsive disorder, it was seen that *P* value was significant for obsessive compulsive disorder only [Table 7].

**Discussion**

Pregnant and lactating females form a vulnerable group due to the hormonal changes, the responsibilities associated with baby and adjusting to new challenges. We aimed to study the effects of this pandemic on their mental health, which can have long-lasting effects on the mental health of babies as well. Social isolation and other measures taken to manage the pandemic led to increased rates of anxiety and stress among pregnant and lactating females. We, therefore, assessed their copings and fear associated with the pandemic.

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**Table 1: Study characteristics of women in our study**

| Socio-demographic features | No. of females (%) |
|----------------------------|---------------------|
| Maternal age (years)       |                     |
| 20-25                      | 13 (13.6%)          |
| 26-30                      | 24 (25.26%)         |
| 31-35                      | 54 (56.84%)         |
| 36-40                      | 4 (4.2%)            |
| Relationship status        |                     |
| Married                    | 93 (97.8%)          |
| Separated                  | 2 (2.2%)            |
| Occupation                 |                     |
| Homemakers                 | 61 (64.21%)         |
| Employee in pvt./govt.     | 21 (22.10%)         |
| Self-employed              | 13 (13.68%)         |
| Educational status         |                     |
| Illiterate                 | 18 (18.94%)         |
| <12th grade                | 36 (37.89%)         |
| Graduate                   | 13 (13.68%)         |
| Postgraduate               | 28 (29.47%)         |
| Health and reproductive status |                 |
| COVID-19 status            |                     |
| Positive                   | 33 (34.73%)         |
| Negative                   | 62 (65.26%)         |
| Pregnant women             | 39 (41.05%)         |
| Lactating women            | 56 (58.94%)         |
| Medical Illness            |                     |
| Present                    | 23 (24.21%)         |
| Absent                     | 72 (75.78%)         |
| Psychiatric Illness        |                     |
| Present                    | 19 (20%)            |
| Absent                     | 76 (80%)            |

**Table 2: Clinical characteristics of our study population**

| EPDS                                   | Number of patients (%) | Mean±S.D |
|----------------------------------------|------------------------|----------|
| Score >13 (clinical depression)        | 41 (43.2%)             | 11.78±6.08 |
| Score <10 (no depression)              | 54 (56.8%)             |          |
| HAM-A                                  |                        |          |
| Mild anxiety (score <17)               | 66 (69.5%)             | 10.37±9.17 |
| Moderate anxiety (score 18-24)         | 18 (18.9%)             |          |
| Severe anxiety (score 25-30)           | 8 (8.4%)               |          |
| YBOCS                                  |                        |          |
| Mild (score 8-15)                      | 16 (16.8%)             | 6.88±5.81 |
| Moderate (score 16-23)                 | 10 (10.5%)             |          |
| Severe (score 24-31)                   | 1 (1.1%)               |          |

EPDS=Edinburgh Postnatal Depression Scale, HAM-A=Hamilton Anxiety Rating Scale, YBOCS=Yale-Brown Obsessive Compulsive Scale. S.D.= standard deviation
In our study, a maximum number of pregnant and lactating females were in the age-group 31–35 years with a mean age of 30.8 ± 3.67 years. The same has been seen in a study conducted before the pandemic in Kashmir where 55% of patients were seen in the age-group >30 years. An important reason could be the late age of marriages, which is becoming common in our society. In another study conducted in UK from May 2020 till December 2020, to study the effects and copings during the pandemic, the mean age of pregnant and lactating females was 31.7 ± 4.7 years which is almost the same as has been seen in our study population. In our study, 33% of females tested positive for COVID-19, but this did not increase the risk of depression or anxiety although being hospitalized for COVID-19 infection increased risk of depression by 2.5 times as calculated by odds ratio.

It has been seen that COVID-19 infection in pregnancy did not result in serious outcomes and mild clinical symptoms were seen in pregnant females. Social distancing and isolation/quarantine procedures implemented during the pandemic, however, increased the risk of psychological problems among pregnant women and new mothers, which could explain the reason for increased depression in cases that needed hospitalization for COVID-19 infection. There are numerous studies to support the increased rates of anxiety and depression in pregnant and lactating females due to not being able to visit friends or relatives during the pandemic. When we asked our study population regarding their coping strategies adopted during the pandemic, about 88% said that they involved themselves in family activities during the pandemic and 71% said that being socially active and visiting social relations helped them to handle the period of pandemic. About 37% used religious rituals as means of coping and only 20% involved themselves in reading, writing, and other forms of art during the pandemic. In a study conducted during the pandemic in UK, the copings involved were good physical health of the mother and involvement in various support groups for pregnant and lactating females which are not present in our society. In our study, involvement in family activities decreased the risk of depression by almost four times as compared to those not involved in family activities. Also, social isolation and being apprehensive regarding the baby increased the risk of depression. It was seen that working during the pandemic and being a part of high-risk group like medical profession, police, and banker increased the risk of anxiety as studied by Hamilton Anxiety Rating Scale and associated odds ratio. Also, in patients with preexisting psychiatric or medical illnesses, the risk of depression and anxiety was more as compared to patients without preexisting medical or psychiatric illnesses.

This study was conducted almost a year after the start of the pandemic to exclude immediate adjustment-related mental issues and find out the prevalence of common mental illnesses like depression, anxiety, and obsessive compulsive disorder.

| Table 3: Copings present in our study population |
|-----------------------------------------------|
| Type of coping | No. of patients |
| Religious coping | 36 (37.9) |
| Social coping | 68 (71.6%) |
| Family activities | 84 (88.4%) |
| Reading, writing | 19 (20%) |

| Table 4: Odds ratio of depression versus other factors |
|---------------|----------------|
| EPDS Family activities | Odds ratio |
| Yes | No |
| 8 | 33 | 4.121 |
| 3 | 51 |  |

| EPDS COVID-19 hospitalization | Odds ratio |
|-----------------------------|------------|
| Yes | No |
| 38 | 3 | 2.533 |
| 45 | 9 |  |

| EPDS Social isolation | Odds ratio |
|-----------------------|------------|
| Yes | No |
| 17 | 24 | 4.756 |
| 7 | 47 |  |

| EPDS Apprehensive regarding baby | Odds ratio |
|----------------------------------|------------|
| Yes | No |
| 23 | 18 | 1.376 |
| 26 | 28 |  |

**Table 5: Correlation between various clinical variables**

| EDPS | HAM-A | YBOCS | Obsessions | Compulsions |
|------|-------|-------|------------|-------------|
| 1 | 0.626** | 0.150 | 0.232* | 0.051 |
| HAM-A | 0.626** | 1 | 0.389** | 0.428** | 0.304** |
| YBOCS | 0.150 | 0.389** | 1 | 0.944** | 0.936 |
| Obsessions | 0.232* | 0.428** | 0.944** | 1 | 0.774** |
| Compulsions | 0.051 | 0.304** | 0.936 | 0.744** | 1 |

*Correlation is significant at 0.05 level. **Correlation is significant at 0.01 level. EDPS=Edinburgh Postnatal Depression Scale, HAM-A=Hamilton Anxiety Rating Scale, YBOCS=Yale-Brown Obsessive Compulsive Scale

| Table 6: Odds ratio of anxiety versus other factors |
|-----------------------------------------------|
| HAM-A category | Family members | Odds ratio |
|----------------|----------------|------------|
| Mild | 4 | 8 | 1.125 |
| Moderate-severe | 8 | 18 |  |

| High-risk group | Odds ratio |
|-----------------|------------|
| No | Yes |
| 56 | 13 | 1.026 |
| 21 | 5 |  |

| Worked during pandemic | Odds ratio |
|------------------------|------------|
| No | Yes |
| 58 | 11 | 1.255 |
| 21 | 5 |  |
pandemic, the prevalence of depression was seen to be 26%. Such an increased prevalence of depression in pregnant females highlights the need for regular screening of pregnant and lactating females for early detection and treatment by gynecologists or primary care physicians treating them. In another study conducted in UK during the pandemic, they found depressive features in terms of feeling low, lonely, irritable, or trouble relaxing in 50% of their participants and anxiety in terms of feeling worrisome in 70% of their participants although they did not use structured instruments for diagnosing these conditions. We also noted that patients with preexisting medical illnesses like diabetes, hypertension, and hypothyroidism had more anxiety and depression than females without any medical illness. This emphasizes the need of good physical health for better mental health. However, a few studies have highlighted the link between physical fitness and mental health. In our study, mild anxiety was seen in about 69% of patients and moderate–severe anxiety was seen in about 26% of patients. Similar results have been seen in other studies conducted during the pandemic. In a multi-national cross-sectional study conducted during June–July 2020, moderate–severe anxiety was seen in about 21% of pregnant and lactating females, which is similar to our study results. It has been studied that during pregnancy, self-reported rates of clinically relevant anxiety and depressive symptoms were higher among pregnant women relative to their retrospectively self-assessed pre-pandemic levels and when compared to non-pregnant individuals in a multicenter cross-sectional study performed in China by Y. Wu et al.

While comparing pregnant and lactating females, we had 39 pregnant females and 56 lactating, and we found that the two groups did not differ in terms of depression or anxiety scores but obsessive compulsive disorder was more in pregnant females and the difference was statistically significant as measured by P value. In a cross-sectional, Web-based multi-centric study performed in Ireland, Norway, Switzerland, the Netherlands, and the UK between June 16 and July 14, 2020, they did not find any significant difference in depression, anxiety, or stress levels between pregnant and breast-feeding females. They found the prevalence of major depressive symptoms (EDS ≥13) as 15% in the pregnancy cohort and 13% in the breast-feeding cohort. Moderate-to-severe generalized anxiety symptoms (GAD ≥10) were found among 11% and 10% of the pregnant and breast-feeding women. There is substantial evidence for the link among maternal stress, anxiety, and depression, as well as a number of pregnancy complications and adverse pregnancy and birth outcomes (like susceptibility to infection, low birthweight, preterm birth, and impaired cognitive development of the child). Also, the separation of mothers from their infants due to COVID-19 has been studied to be detrimental for bonding and it needs to be discussed and revised as per the case.

In our study, we had two cases with adverse pregnancy outcomes, one female had a low-birthweight baby and one had intrauterine death of the baby. It is very difficult to say whether the outcomes were due to COVID-19 infection, or depression and anxiety due to the pandemic, or they were part of adverse pregnancy outcomes. For long-term outcomes like cognitive development or any behavioral issues, these cases need to be followed up longitudinally. Our study highlights the increased prevalence of common mental illnesses in pregnant and lactating females after the pandemic, and therefore, health policies should incorporate maternal mental health, especially during epidemics and disasters.

### Conclusion/Key points

Our study is the first of its kind in India to study about the effects of pandemic on maternal mental health. We found high rates of depression, anxiety, and obsessive compulsive disorder among these females. Also, positive association was seen between factors like hospitalization because of COVID-19 infection, social isolation, less involvement in family activities, being apprehensive regarding the baby, and depression in our cases. We also found high levels of anxiety among cases who were belonging to high-risk group like the medical profession, police, banker, and those who had been going to their place of work during the pandemic.

### Limitations

Our study had two limitations: one being the small sample size, that is, a larger sample would give us better idea regarding the impact of pandemic on maternal mental health; and The other being the cross-sectional nature of our study, that is, longitudinal follow-up of these cases could give us information regarding the long-term outcomes like behavioral issues in child or any cognitive deficits due to this pandemic.

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### Author contributions

Yuman Kawoos conceptualized and designed the study; Rehana Amin performed the literature review; Masood Maqbool did the data and statistical analysis; Zeenat Farooq helped in data

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**Table 7: Comparison between pregnant and lactating females**

| Clinical variable | Mean scores Pregnancy | Mean scores Lactation | df  | P    |
|------------------|----------------------|-----------------------|-----|------|
| EPDS total       | 11.58                | 11.92                 | 93  | 0.791|
| HAM-A            | 11.76                | 9.41                  | 93  | 0.220|
| YBOCS total      | 8.38                 | 5.83                  | 93  | 0.035|
| Obsessions       | 4.00                 | 2.82                  | 93  | 0.079|
| Compulsions      | 4.33                 | 2.94                  | 93  | 0.026|

*P<0.05 is taken as statistically significant. df=degrees of freedom*
collection; Zaid Wani prepared the manuscript; and Mushtaq A. Margooob helped to review the manuscript. Dr. Yuman Kawoos finalized the manuscript and will act as the “guarantor.”

**Highlights**

- High rates of depression, anxiety, and obsessive compulsive disorder were seen in pregnant and lactating females after the pandemic.
- Involvement in family activities was used as coping in the majority of our cases.
- Being hospitalized due to COVID-19 infection, social isolation, and apprehensions regarding the baby increased the risk of depression.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

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