



Mental Health of Pregnant Women during Covid-19: A Systematic Review Study

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: The novel coronavirus (COVID-19) pandemic has created avenues for physical and mental stress on individuals worldwide. Pregnant women especially, with the onset of COVID-19 have been challenged greatly by an array of disorders, all with varying cognitive, emotional, and behavioral responses. The aim of our research is to conduct a review of the different mental health issues experienced by pregnant women in various geographical locations and analyze the prevalence of specific mental issues.

Materials and Methods: A mixed-methods systematic review was conducted. Databases PubMed, Google Scholar, BioMed Central, CrossRef and British Medical Journal were thoroughly examined by the authors for the purpose of locating the relevant articles as per specific geographical location.

Results: From the applicable studies identified, twenty-eight (28) were selected for review. As per the North American studies, levels of depression and anxiety in pregnant women at and around the time of the pandemic ranged from 33.2 to 70%. This differs in European countries where there were levels of 14.0 to 60%. Prevalence of stress among pregnant women in Asia was 32.7% while 17% of North American women reported the same. In the studies of Australia and South America,

the prevalence of anxiety ranged 6% to 13.9% while studies in Africa reported severe and extremely stress, 7.2% (n=33) and 64% (n=29) respectively.

Conclusion: The prevalence of depression and anxiety among pregnant women was shown to be relatively high in all regions as per the COVID-19 pandemic, owing to many factors. Based on the studies analyzed, adequate support, resources and better healthcare systems are imperative for ensuring that depression and anxiety levels be reduced among this demographic.

Keywords: COVID-19; pregnant women; mental health; anxiety; depression.

1. INTRODUCTION

1.1 Problem Statement

The COVID-19 pandemic has created avenues of physical and mental stress on individuals worldwide. Various individual and social factors influence the responses to a stressful experience. Pregnant women especially, with the onset of COVID-19 have been challenged greatly by an array of disorders, all with varying cognitive, emotional and behavioral responses. Interestingly, the social and cultural backgrounds of these women have a huge role to play in the management of the various diseases and disorders which may have arisen as a result of the pandemic.

1.2 Aim

- To review different mental health issues experienced by pregnant women in various geographical locations and analyze the prevalence of specific mental issues during the COVID-19 pandemic.

1.3 Objectives

To determine the prevalence of mental health issues faced by pregnant women during the COVID-19 pandemic per ethnicity and geographical area.

1.4 Significance of Study

It is critical that we address these mental health issues, more importantly, per ethnicity and geographical location, as impaired management could have drastic impacts on mother-baby bonding, the further emotional development of the baby, the family and workplace. This research intends to explore the differences in the mental health of pregnant women during the pandemic in different geographical location to better provide understanding of the challenges and learn how these mental health issues were addressed during the crisis.

2. LITERATURE REVIEW

The World Health Organization defines mental wellness as “a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community.” (American Mental Wellness Association, n.d.). Internal and external issues alike may alter the mental wellness of varying groups of individuals.

Pregnant women are at increased risk for various maternal issues due to depression and anxiety which typically affects one in seven women during the prenatal period [1]. According to Wang et al. [2], Yali and Lobel [3], females are predisposed to more severe anxiety and Post Traumatic Stress Disorder (PTSD) in epidemic outbreaks, especially for pregnant women who undergo physiological, social, and emotional changes [4]. Hence, the mental health of pregnant women may be even more vulnerable to strict public health interventions such as city lockdowns, restrictions and home quarantine than the general population during the outbreak of COVID-19 pandemic.

The COVID-19 is a new strain of the coronaviruses which had not been previously discovered in humans. It is the cause of an outbreak of respiratory illnesses that quickly spread globally. The World Health Organization declared the outbreak a pandemic on March 11, 2020 [5]. Since this declaration, illness has killed about four million people worldwide [6].

For individuals that contracted the disease, the physical symptoms have typically varied from mild to severe. There have also been reported increased complications, experienced both by pregnant mothers and babies. According to the National Institute of Health, some of those include fetal distress and suggestions of increased preterm delivery and vertical transmission. (Journal of Medicine and Primary care, 2020). This has not taken into account the

mental illness that is associated with being pregnant in a pandemic or even as a pregnant woman that has contracted COVID-19.

The changes faced by pregnant women during pandemics warrant additional emotional and psychosocial support. Though much research must be done in assessing such mechanisms, it can be noted that social support and community cohesion are primary protective factors in the face of large-scale stressful events [7, 8]. These factors apply to pandemics because countermeasures are known to increase a sense of social isolation [9].

3. MATERIALS AND METHODS

3.1 Study Design

The research subjects of this review were pregnant and postpartum women during the COVID-19 pandemic. The time frame considered for the review were articles that were written beginning in 2020 during the pandemic and up until 2021. A mixed-methods systematic review was conducted. Analyzing both qualitative and quantitative data enabled a more thorough and complete review of the mental health states of the pregnant and post-partum women in the six (6) geographical locations.

3.2 Eligible Studies and Study Databases

Articles used in the review were selected if it included specific keywords and had participants residing in a particular geographical location. The geographical locations considered were North America, Europe, Africa, Australia, South America, and Asia. The use of these distinct location follows the already established geographical grouping of the nations of the world.

The main keywords used in the search were as follows: (pregnancy OR maternal health) AND (mental health OR anxiety OR depression) AND (COVID-19 OR coronavirus). Renowned, credible and scholarly database used for the search included PubMed, Google Scholar, BioMed Central, CrossRef and British Medical Journal. Each author independently reviewed the abstracts of the papers to determine if it had the desired information before proceeding to use it. Any doubts regarding the inclusion of any article were resolved through consultation with other authors in the team. Additionally, careful

attention was paid to the articles used as per the definitive words required.

3.3 Data Collection Process

To obtain data for all the studies, each of the authors took on the responsibility to reach for articles from assigned geographical areas. Studies that were included were those that met the criteria pre-determined in the eligible studies. Studies made available from each individual's search followed the similar pattern of further selection or de-selection based on the contents of the articles when read.

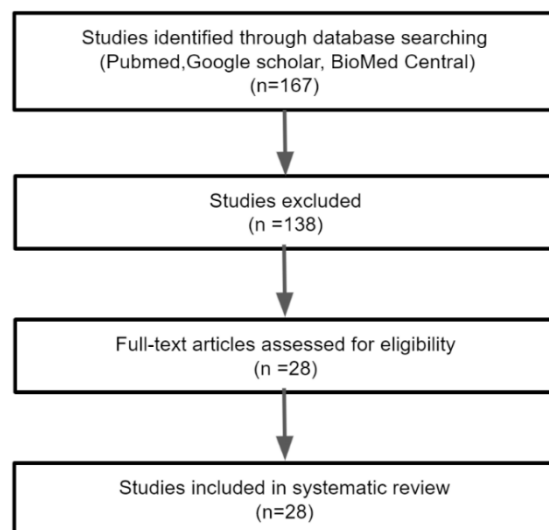


Fig. 1. Process flowchart

All of the articles had to be dated within the inception of the global pandemic to the most current. Characteristics such as age and social status were not included as qualifiers. The general characteristics of the included studies are as shown in Table 1.

4. RESULTS

4.1 Studies Conducted in North America

Studies conducted in Canada, the United States and Mexico were examined. Majority of the studies utilized standardized tools such as Edinburgh Postnatal Depression Scale (EPDS), PROMIS Anxiety and the Pregnancy Related Anxiety Scale (PRAS). In the research conducted in Canada, Groulx et al. [10] studied the impact of COVID-19 on the mental health of pregnant women and found that there was an

Table 1. General characteristics of the included studies

Author Year reference	Country	Design	Instruments Used	Sample size	Main finding
North America					
Groulx et al. [10]	Canada	Cross sectional	Edinburgh Postnatal Depression Scale (EPDS) PROMIS Anxiety Pregnancy Related Anxiety Questionnaire (PRAQ)	4604	The odds of experiencing mental health issues like clinically elevated anxiety and depression increased due to the following: - inability to have a support person during birth, cancellation of prenatal appointments and changes to child-care plans during labour.
Lebel et al., [11]	Canada	Cross sectional	Edinburgh Postnatal Depression Scale (EPDS) PROMIS Anxiety Social Support Effectiveness Questionnaire (SSEQ)	1987	Higher symptoms of depression and anxiety were observed due to issues related to access to necessary prenatal care, relationship strain, social isolation and the threat posed by a COVID infection to the life of mother and fetus.
Perzow et al. [12]	United States	Longitudinal	Edinburgh Postnatal Depression Scale (EPDS)	135	Depressive and anxiety symptoms were higher due to the pandemic and the most COVID-19 adversity appeared to be associated with increased internalization of symptoms.
Moyer et al. [13]	United States	Cross sectional	Pregnancy Related Anxiety Scale (PRAS)	2740	The pandemic magnified the occurrence of pregnancy related anxiety driven by factors such as cessation of physical prenatal visits, fear of infection and fear of running out of food.
Medina-Jimenez et al. [14]	Mexico	Cross sectional	Edinburgh Postnatal Depression Scale (EPDS) Perceived Stress Scale (PSS)	503	Perceived high levels of stress and depression occurred as a result of the COVID-19 pandemic.
Europe					
Puertas- Gonzalez et al., [15]	Spain	Cross sectional	Perceived Stress Scale (PSS) Athens Insomnia Scale Prenatal Distress Questionnaire Symptom Checklist-90 Revised	200	Lack of sleep, fear of contagion and loss of a loved one were the main reasons for depression
Dib et al. [16]	United Kingdom	Descriptive analysis	Bartlett Test of Sphericity	1329	Coping mechanisms help reduce stress and anxiety Women who were working in the healthcare industry while pregnant experienced heightened levels of anxiety Financial instability was also a significant contributing factor

Author Year reference	Country	Design	Instruments Used	Sample size	Main finding
					The need for family support during normal pregnancy and now pandemic-stricken time raises concern of anxiety depression and stress that require much needed attention
Naurin et al. [17]	Sweden	Large scale longitudinal survey	Likert Scale	3113	Assessment of worry among pregnant mothers and their partners reveals a significant level of increase during the Covid-19 onset unlike pre Covid times.
Stampini et al. [18]	Italy	Web based survey	Descriptive Analysis	739	Anxiety and depressive symptoms prevalent during the lockdown.
			Patient Health Questionnaire for Depression and Anxiety Poisson Analysis		Need to reform public health approach to deal with health dispensation when patients are distinct.
Stepowicz et al. [19]	Poland	Cross- sectional	Perceived Stress Scale PSS)	210	Anxiety and depressive conditions observed to be higher in single mothers, those in their first trimester and those who are younger
			State-Trait Anxiety Inventory (STAI)		A past medical history of mental disorder is a predisposing factor for heightened anxiety and depression
Ceulemans et al. [20]	Ireland, Norway Switzerland, Netherlands and UK	Multinational Cross-sectional web-based study	Edinburgh Depression Scale (EDS)	9041	High levels of depressive symptoms and general anxiety
			General Anxiety Disorder (GAD-7)		Professional status of pregnant mothers may be significant in the mental state of mothers.
			Perceived Stress Scale (PSS)		Unplanned pregnancy and somatic illness are also notable
			Regression Model Analysis		
Asia					
Effanti-Daryani et al. [21]	Iran	Cross-sectional study	Depression, Anxiety and Stress Scale-21 (DASS-21)	205	Marital life satisfaction, spouse support and education level were predictive factors that led to mild to very severe depression, stress and anxiety symptoms among pregnant women
Dong et al. [22]	China	Web-based Survey	Self-Rating Anxiety Scale (SAS)	156	Anxiety levels of pregnant women were the same as before the pandemic whilst the level of depression was much higher.
			Self-Depression Rating Scale (SDS)		Compared with pregnant women from other regions, those who lived in Wuhan were not more anxious or depressed during the pandemic
Wu et al. [23]	China	Cross-sectional study	Edinburgh Postnatal Depression Scale	4124	Significantly higher rates of depressive symptoms seen among pregnant women assessed after public declaration of the COVID-19 pandemic.

Author Year reference	Country	Design	Instruments Used	Sample size	Main finding
Durankuş and Aksu, [24]	Turkey	Web-based Survey	Edinburgh Postpartum Depression Scale (EPDS) Beck Depression Inventory (BDI) Beck Anxiety Inventory (BAI)	260	Statistically significant effects of COVID-19 on psychology and social isolation.
Patabendige et al., [25]	Sri. Lanka	Descriptive Analysis Cross-Sectional Study	Hospital Anxiety and Depression Scale (HADS)	1500	Increase in prevalence of perinatal anxiety among Sri-Lankan pregnant women with no proven COVID-19 infection.
Zhang and Ma, [26]	China	Web-based Survey Descriptive Analysis	Impact of Event Scale (IES) Questionnaire	560	Psychological impact is more severe in women in the second trimester of pregnancy. Association between trimesters and indicators of negative health impacts.
Africa					
Abrahams et al., [27]	South Africa	Descriptive cross-sectional study	Edinburgh Postnatal Depression Scale (EPDS) Household Food Insecurity and Access Scale (HFIAS) Composite Abuse Scale (CAS-SF)	2149	The association between CMD, and the socio-demographic and psychological characteristics showed that proportion of women with CMD significantly increased with increasing number of pregnancies and severity of food insecurity. Psychological distress increased during the lockdown period than before covid19
Nwafor et al., [28]	Nigeria	Cross-sectional study	Questionnaire: two components: sociodemographic characteristics Depression Anxiety and Stress Scale-21 (DASS-21)	456	Severe and extremely severe depression were reported in 7.2% (n=33) and 6.4% (n=29) of the pregnant women, respectively.
Moyer et al., [13]	Ghana	Web based survey	Online Qualtrics survey	71	Women showed increased Covid19 anxiety associated with fear of the stigma of getting sick, were concerned about food running out, feared job/income loss, and feared increased conflict in the home
Anikwe et al., [29]	Nigeria	Cross-sectional study	Questionnaire included sections A - socio-demographics and obstetrics characteristics	460	Majority (38.0%) of participants were between the age of 31-34 years. More than three-quarter (80.4%) of the women were in their third trimester of pregnancy.

Author Year reference	Country	Design	Instruments Used	Sample size	Main finding
			of the women;		
			section B - the level of knowledge of COVID-19 infection;		Adequate knowledge of COVID-19 disease is poor as less than half (43.5%, 200/460) of the respondents had adequate knowledge of the disease.
			section C - reaction to COVID-19 infection		The majority believed that pregnant women were immune to COVID-19 infection
			section D - Coronavirus anxiety scale		Women that were ≤ 30 years were more likely to be more anxious about coronavirus infection than their older counterpart
Kassaw and Pandey, [30]	Ethiopia	Cross-sectional study	Questionnaire general anxiety disorder (GAD-7)	178	From a total of 178 respondents, 57 (32.2%) of them were scored 9/21 and considered as General anxiety disorder.
South America					
Nomura, R.et al., [31]	Brazil	Cross-sectional study	Beck Anxiety Inventory (BAI)	1662	23,4% of participants experienced moderate/severe anxiety
Parra-Saavedra, M. et al. [32]	Columbia	Cross-sectional	Customized questionnaire	946	COVID-19 pandemic has greatly affected the mental health of pregnant women.
López-Morales, H.,et al. [33]	Argentina	Longitudinal study	Beck Depression Inventory-II (BDI-II) State-Trait Anxiety Inventory (STAI)	194	The prevalence of depression and anxiety amongst pregnant participants greatly increased as social isolation increased.
Machado, M., et al. [34]	Brazil	Observational, cross-sectional study	SRQ-20 (Self-Reporting Questionnaire) The Fear of COVID-19 Scale	1041	Participants who suffered from common mental disorders had exacerbated symptoms due to presence of COVID-19
Australia					
Chivers, B. R., et al. [35]	Australia	Observational, qualitative study	Online discussions Online forums with specific search string	831	The lack of adequate information regarding COVID-19 heightened the anxiety and distress amongst perinatal women
Wilson, A. N., et al. [36]	Australia	Cross-sectional, descriptive study	Online survey	3364	Most participants experienced high levels of distress and seclusion.

elevated incidence of both clinical depression (34%) and anxiety (70%) as well as manifestation of pregnancy related anxiety symptoms. For the participants in the sample population, it was determined that the uncertainties associated with the inability to have support system resources at prenatal appointments and during birth, changes to childcare plans during labor and the cancellation of appointments due to COVID-19 restrictions were the underlying stressors. The key stressors expressed by 89% of respondents was the way in which prenatal care was delivered during the pandemic. Even though the research stratified the data into the different ethnicities of the women sampled, 81.9% of the sample population identified as Caucasian. As a result, it was quite hard to appropriately determine if the incidence of maternal health issues were elevated amongst the different ethnicities given the reduced power of the sample. Among the Caucasians that are French speaking from the province of Quebec, it was noted that it was only the change in support persons available to attend the birth that caused an increase in anxiety and depression. One of the key observations from the study is that anxiety and depression experienced or expressed was not due to the fear of contracting the virus.

The second study by Lebel et al. (2020), identified a similar trend amongst the participants. According to Lebel et al., social support is a major determinant of physical and psychological stress during pregnancy and the chances of experiencing clinically elevated depression and anxiety reduced in the presence of better perceived social support. A factor that may have a contributing role in the elevated symptoms is the parity of the participant. Nulliparous individuals reported significantly higher pregnancy-related anxiety symptoms compared to primiparous and multiparous individuals [11]. It was determined that the level of anxiety is higher (57%) than the level of depression (37%). In this study, the ethnicity of the participants was also captured and 87.1% identified as Caucasians. Like the study done by Groulx et al., it was not possible to determine the effect of COVID-19 on maternal mental health amongst the non-Caucasians.

Perzow et al. [12] carried out a longitudinal study to assess changes in the symptoms of depression and anxiety pre-pandemic and during the pandemic in a sample of pregnant and postpartum women. According to Perzow et al.

symptoms of depression and anxiety were higher in the sample after the beginning of the pandemic (35%). As noted by Perzow et al., depressive symptoms captured in longitudinal studies commonly decline due to regressive effects associated with mean and attenuation. However, a spike in the level of depressive symptoms was observed during the pandemic. The symptoms were exacerbated in respondents that reported more loneliness and COVID-19 specific adversities. These results differ from the Canadian studies in which anxiety and depression were associated with access to support resources.

In the study by Moyer et al. [13] the impact of the pandemic on the maternal mental health of the participants was driven by factors such as cessation of face-to-face prenatal visits, changes in plans to deliver in a hospital setting, fear of running out of food (59.5%), loss of household income (63.7%), increased relationship tensions and strains at home (37.5%) and the fear of contracting the coronavirus (93%). For this study, 87.7% of participants identified as Caucasians, therefore it was not possible to make any conclusive determinations about the impact of the pandemic amongst the different ethnicities.

Medina-Jimenez et al. [14] examined the stress levels and incidence of depression in pregnant women in Mexico as a result of the pandemic. According to Medina-Jimenez et al., Latin America is unique as huge social gaps typically influence the depression and stress levels in the region. Notwithstanding, increases in the levels of stress (17%) and depression (33.2%) as a result of the pandemic were observed. It is noted that these increases were still lower in comparison to other developing countries.

4.2 Studies Conducted in Europe

The discussion is based on articles from studies carried out in Spain, Sweden, Italy, Poland, United Kingdom and one based on a multinational investigation consisting solely of European countries, most of which were varied, the most common being cross-sectional in nature using the standardized PSS and STAI methods for analyses. A common trend underscores the negative impact that the current global health crisis has had on pregnant mothers and by extension those who are currently lactating.

The period of pregnancy introduces a range of symptoms that vary from person to person as per age and may also stem from other contributing factors able to disequilibrate the mental capacity.

In the research carried out in Spain among 200 participants two equal groups were assessed- one on their state of health during pre-pandemic times (Pre-Pandemic Group -PPG) and the other during the pandemic (Pandemic Group- PG). Of the four assessments, the PG scored higher in the analysis of depression tests, phobic anxiety tests (SLC- 90) and in the PSS than the PPG. Insomnia (13 % variance of the PSS) and grief were significant effectors of depression. Also posing stress were the unconventional physical distancing from loved ones and the unpredictability of the pandemic and the awareness of the concurrent fetal development. There is a need for continuous use of the best possible instrument of assessment of mental maternal health so that the best analyses can facilitate better approaches and solutions. Cognitive Behavioral Therapy was suggested as ideal in assisting with improving maternal health. (Puertas Gonzalez et al, 2021)

The descriptive analysis carried out in the United Kingdom (by Dib et al., 2020) assessed the various feelings that maternal females experienced during the Covid-19 with the intent to find ways to help them. The report revealed that the participants experienced loneliness (56%), feeling down (59%), irritability (62%) and worry (71%) but despite that, 70% of them felt that they were adequately capable of handling their situation. Mental distress was particularly fueled by the need to survive under physically restrictive conditions whilst “maintaining normalcy” in a time when many were jobless, thus being financially burdened. In many situations, even those who still had the ability to work were under dire stress, due to the danger of travel. On a lighter note, some mothers opined that their domestic responsibilities had decreased due to the increased number of persons at home for longer periods daily. Four principal Component Analyses were carried out from the survey- maternal mental health, time availability, coping and sleep and appetite changes. As to how physical activity will have a direct impact on the management of health within the population under study and claim that the possible inclusion of ethnic disparities as qualifiers for unstable mental health during the pandemic is not statistically supported.

A striking feature of the Sweden study [17] is the inclusion of the partners (married or committed relationship) in the assessment of mental health maternal status. Too often this aspect is overlooked, and the microscope is placed solely on the female. The role of partners regarding the mental health of the females should not be overlooked. This is even more critical during the period of crisis.

The existence and long-term effects of anxiety seemed to be most problematic based on results obtained. An example of a question posed is, “How often do you think of the Corona Virus and its overall impacts?” Eighty-nine (89 %) of the women said they think about it frequently whilst partners’ response to the same was 83 % among their partners. In response to how concerned they were about the pregnancy and the delivery, while 91 % of the females were concerned, the value was 79 % of the partners. The striking similarity lies in the worry of both partners about the virus. The study went on to show how isolation directly affected the confidence of persons in the health system. Only pregnant females who are able to see their friends had a more positive outlook of the current state of affairs compared to their partners who for one, are prohibited from accompanying their significant others for doctor’s visits and secondly have very little contact with others. The three groups most vulnerable to worry, in this pandemic according to the investigation are pregnant females and their partners who are immigrants, low-income earners who lack education.

The Italian based study conducted by Stampini et al. [18] placed emphasis on the link between lockdown and the mental wellbeing of pregnant mothers and those who were a few weeks postpartum, the lifestyle changes imposed by the lockdown and the access to health during gestation during the same period. There was a high level of both anxiety and depression of about sixty percent (60%) on average among the two classes of females evaluated. Data showed an inverse relationship between the presence of a partner, suitable living conditions and economic status, incidence and recorded levels of anxiety and depression. Being indoors made it easier to assume healthy eating habits. Stemming from the analysis is the need to forge new and smart ways of dispensing health education and care to at-risk persons such as pregnant women.

The Stepowicz et al. [19] study of the stress and anxiety levels in pregnant and postpartum women (Poland) shows a strong correlation between treatment for mental health and the preponderance of high anxiety levels. STAI values-Sixty-nine (69 %) of pre-treated females versus 29 % of those who never had such conditions showed high levels of anxiety. Data from Stress analyses using the PSS also supported this notion (69 % compared to 39 %). Another noteworthy finding was a direct relationship between marital status and anxiety levels. Those persons who were married (55 %) generally showed a lesser degree of anxiety compared to those who weren't (71 %). Stepowicz et al. also highlight the finding of Saccone (Italy) with a similar study that revealed similar results. The essence is that unknown and departure from the norm attracts worry for the ordinary man and even more so for the pregnant mother; worry can be minimized through support systems and the adoption of the appropriate psychological assessment tools and intervention. Like the other surveys already mentioned, the responsible authorities in those countries have seen the door forged-open by COVID-19 has forged where more in-depth study and attention can be given to pregnant mothers beyond the pandemic.

The multinational cross-sectional study, documented by Ceulemans et al. [20], provided a broadened view on this all-important discussion. There is a fourteen percent (14%) prevalence of depression among pregnant females. The impact of mental health imbalance impacts not only the pregnant mother but may also negatively impact the fetus in the future. Factors including Chronic Illness, smoking, somatic illness, and unplanned pregnancy were major contributors to the depression experienced. The UK and Ireland showed the highest levels of depressive symptoms associated with the afore-listed events. Exclusion of partners from checkups and delivery posed increased stress and depression. Professional status, occupation and availability of physical support will also determine the level of stress. It would be wise that plans be placed to reduce the level of infections for and improve the ability of partners to be more present during prenatal visits or related events.

4.3 Studies Conducted in Asia

The clear-cut psychological effects of the COVID-19 pandemic in Asia warranted many studies to be conducted not only to evaluate the

effects on the general public, but that of pregnant women within the continent. By utilizing the Depression, Anxiety and Stress Scale-21 (DASS-21), Effati-Daryani et al. [21] found that out of a sample of 205 healthy pregnant women who resided in metropolis Tabriz-Iran, at a time of growing figures of COVID-19 cases, 67.3% were of normal status whilst 32.7% had symptoms of depression. 32.7% of women admitted to symptoms of stress whilst a subsequent anxiety test confirmed that 56.1% of 43.9% of these women had symptoms of anxiety. Interestingly, the predictors of stress and depression in these Iranian women were directly linked to marital life satisfaction, spouse support and household income sufficiency.

Conducted merely a month earlier, Dong et al. [22] concluded investigations into the levels of depression and anxiety during pregnancy pre and post pandemic. The self-rating anxiety scale (SAS) and a self-depression rating scale (SDS) unveiled no drastic changes in scores as per geographic region-Wuhan versus other regions in China-, gestational age, health status, living conditions or education. Nevertheless, the dawn of the pandemic granted 79 pregnant women (50.6%, 79/156) admit to depression, 13 confirming light anxiety and a total of 13 who suffered from both anxiety and depression.

The Edinburgh Postnatal Depression Scale proved to be a very useful tool for Wu et al. [23] who chose to identify and assess the mental health concerns of pregnant women before and after that pivotal point of declaration of the COVID-19 pandemic to the provinces of China. Interestingly, 2839 pregnant women were assessed before the declaration and 1285 after that point which provided information on prevalence rates and risk factors of anxiety and depression from both time periods. It was discovered that employed middle income primiparous women 35 years and below were at increased risk for developing symptoms of anxiety and depression as the pandemic progressed. Other factors such as weight before pregnancy and living space were also tied to this demographic. The EDS denoted a slight increase of depressive symptoms (29.6%) in women assessed after the declaration versus lower values (26.0%) present among the sample prior to the public announcement. Rates of thoughts of self-harm were greater among the women assessed after news of the pandemic became public (n=1285).

Turkish researchers Durankuş and Aksu [24] recognize the concentration of studies that commenced in order to manage the pandemic effectively but the lack of research on the psychological impact on the general population and pregnant mothers. An online questionnaire on depression and anxiety yielded respondents ($n=92$) from which 35.4% scored over 13 on the EPDS scale (range 0-30). The need for psychosocial aid was pointed out as social isolation and great psychological effects were concluded among the sample.

Further study on the same was carried out by Patabendige et al. [25] in Sri Lanka in the form of a cross-sectional study during a time of low rate of infection. The researchers utilized the Hospital Anxiety and Depression Scale (HADS). Out of a sample of 1500 women attending antenatal clinics, mothers in the age group of 18-25 had a higher risk of being both anxious and depressed.

Finally, in a study by Zhang and Ma [26], the Impact of Event Scale (IES) and mental health related questions were utilized in the form of an online questionnaire and distributed to 560 pregnant women. The overall mean IES was 31.4 ± 13.7 , with 67.1% of pregnant women with an IES ≥ 26 . This score concluded a moderate to severe stressful impact in pregnant women during the beginning stages of the pandemic and even greater so in mothers in their second trimester.

After evaluation of all six resources, all researchers recognized the clinically significant findings found on the topic. It was strongly encouraged that timely focus, guidance, psychosocial support, and intervention be provided in order to reduce the stress, anxiety and depression in pregnant women not only during the COVID-19 pandemic but beyond this time.

4.4 Studies Conducted in Africa

Several studies on COVID-19 and pregnancy have been published recently. However, very few studies in developing countries like in the African countries have evaluated the impact of this pandemic on maternal mental health, particularly in a low-resource setting. Five studies conducted in different African countries, have been evaluated for the prevalence of depression, anxiety, and stress, among pregnant women during COVID-19 lockdown.

Abraham et al, conducted the research with the study sample consisting of 885 participants, of whom 110 (12.4%) were classified as having a probable CMD and 775 (87.6%) were not. Almost half the women were severely food insecure ($n=378$), while more than half were unemployed ($n = 475$). The proportion of women with CMD significantly increased with the increasing number of pregnancies ($p=0.017$) and severity of food insecurity ($p<0.001$). Also, During the lockdown the proportion of women who felt unable to stop worrying or thinking too much increased more than three-fold (12–40%), while the number of women who felt down, depressed or hopeless increased by six times (5–30%). Significantly more women experienced psychological distress during the lockdown, compared to their first clinic visit (3.1 vs. 26.2%; $p<0.001$).

In the study conducted by Nwafor et al. [28], the study reported severe and extremely severe depression in 7.2% ($n=33$) and 6.4% ($n=29$) of participants. Analysis also revealed that 3.3% ($n=15$) and 7.7% ($n=35$) of women had severe and extremely severe anxiety, respectively. In total, 23% ($n=105$) of the participating women had severe stress while 16.7% ($n=76$) reported extremely severe stress. In addition, the study conducted by Nwafor et al [28] reported that over one-third (37.5%) of the pregnant women surveyed reported COVID-19-related anxiety. Similar findings were reported by Taubman-Ben-Ari et al. [37] which was conducted in Israel where a significant number of pregnant women also reported COVID-19-related anxiety; this concern was related to the fear of being in public places or taking public transport [37]. This was followed by anxieties relating to the health of others, either the fetus or family members, and then the possibility of the pregnant woman herself being infected, and anxiety relating to delivery.

The online Qualtrics survey conducted by Moyer et al [55] for pregnant women was distributed via Facebook, WhatsApp groups, and health listserv related to pregnancy in Ghana reported that When asked about specific COVID-19-related anxieties, the following concerns were reported: 60 (87.0%) feared getting sick, 45 (65.2%) women feared the stigma associated with getting sick, 44 (63.8%) reported fear of discrimination if infected with COVID-19, 40 (58.0%) were concerned about food running out, 25 (36.2%) feared job/income loss, and 19 (27.5%) feared increased conflict in the home. In conclusion, as

a result of all this COVID-19 has had a significant impact on pregnant women's anxiety and reported care-seeking in Ghana, with women skipping ANC visits and reconsidering facility births in order to reduce the risk of being infected by COVID-19. The skipping of the antenatal visit and reconsidering facility birth is due to the anxiety and fear experienced by these pregnant women.

Anikwe et al. [29] studied Nigerian pregnant women (n=460) for anxiety and found the majority of the pregnant women had poor knowledge about COVID-19 while less than the respondents had knowledge about it. From this study, about two-third (65.0%, 300/460) of the women expressed fear to COVID-19 which is due to the resulting effects of the disease, and the havoc wreaked around the world [38, 39, 40]. On the other hand, most of the women (11.2%, 315/460) were not afraid of contracting the disease, probably attributed to a wrong understanding/belief that pregnant women were immune to coronavirus infection. The odds of such belief (pregnant women immune to COVID-19) are significantly high, and this has been shown to slow down the prevention of the disease.

Finally, Kassaw and Pandey, [30] examined pregnant women in Ethiopia and of 178 respondents, 57 (32.2%) of them scored 9/21 and considered it as a general anxiety disorder. This study found a 32.2% prevalence of general anxiety disorder among perinatal service attending mothers, and this finding was higher than the study conducted in China (17.2%) [41]. Respondents with poor social support were 4.39 times (2.29–12.53) more likely to suffer from general anxiety disorder than those who had high social support, which was supported by a similar study done in Malawi by Belete et al., [42] and Ethiopia by Azene et al. [43]. So, this study has shown that a good or poor support system is related to anxiety disorder.

4.5 Studies Conducted in South America and Australia

Using the BAI scale, 13.9% and 9.6% of 1662 participants in a study conducted in Brazil reported having moderate and severe anxiety levels respectively [21]. With regards to ethnicity the white participants had a significant relationship with maternal anxiety with their p-value being < 0,001. Other confounding factors that showed a significant relationship with mild

and severe anxiety are alcohol consumption, cohabiting/married, secondary school education, COVID-19 in family, hypertension comorbidity, and geographical regions – all with a p-value lower than 0,05. Another Brazilian study conducted 2 months prior to the aforementioned study measured the presence of common mental disorders (CMD) when participants were asked questions from *The Fear of COVID-19 Scale* [34]. All questions were statistically significant with the CMD amongst participants- with the most notable questions being “*Can't sleep because I am worried about getting the Coronavirus?*”, “*Would you like to talk to a professional about your thoughts and feelings?*”, and “*Negative feelings towards COVID-19*” having 69,7%, 60,9% and 69,4% of participants positively responding.

López-Morales, H. and their colleagues [33] conducted a study in Argentina that explored the indicators of various mental illnesses amongst pregnant and non-pregnant individuals. They found that anxiety and depression significantly increased amongst their participants, with pregnant individuals showing higher rates. Amongst the pregnant participants the mean and standard deviation (SD) greatly increased in the 3rd wave of isolation and slightly decreased in the 4th wave.

In Columbia, it was reported that the most prevalent symptoms of distress during the COVID-19 pandemic amongst their participants were anxiety (50,1%), insomnia (94,1%) and irritability at 34,7% [32]. They also reported a p-value of <0,001 for statements “*Feels she should deliver prematurely before the peak of the pandemic*” and “*Feels fear for the effects that SARS CoV-2 can have on her baby*” where the percentage of positive responses (answered ‘yes’) were higher amongst women poorly informed about COVID, than women adequately informed of COVID-19.

Of 3364 participants of a study conducted in Australia, just below a third (29%) of the women could access antenatal care education [36]. Some participants mentioned that they changed their hospital choice for antenatal care as well as birth from public hospitals to private as they felt the COVID-19 pandemic affected the public hospitals in a way that limits their choice of support and postnatal care.

A qualitative study in Australia reported that concerns from their participants and their unease

rose due to the presence of COVID-19. Many participants also admitted to experiencing high levels of worry as they were nearing the end of their third trimester; and were considering alternative methods of attending and conducting their antenatal appointments and method of parturition [35]. Chivers and their colleagues [35] also recorded that their participants experienced anticipated grief due their inability to have support at a hospital outside of healthcare workers (HCW); to host antenatal social gatherings like baby showers, gender-reveal parties. Participants expressed that they feel robbed of experiencing a 'normal' pregnancy; and admit that social distancing regulations caused some disturbances in their familial relationships. Chivers and their colleagues [35] also documented that some of their participants encountered happiness accompanied by guilt. Participants conveyed that although they are elated by their pregnancy, the negative impact of the COVID-19 pandemic on their surroundings brought about guilt.

5. DISCUSSION

Regardless of the geographical location where the studies were conducted, it is evident that the pandemic has caused an increase in the mental distress amongst pregnant women. In some regions, anxiety was most significant and for others it was depression. However, it remained clear that pregnant women in the different regions had different causative factors of anxiety and depressions associated with the pandemic. In the North American studies reviewed, access to support resources during labor and prenatal care were the fundamental stressors for all participants as well as the uncertainty caused by the restrictions and changes made by the government. These restrictions affected all women in the population regardless of age, parity or educational level. Whereas the majority of Asian studies indicated the presence of marital support, general social isolation and employment status as chief elements contributing to the clinically significant stress scores of pregnant women. This was also echoed in some parts of Europe.

Of the studies conducted in Brazil, the results in both studies showed a concerning increase in the prevalence of depression and anxiety amongst pregnant women. With some of the participants stating that with them or their family members being infected with COVID-19, their anxiety increased drastically [31]. This could be

due to the increased incidence and mortality rate in Brazil in the middle of 2020 that made it the epicenter of the pandemic [44]. With Columbia and Argentina neighboring the country of Brazil, one can suggest that the prevalence of the COVID-19 heightened the worry amongst pregnant women. The limitations on social interactions allowed for an increase in the incidence of depression within pregnant women [33].

Chivers, B. R. and their colleagues [35] noted that in the analysis of the frequency of the use of certain words, "worrying" and "concerns" had percentage frequencies of 19.9% and 8.8% respectively. A similar study in Ghana revealed that pregnant women had reservations with visiting healthcare centers as there were concerns of their health and safety [13].

Similar to the findings of pregnant women experiencing insomnia made by Parra-Saavedra et al. [32] a study in Spain showed the presence of insomnia and grief contributed to the incidence of depression [15]. This may suggest that pregnant women in different regions respond similarly to the stress that the pandemic has caused.

In Wuhan China, the place thought to be the origin of the Sars-CoV2 emerged, a study concerning the rate of depression amongst pregnant women reported a positive association between the rate of depression, the incidence of COVID-19 in Wuhan, and its mortality rate [23]; this finding supports the phenomenon of increased rate of depression in pregnant people of Brazil and South Africa [27,31,44] (Normura, et al., 2020).

Evaluation of the anxiety levels of pre and post pandemic groups of women show that there is an observable difference. This is supported by studies carried out in North America and well as in Europe [15, and 12].

In the study conducted by Abraham et al, this result is similar to the study in South Africa conducted by Woody et al; Dennis et al. [56], that there is high prevalence of depression and anxiety during the perinatal period, especially in low- and middle-income countries where approximately 19% of perinatal women develop depression, and approximately 34% develop anxiety. In South Africa the prevalence is particularly high, with several studies reporting

that one in every three pregnant women develop symptoms of depression, and one in every four pregnant women develop symptoms of anxiety [46, 47, 48].

This report by Nwafor et al. [28] is however, similar to studies conducted on the psychological effects of the SARS outbreak in 2003 on the experience of pregnant women, that showed that these women experienced high levels of depression, anxiety and stress with regards to potential infection. Anxiety is common during and after pregnancy as women anticipate and adjust to motherhood, especially in those women and couples who have previously experienced adverse pregnancy outcomes, such as miscarriage and perinatal death [49, 50].

Mostly the younger women were more anxious than the older women. COVID-19 has been identified to be associated with an increased rate of psychosocial issues and mental health challenges around the world [51, 52, 53] and the burden could be high in sub-Saharan Africa, as a result of the weak health care systems in developing countries which provide no support system to pregnant women. Pregnant women are not immune to these mental health issues which can have deleterious effects on the woman and her developing fetus [53, 23, 54]. Possible deleterious effects of COVID-19 mental health issues on pregnancy include preeclampsia, preterm labor, and low birth weight.

In addition, the experience of experiencing pregnancy and birth-related conditions though varied among women have generally been stressful with intense thoughts of uncertainty stemming from a wide range of factors. Women's health and the need for greater attention had placed it as a top global health priority.

6. STUDY LIMITATIONS

As a result of tight time constraints, selection bias may have been unintentionally introduced in the process of selecting and reviewing articles by the authors. This constraint made it impossible to adopt various research tools and processes to improve the rigor of the research. To mitigate against this bias, the authors relied on reviewing the titles and abstracts of the articles and made decisions to include those that meet inclusion criteria. In future studies, it would be ideal to consider studies conducted within a consistent time period during the pandemic given that different countries implemented lockdown

restrictions that were dependent on the local situation related to the spread of the virus. Lastly, the maternal mental health amongst only first-time mothers during the pandemic could be another area assessed in future research.

7. CONCLUSION

Research continues to show that pregnant women in this period should remain prioritized as their mental health is severely affected by the effects of the COVID-19 pandemic (in particular the regulations regarding social interaction and the burden of the infections of the healthcare system as a whole). The advent of the COVID-19 Pandemic has revealed clearly that although efforts may be invested in new physical structures for the administration of better healthcare, major loopholes still exist. One of these is the need for creativity in regard to the dispensation of smarter and more effective healthcare, capable of clearing the obvious barriers of time and space.

Studies from Africa underscore the need for improved health care dispensation as poverty-stricken areas feel the brunt of the crisis. Low-income families show an obvious increased state of anxiety. A good support system is advantageous in dealing with mental health issues especially among women who are high-risk or first-time mothers.

Based on the findings, the authors recommend each healthcare institution implement one tool or strategy that would aid to improve women's mental health at this time, especially the mental health of pregnant women. This could be in the form of a hotline, campaign, virtual sessions or increased availability of a psychologist. In this manner, the debilitating effects of the pandemic on many families will be surely decreased.

ETHICAL APPROVAL

There were no ethical issues or conflicts of interest. All information obtained from various sources were correctly cited and paraphrased.

CONSENT

There was no misconduct and no informed consent required. The authors ensured that information obtained was not misrepresented.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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