

# Estimates and Determinants of Psychological Problems of Pregnant Women during COVID-19 Epidemic in South Africa

A. M. Hoque, M. Hoque, M. E. Hoque, and G. Van Hal

## ABSTRACT

The COVID-19 epidemic has impacted significantly on the general population including pregnant women. The psychological impact of COVID-19 among vulnerable population like pregnant women is yet to be estimated. Therefore, the objective of this study was to estimate the prevalence and factors associated with anxiety, depression, and overall psychological problems. A questionnaire-based cross-sectional study was conducted among black pregnant women attending a Primary Health Care facility in South Africa. Logistic regression analysis was performed to determine the significant factors for psychological problems. A total of 346 pregnant women participated in this study. The rates of anxiety, depression and overall psychological problems were 35.7%, 38.2% and 34.3% respectively. Gestational age between 14-26 weeks were 60% (OR=.397,  $p<0.05$ ), part-time employment 53% (OR=0.47,  $p<0.05$ ) and pregnant women having adequate funding for monthly expenses were 62% less likely (OR=0.381,  $p<0.05$ ) to have anxiety problems. Married women were 2.5 times more likely (OR=2.54,  $p<0.05$ ) and women living together or widowed were 2.9 times more likely (OR=2.91,  $p<0.05$ ) to have anxiety. Pregnant women aged between 20-29 years were nine times (OR=9.03,  $p=0.016$ ), women aged 30 to 39 years were 6.3 times (OR=6.3,  $p=0.032$ ) more likely to have depression. Parity one 91% (OR=0.094,  $p=0.007$ ), parity two 86% (OR=.143,  $p=0.027$ ) and part-time employment 65% (OR=0.354,  $p=0.002$ ) were less likely to have depression. Comparing with women aged >39 years, women who were between 20-29 years were 28 times (OR=27.8,  $p<0.01$ ) and women aged between 30-39 years were nine times more likely to have overall psychological problems. Respondents with parity one was 83% (OR=0.17,  $p<0.05$ ) less likely to have psychological problems when compared with other parity groups and women having adequate funding were 65% less likely (OR=0.35,  $p<0.05$ ) to have overall psychological problems than those did not have adequate funding. Higher rates of anxiety, depression and overall psychological problems are found among black pregnant women. It is therefore imperative that appropriate and timely mental health care supports are provided to reduce adverse health outcomes.

**Keywords:** Anxiety, Depression, Psychological impact, Prevalence, Risk factors.

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**A. M. Hoque \***

Kwadabeka Community Health Centre,  
Durban, South Africa.

(e-mail: mhoque75@gmail.com)

**M. Hoque**

South African College of Applied  
Psychology, Durban, South Africa.

**M. E. Hoque**

Management College of Southern  
Africa, Durban, South Africa.

**G. Van Hal**

University of Antwerp, Antwerp,  
Belgium.

\*Corresponding Author

## I. INTRODUCTION

Since coronavirus disease of 2019 known as COVID-19 has identified and emerged globally from Wuhan, China, in December 2019 it is the largest pandemic humanity is dealing with [1]. The COVID-19 outbreak has impacted significantly on the general population of South Africa (SA) as there are 589 886 cases (58% being female) and 11 982 deaths as of 18 August 2020 [2]. Most recent studies have largely focused on describing the epidemiological and clinical characteristics and outcomes of the disease in the general population, health care workers and suggested that the most of infections cause a mild form of infection [3]. However, those studies found that older adults and people with medical comorbidities are at higher risk of severe

illness and death, with more men than women [4], [5]. Based on WHO recommendations, mass quarantine measures are implemented in SA and in many countries as the universal disease control measure [6]. In addition to lockdown and home quarantine, SA has also engaged in media campaigns to disseminate information on preventive measures to the general population including pregnant women like many other countries; regular hand washing with water and soap, social distancing is some of the initiatives [7].

The quarantine has restricted people to their homes, to prevent or slow down transmission of the COVID-19 infection in communities and countries irrespective of high and low infection rate [6], [8]. Psychological impact of quarantine alone is known to cause mental distress e.g., irritability, loneliness, frustration, anxiety, depression, fear of

contracting and spreading infection to family members, insomnia, despair, to extreme consequences like suicidal tendency and committing suicide [9]-[13]. Imposed country wide mass quarantine and application of universal infection prevention strategies applied by the nationwide lockdown program in South Africa (SA) may produce psychological impact like mass hysteria, anxiety and distress. Few previous studies have highlighted that mental well-being had negatively been affected in the general and vulnerable populations (like pregnant women) due to COVID-19 pandemic and applied preventive measures [9], [14]-[17]. According to a study in Chinese citizens, it was found that females experienced a higher degree of negative psychological health due to the outbreak [18]. This finding concurred with the previous epidemiological studies that reported women were at a higher risk of developing depression and anxiety that could possibly be due to biological and or socioeconomic factors [19], [20].

Pregnant women are known to be vulnerable to many infectious diseases that can cause adverse effects not only to maternal but also to foetal outcomes [21]. Thus, pregnant women are considered to be a unique and special population as a result of 'immune suppression' caused by pregnancy [21]. Furthermore, the known immunological and physiological changes of pregnancy when infected are found to be related with higher risk of severe illness or mortality in general and also more specifically due to COVID-19 compared with the general population or non-pregnant women [21], [22]. In general, around 10% of pregnant women are known to suffer from depression and this rate increases to 16% in developing countries [23]. Mental health problems among this vulnerable group are expected to increase by the mental health repercussion due to COVID-19 pandemic [24]. It has become a public health crisis as it impacted on the social, demographic and economic problems the society and impacted substantially negative psychosocial effect on all including pregnant women. Anxiety of pregnant women alone is a known negative predictor of pregnancy complications such as depression, preeclampsia, nausea, vomiting and preterm labour or miscarriage [25].

WHO has recommended that the countries of high COVID-19 infection to take the necessary actions against the negative impact on psychological health and well-being of the general population [26]. However, to the best of our knowledge, there is very little known about the psychological problems pregnant women are experiencing in SA due to COVID-19. Therefore, the objectives of this study were to assess and estimate the anxiety, depression, and overall psychological problems during the COVID-19 crisis among pregnant women attending a primary health care setting in Durban, South Africa.

## II. MATERIALS AND METHOD

### A. Study Design

This was a cross-sectional study conducted among pregnant women attending Kwadabeka Community Health Center (KCHC), a primary health care center running maternity services using national guidelines in a peri-urban setting of Durban, South Africa during the early stage of the epidemic [27].

### B. Study Settings, Sample Size, Participant Selection, Data Collection and Measurements

The study settings, sample size and selection as well as data collection strategy is explained elsewhere [28]. Any pregnant woman screened positive for COVID-19 was excluded from the study. A questionnaire was used for data collection. The questionnaire dealt with pregnant women's demographics (age, education, employment and marital status), personal, medical and obstetric risk (parity, gestational age, vulnerable co-morbidity), alcohol habits and household (HH) risk factors (number of people living in a HH, respondent living with one or more children under 5 years and respondent living with one or more elderly of 60 years or over), whether the HH had adequate funding for daily living before and during the epidemic. Generalized Anxiety Disorder (GAD-7) and Patient Health Questionnaire scales (PHQ-9) were adopted to measure anxiety and depression [29], [30]. Seven-items for GAD-7 and nine-items for PHQ-9 symptom questions were used respectively to measure anxiety and depression problems during the past 2 weeks [31], [32]. Responses to each of the questions had 4 options: "not at all," "several days," "more than half of the days" and "nearly every day," scored as 0, 1, 2, and 3, respectively for all questions to measure anxiety, depression, and overall psychological problems. Any respondent found with either anxiety and or depression problems was then referred to social workers' clinic for intervention at KCHC.

### C. Data Analysis

Data were captured in Microsoft Excel and exported to SPSS version 22 for analysis. Descriptive statistics were used such as mean with standard deviation (SD) for continuous variables and frequency distribution for categorical variables. The prevalence of anxiety, depression and overall psychological levels were reported. Both anxiety and depression problems were measured using cutoff points of the summary scores 5, 10 and 15 to classify or categorize as mild, moderate and severe anxiety and depression respectively as based on other reports [33]. Therefore, the total scores for GAD-7 and PHQ-9 were separately categorized to represent: (1-5) none or minimal, (6-9) mild, (10-14) moderate and (> 15) severe anxiety and depression. However, the cut off points of GAD-7 and PHQ-9 scores >10 for anxiety and depression disorders were considered based on previous published studies [34], [35]. The combined GAD-7 and PHQ-9 scores > 20 were used to measure overall psychological problems. The GAD-7 (score > 10 = 1 and < 9 = 0), PHQ-9 (scores > 10 = 1 and < 9 = 0) and overall psychological scores (> 20 = 1 and < 19 = 0) were treated as dichotomous variables for the bivariate and multivariate analysis. Pearson's correlation test was conducted to determine the relationship between anxiety and depression scores. Cross table analysis with Chi-square test was used to identify associated factors for anxiety, depression, and overall psychological problems. Binary logistic regression (backward stepwise) analysis was undertaken to identify the predictors for anxiety, depression, and overall psychological problems. The results were reported as OR (odds ratio) with 95% Confidence Interval (CI). All tests were two-tailed, with a significance level of  $p < 0.05$ .

#### D. Ethical Consideration

Ethical approval was obtained from Health Ethics Review Board (Reference no. 06/2020). Permission from the KCHC management was obtained to undertake the study (reference no. 02/2020). Anonymity and confidentiality of the respondents was maintained at all times. Participation in the study was voluntary. The study obtained informed consent from the participants after explaining the purpose, nature and objectives of the study.

### III. RESULTS

The study recruited 346 pregnant women with the mean age of 26.7 (SD=6.81) years and 14.8% were teenage pregnancy (age < 20 years). Majority (82%) belonged to ages between 20 to 39 years and 71.4% was single (Table I). More than half (52%) of them were unemployed and having lower level of education (73% had matric or below education). The mean gestational age was 23.8 (SD 6.83) weeks and most of them were in their late gestation (48.8% and 32.4% in second and third trimesters). Nearly half (49%) were nulliparous, meaning having or experiencing first pregnancy. The mean number of people per household was 3.56 (SD 2.3) and majority (52.6%) HH had between 1-3 people. The respondents living with high-risk population for COVID-19 were 44.4% (children <5 years) and 25.1% with people with age > 60 years respectively. Half (50.29%) of the respondents had known vulnerable comorbidities for COVID-19. Among these, the highest prevalence was HIV (28%) followed by known hypertension (11.3%), chronic asthma (7%), diabetes (3%) (not shown in table). However, some respondents (3%) had more than one comorbidity. Over half of the respondents (53%) reported that they had adequate funding before the COVID-19 epidemic. Adequate funding at the household level went down to 27.7% during the epidemic. Only 7.5% of pregnant women reported to consume alcohol before the epidemic and the rate went down to 1.8% during the epidemic.

#### A. Prevalence of Anxiety, Depression, and Overall Psychological Disorders

Majority (62.6%, 60.6% and 65.7%) of the respondents had minimal to mild forms of anxiety, depression and overall psychological problems respectively (Fig. 1). However, considering the generalized anxiety and depression disorder among pregnant women (GAD-7 and PHQ scores >10 individually) 35.7% and 38.2% were found with anxiety and depressive disorders respectively. Similarly, more than one-third (34.3%) of the respondents were found with overall psychological problem.

#### B. Demographic Variables and Its Association with Anxiety, Depression, and Overall Psychological Disorders

Chi-Square test of association was undertaken to identify the demographic variables significantly associated with anxiety and depression disorders, and overall psychological problems (results not shown).

TABLE I: DEMOGRAPHIC, PERSONAL AND HOUSEHOLD VARIABLES OF THE STUDY RESPONDENTS

Variables	Frequency	Percentage
Age (n=346)		
<20 years/ Teenage	50	14.5
20-29 years	172	49.7
30- 39 years	111	32.1
>=40 years	13	3.7
Mean (SD) age	27 years (SD 6.81)	
Parity (n=346)		
Nil (0) parity	169	48.8
Parity 1	88	25.4
Parity 2	55	15.9
Parity 3	26	7.5
Parity 4	8	2.3
Gestational age (n=346)		
First trimester	65	18.8
Second trimester	169	48.8
Third trimester	112	32.4
Marital status (n=346)		
Single	247	71.4
Married	60	17.3
Others(Living together, widow)	39	11.3
Employment Status(n=346)		
Full- time	87	25.2
Part- time	80	23.1
Unemployment	179	51.7
Education level (n=346)		
No education	14	4
1- 11 years schooling	129	37.3
Grade 12	126	36.4
Diploma/ degree	77	22.3
No. of people in the household (n=346)		
Between 1-3 people	182	52.6
Between 4-6 people	135	39
7 or more people	29	8.4
Mean number of people per HH	3.56 (SD 2.3)	
Respondents living with children under 5 years	154	44.5
Respondents living with elders ≥ 60 years	87	25.1
Presence of known vulnerable co-morbid conditions (n=346)	167	48.3
Adequate household funding before COVID-19 epidemic (n=346)	149	43.1
Adequate household funding during COVID-19 epidemic (n=346)	96	27.7
Drink alcohol usually and before COVID-19 epidemic	26	7.5
Drink alcohol during COVID-19 epidemic	6	1.8

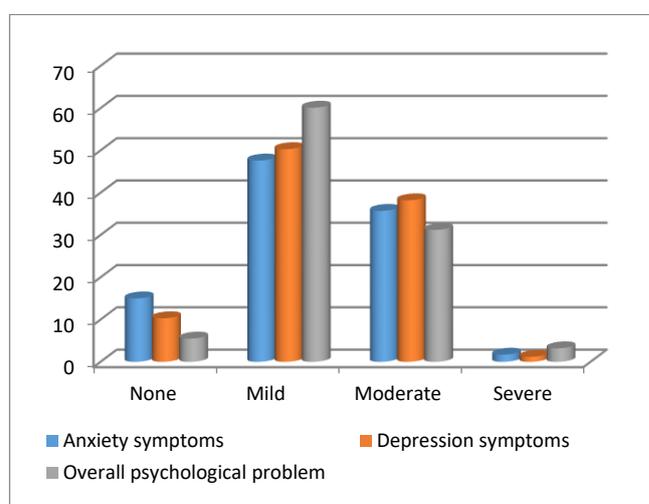


Fig. 1: Frequency distribution of anxiety, depression, and overall psychological disorders in percent among 346 pregnant women.

The following variables found to be significantly associated with anxiety and depression disorders, and overall

psychological problems were age, education, employment status, parity, gestational age, pregnant women living with people > 60 years, respondents who did not have adequate funding for living, HH funding before and during the COVID-19 epidemic. Pearson correlation test (Table II) showed that total anxiety scores were significantly but poorly positively correlated with depression scores ( $r=0.168$ ;  $p<0.05$ )

TABLE II: CORRELATIONS TEST RESULTS OF ANXIETY AND DEPRESSION SCORES

		Total	
		Total anxiety	Depression
Total anxiety	Pearson Correlation	1	.168**
	Sig. (2-tailed)		.002
	N	346	346
Total Depression	Pearson Correlation	.168**	1
	Sig. (2-tailed)	.002	
	N	346	346

### C. Regression Analysis Results

Binary logistic regression analysis was performed to identify demographic, personal and household risk factors associated with anxiety disorder (GAD-7 score >10), depression (PHQ-9 score >10) and overall psychological problems (scores >20). The variables that were found to be significantly associated with the dependent variables were initially included in the model. Gestational age between 14 to 26 weeks was 60% less likely to be related with an anxiety disorder (OR=.397,  $p<0.05$ ) compared to first trimester (gestational age < 13 weeks) (Table III). Married women were 2.5 times more likely (OR=2.54,  $p<0.05$ ) to have anxiety disorders compared to single women. Similarly, pregnant women living together or being widowed had 2.9 times more risk (OR=2.91,  $p<0.05$ ) to have anxiety problems than single women. Pregnant women who were part time employed were 53% less likely (OR=0.47,  $p<0.05$ ) to have anxiety problems than those who were unemployed. Similarly, pregnant women having adequate funding for monthly expenses were 62% less likely (OR=0.381,  $p<0.05$ ) to have an anxiety disorder.

TABLE III: MULTIPLE LOGISTIC REGRESSION ANALYSIS OUTPUT FOR ANXIETY DISORDER

Variables	Sig.	Exp(B)	95% C.I.for EXP(B)	
			Lower	Upper
Gestational age	.019			
Gestational age A (1)	.012	.397	.194	.814
Gestational age A (2)	.966	.989	.592	1.651
Marital status	.098			
Marital status (1)	.044	2.544	1.027	6.303
Marital status (2)	.038	2.919	1.063	8.014
Employment status	.063			
Employment status (1)	.350	.768	.442	1.336
Employment status (2)	.020	.473	.252	.887
Currently have sufficient funding to cover monthly cost (1)	.000	.381	.226	.643
Constant	.553	.733		

Women aged 20 to 29 years were nine times more likely to have a depression disorder (OR=9.03,  $p=0.016$ ) than the teenagers (Table IV). Women aged 30 to 39 years were 6.3 times more likely to have a depression (OR=6.3,  $p=0.032$ ) than the teenagers. Parity one (second time pregnant) women were 91% less likely to have a depression disorder

(OR=0.094,  $p=0.007$ ) than nulliparous women. Parity 2 (women with their third pregnancy) were 86% less likely (OR=.143,  $p=0.027$ ) to have a depression than those who had no pregnancy before. Part time employment was found with a protective effect (65% less likely to have depression (OR=.354,  $p=0.002$ ) compared to unemployed respondents.

It was found that women aged between 20 to 29 years were 28 times more likely to have overall psychological problems (Table V) than the teenagers (OR=27.8,  $p<0.01$ ). Similarly, older ages (30-39 years) were nine times more likely to have overall psychological problems (OR= 9.345,  $p < 0.05$ ) than the teenagers. Women with parity 1 were less likely to have overall psychological problems than those being nulliparous (OR=0.17,  $p < 0.05$ ). Pregnant women who had adequate funding during the epidemic were less likely to have psychological problems than those who did not have adequate funding (OR=0.35,  $p < 0.05$ ).

TABLE IV: MULTIPLE LOGISTIC REGRESSION ANALYSIS OUTPUT FOR DEPRESSIVE DISORDER

Variables	Sig.	Exp (B)	95% C.I.for EXP(B)	
			Lower	Upper
Category age	.024			
Category age (1)	.016	9.036	1.506	54.206
Category age (2)	.032	6.309	1.175	33.879
Category age (3)	.192	2.954	.581	15.006
Parity	.001			
Parity (1)	.007	.094	.017	.526
Parity (2)	.082	.219	.039	1.216
Parity (3)	.027	.143	.025	.802
Parity (4)	.507	.551	.095	3.206
Employment status	.008			
Employment status (1)	.259	.706	.386	1.292
Employment status (2)	.002	.354	.183	.684
Constant	.873	1.158		

TABLE V: MULTIPLE LOGISTIC REGRESSION ANALYSIS OUTPUT FOR OVERALL PSYCHOLOGICAL PROBLEM

Variables	Sig.	Exp (B)	95% C.I.for EXP(B)	
			Lower	Upper
Category age	.002			
Category age (1)	.004	27.86	2.858	271.595
Category age (2)	.045	9.34	1.050	83.214
Category age (3)	.093	6.31	.734	54.326
Parity	.003			
Parity (1)	.049	.174	.031	.990
Parity (2)	.311	.410	.073	2.305
Parity (3)	.825	.821	.144	4.687
Parity (4)	.428	.469	.072	3.053
Currently have sufficient funding to cover my monthly cost (1)	.000	.355	.213	.594
Constant	.400	.356		

## IV. DISCUSSION

This study provides an initial insight of psychological problems of pregnant women attending KCHC at the initial phase of the COVID-19 pandemic in SA. This study is unique because it is the first known study to describe the prevalence of anxiety, depression and overall psychological problems due to the COVID-19 pandemic and psychological or mental health services need for pregnant women attending Primary Health Care (PHC) facilities in SA. The use of GAD-7 and PHQ-9 scales are commonly used to diagnose generalized anxiety and depression disorders in general population. The National Institute for Health and Care Excellence (NICE) recommends using GAD-7 and PHQ-9 scales to measure prenatal anxiety and depression risk in

pregnant women Therefore, it was found to be suitable for this study.

#### A. The Demographic Indicators of Pregnant Women with the Index Pregnancy

Being single (71.4%), low level of education (only 22% had post matric education), high unemployment rate (52%), having inadequate funding before (57%) and during 72.3% the COVID-19 epidemic in SA is indicative of poor socio-economic condition. In addition, nearly half of them (44%) are living with a vulnerable population (children less than 5 years (44.5%) and a quarter of them with people over 60 years old and vulnerable medical comorbidities (48.3%). The presence of these vulnerable people in the HH and having comorbidities can cause a lot of distress, worry and anxiety to pregnant women.

The reduction of consuming alcohol before the epidemic from 7.5% to 1.8% during the epidemic is due to the national lockdown and banning of alcohol and cigarettes sale in SA.

More than one-third of the pregnant women were found with anxiety (37.4%) and depressive disorders (39.4%) and overall psychological problems (34.3%). These rates are more than double than the psychological problems pregnant women were known to experience during the usual time in developing countries [23], [24]. In general, women are found with a higher degree of psychological problems and it is higher in our study than in the case of China during the COVID-19 epidemic for stress, anxiety, and depression [18]. These findings also concur with previous epidemiological studies among women to be at a higher risk of depression due to their unique biological and socioeconomic factors [19], [20]. Anxiety and depression symptoms and disorders are known to often co-occur among pregnant women, and our analyses also found this. Overall, one third of respondents had psychological problems. Higher psychological impact was associated with younger age similar to other report [37]. Previous reports had already highlighted that the prevalence of anxiety among pregnant women were high and between 15% and 23% [25], [38], [39]. Family history (parental) of mental disorders together with low socioeconomic condition had also found associated with increase the risk of anxiety [40]-[42].

#### B. Factors Influencing Pregnant Women's Psychological Status

The present study found that demographic variables such as age, levels of education, gestational age, marital status, employment status, adequate financial resources and parity of pregnant women were all factors related to negative psychological status during the COVID-19 pandemic. It was also found that women aged between 20 to 29 years were 9 times and 28 times more likely to have depressive and overall psychological problems than the teenage pregnant women, consistent with another study [43]. In addition, the same study highlighted that a higher prevalence of anxiety and depression are associated with the lower level of education consistent with the results of our study [43]. It is likely because people with a higher education and older ages are more likely to have a self-protection and self-defense psychological mechanism and may gather relevant information and knowledge on the COVID-19 epidemic on their own initiative by different methods. Therefore, older

pregnant women may have developed psychological adaptation due to less cognitive bias towards the epidemic diseases.

The results also showed that pregnant women in late gestational age (second trimester) were 65% less likely to develop anxiety compared to earlier gestation (first trimester) period. It is likely due to morning sickness and other associated symptoms pregnant women usually experience in early gestational period and the development of maternal immune system in early pregnancy and it is known to be very sensitive, to develop anxiety and depression symptoms together with the problems of the COVID-19 pandemic [44].

It is well known that if depression during antenatal period remained untreated, it often results in negative obstetric outcomes and that it is a known risk factor for poor maternal health that may lead to inadequate prenatal care, care during delivery and postnatal depression of mothers [45], [46]. In addition to the possible negative impact on pregnancy outcomes, depression during postnatal period is also linked with disrupted maternal-infant bonding, increased irritability, and decreased activity. Delayed cognitive and language development, lower IQ, and increased prevalence of psychiatric and emotional problems of newborns or children are often found with mothers with psychological problems like depression during and after delivery. Maternal depression during pregnancy is often known to continue or become worse after delivery [47]-[49]. Therefore, there is an urgent need to comprehensively screen all pregnant women for psychological problems e. g., stress, anxiety and depression in existing antenatal care programs to provide proper support to pregnant women in the PHC settings in SA. A detailed mental health crisis program is the demand of time due the COVID-19 pandemic.

This study evaluated the psychological problems of the COVID-19 epidemic among pregnant women in SA at its initial phase. As the epidemic is progressing in SA concerns regarding broader issues of economy, and livelihood together with health are likely to increase day-by-day. This could lead to develop further physical and psychological problems in long run. The findings of the psychological problems estimated in this study could help inform public health managers and policy makers to provide mental health interventions at an individuals and community level of those who are in need. Further studies are recommended to plan prospective longitudinal studies for assessing and determining the long-term psychological problems they could develop and immediate treatment or psychological support to be considered immediately.

## V. STRENGTHS AND LIMITATIONS

The strength of this study is that it is the first known study in a first level health care facility to evaluate and establish the prevalence of psychological or mental health problems due to the COVID-19 epidemic among pregnant mothers in SA. It is a single centre study which limits the generalization of the study findings to the study area. A multi-centre study would have been ideal. We only considered a small convenience sample of respondents in a short period of time. We also consider the cross-sectional study being unable to account for potential changes in anxiety and depression

levels over a longer period.

## VI. CONCLUSION

Pregnant women are found with higher rates of anxiety, depression, and overall psychological problems during the COVID-19 outbreak. We found that demographic factors/variables such as age, levels of education, gestational age, marital status, employment status, adequate financial resources and parity of pregnant women were all factors related to negative psychological status during the COVID-19 pandemic. It is of great importance to provide timely psychological support for pregnant women with mental disorders, to enhance their confidence in being a good mother, and to help them pull through such peculiar time smoothly.

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## AUTHOR'S CONTRIBUTION

AMH, MH, MEH, GVH – Conceptualisation, analysis and finalizing of the manuscript.

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