

# Depression and Anxiety Among Pregnant Mothers in the Initial Stage of the Coronavirus Disease (COVID-19) Pandemic in Southwest of Iran

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## Research

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# Abstract

**Background:** Women are at higher risk for depression progression especially during pregnancy. So, we aimed to investigate depression, anxiety, and stress level of pregnant mothers in the initial stage of the COVID-19 infection in Southwest of Iran.

**Methods:** This cross-sectional study conducted during March and April, 2020 in Shiraz, Iran. Pregnant mothers registered in maternity clinics affiliated to Shiraz University of Medical Sciences were included. An online self-administered checklist was used. It included socio-demographic, obstetric and medical history, and the short form of Depression Anxiety Stress Scales (DASS-21) for evaluation of depression, anxiety, and stress. P-value < 0.05 was considered significant.

**Results:** 540 pregnant mothers answered the questionnaire. 83.5% had no comorbidity. Abnormal depression score was significantly higher in those who did not have any insurance (OR= 2.5) and in those with poor self-rated health (SRH) (OR= 27.8). Pregnant mothers with lower SRH and two or more comorbidities had higher chance of having abnormal level of anxiety subscale; 6.9, 3.7 times, retrospectively.

**Conclusion:** The study revealed that that abnormal level of depression was associated with SRH and medical insurance status. Moreover, the number of comorbidities and poor SRH were significantly increased the chance of achieving abnormal anxiety level in pregnant mothers during the COVID-19 pandemic.

## Plain English Summary

Children of mothers who experienced high psychological distress during pregnancy, are more susceptible to have cognitive and behavioral problems. Moreover, few studies reported that psychological distress of pregnant mothers during the COVID-19 pandemic, and it may be revealed as a risk factor of child developmental disorders.

540 out of 920 registered pregnant mothers in maternity clinics affiliated to Shiraz University of Medical Sciences answered the online questionnaire were included. Online self-administered data gathering tool was used so that the respondents feel more secure. The data gathering tool had three main parts: socio-demographic, obstetric and medical history, and the short form of Depression Anxiety Stress Scales (DASS-21) which consists of 21 questions, 7 in each subscale; depression (DASS-D), Anxiety (DASS-A) and Stress (DASS-S).

Pregnant mothers who had two or more comorbidities or those with lower self-rated health (SRH) had a higher chance of having an abnormal level of anxiety subscale. Besides, there was a higher depression level in pregnant mothers who did not have any insurance. Additionally, depression symptoms were more prevalent in pregnant mothers who had low health status compared to those with good or intermediated SRH.

In conclusion; the COVID-19 pandemic contributes to a significant increase in depression and anxiety symptoms among pregnant mothers. Moreover, lack of insurance, poor SRH, and having comorbidities are significantly associated with increasing depressive and anxiety scores.

## Background

In late December 2019, Chinese health care facilities reported numerous kind of pulmonary infection cases with unknown type which was named coronavirus disease 2019 (COVID-19) in Wuhan, Hubei, China [1, 2]. The World Health Organization (WHO) has declared this disease as global pandemic on March 11, 2020 [3]. Up to now, August 31, 2020, more than 13 million cases with 461,000 death confirmed in united states of America and around 24.9 million cases with 839,000 death confirmed worldwide [4].

Recent studies reported that patients with heart failure, cancer, elderly patients with underlying disease, and immunocompromised are frail and predominantly susceptible to developing severe outcomes associated with COVID-19 infection [5, 6]. Besides, due to the pathophysiological and mechanical changes during pregnancy, pregnant women and their fetuses could be a high-risk population and more prone to this infection too [7, 8].

Previous studies revealed the remarkable impacts of infectious disease outbreaks such as severe acute respiratory syndrome (SARS) on psychological distress including depression and anxiety in pregnant mothers [9, 10]. Moreover, children of mothers who experienced high psychological distress during pregnancy, are more susceptible to have cognitive and behavioral problems and had a significant impact on their communication skills [11, 12]. Despite the extensive effect of psychological distress on pregnant women and their children, there is a gap in our knowledge about the rate or level of these distresses. Additionally, few studies reported that psychological distress of pregnant mothers during the COVID-19 pandemic, and it may be revealed as a risk factor of child developmental disorders [13, 14]. Hence, this study was aimed to investigate the depression, anxiety, and stress level of pregnant mothers in the initial stage of the COVID-19 infection in Southwest of Iran.

## Methods

### Study design and participants

This study is a cross-sectional study conducted during March 24 and April 7, 2020 in Shiraz; the fifth populous city located in Southwest of Iran. The study protocol was written based on the Helsinki ethical principles for medical researches and approved by the Ethics Committee affiliated to Shiraz University of Medical Sciences (SUMS) (IR.SUMS.REC.1398.1424).

The participants were pregnant mothers registered in maternity clinics affiliated to SUMS. The secretary of each maternity clinic contacted mothers through a phone call and introduce them the study and its goal. After reminding the participants their rights, they were asked to fill an online questionnaire. Pregnant

mothers included in this study if they were visited by an obstetrician working in maternity clinics affiliated to SUMS. On the other hand, pregnant mothers were excluded from the study if

- They did not answer their phone for three times.
- They were reluctant to participate.
- They had not been living in Shiraz for at least 6 months prior to the study.

Finally, 540 pregnant mothers sent us a completed questionnaire. (Figure 1)

## Data gathering tools

Aimed to assess the level of depression, anxiety and stress in pregnant mothers, we used an online self-administered data gathering tool, so that the respondents feel more secure. The data gathering tool had three main parts: socio-demographic, obstetric and medical history, and the short form of Depression Anxiety Stress Scales (DASS-21).

The socio-demographic part comprised the participant's age, marriage duration, residential area (Shiraz versus villages around Shiraz), educational level, employment status, insurance status, self-reported socioeconomic status (SES), and the perceived correlation between the household income and expenditure.

The second part included gestational age (GA), number of pregnancies including the current pregnancy, concurrent maternal comorbidities and medication history including the supplements.

The third part was DASS-21 questionnaire. This questionnaire was suggested by S. H. Lovibond and P. F. Lovibond as an acceptable substitution for DASS-42 in 1995 [15]. They applied DASS-21 in a sample of 2914 non-clinical individuals and showed that the internal consistency of Depression, Anxiety and Stress subscale was 0.91, 0.84 and 0.90, respectively. The validity and reliability of DASS-21 has been assessed by Asghari et al in a sample of 378 non-clinical Iranian population. They showed that DASS-21 had an acceptable Cronbach alpha for total score of DASS-21 (0.94) as well as for the subscales; including, 0.85 for Depression, 0.85 for Anxiety and 0.87 for Stress [16]. Also, Samani et al evaluated DASS-21 reliability in a sample of 638 Iranian university student [17]. They reported the internal consistency of Depression, Anxiety and Stress subscales 0.8, 0.76 and 0.77, respectively.

DASS-21 questionnaire consists of 21 questions, 7 in each subscale; depression (DASS-D), Anxiety (DASS-A) and Stress (DASS-S). Each question is scored through a 4-point Likert scale; 0 for "never", 1 for "often", 2 for "usually" and 3 for "always". Hence, the score in each subscale ranges from 0 to 21, while the higher score represents the respondent's higher level of stress, anxiety and stress. Score of DASS-D, DASS-A and DASS-S was considered abnormal if it was higher than 9, 7, and 14, respectively.

## Statistical analysis

SPSS version 18.0 (IBM Corp., Armonk, NY, USA) was used for analysis of the data. Chi-square test was applied to assess the association between qualitative variables. Independent T test and ANOVA were used for comparing numeric variables between two groups and among three groups. Variables with p-values less than 0.2 in univariate analysis were entered into the logistic regression model and backward elimination (alpha-to-remove= 0.1) was used. P value less than 0.05 was considered statistically significant.

## Results

540 out of 920 registered pregnant mothers filled the online questionnaire (58.7%). Mean age of participants was 31.4 ( $\pm$  5.9) years while the youngest and the oldest were 17 and 49 years of age, respectively. The median duration of marriage was 7 years, ranged from 1 to 28 years. Also, median number of pregnancies including the current one was 2, ranging from 1 to 8 pregnancies. Majority of mothers had no comorbidity (451; 83.5%), while 59 mothers (10.9%) had one comorbidity, 29 mothers (5.4%) had two comorbidities and one mother (0.2%) reported three comorbidities. While the first two most common comorbidities were hypothyroidism (42; 7.8%) and diabetes mellitus/gestational diabetes mellitus (31; 5.7%), the least frequent one was idiopathic thrombocytopenic purpura (ITP) reported by one pregnant mother (0.2%). Other comorbidities were hypertension (17; 3.1%), cardiovascular diseases (9; 1.7%), renal disease (9; 1.7%), respiratory diseases (7; 1.3%), and seizure (7; 1.3%). Regarding medication, we found 167 mothers (30.9%) had been taking medication, of them 136 (25.1%) were taking supplements including ferrous sulfate, folic acid or perinatal multi-vitamins. Besides, 42 mothers (7.8%) were taking levothyroxine, 42 mothers (7.8%) were taking Acetylsalicylic acid (ASA) and 57 mothers (10.6%) took other medications.

Table 1 shows the distribution of abnormal DASS subscales based on the participants' demographic and socio-economic factors. The abnormal DASS-D score was statistically associated with the respondent's insurance status and level of self-rated health (SRH). Hence, abnormal DASS-D score was significantly higher in pregnant mothers who did not have any insurance (10.5% vs 3.9%;  $P = 0.01$ ). Besides, abnormal DASS-D score was more prevalent among pregnant mothers who had reported poor health status (15.6%) compared to those with good SRH (6.1%) and intermediate SRH (3.1%). The proportion of abnormal DASS-D was evenly distributed among the rest of demographic and socio-economic factors.

Table 1

Comparing Abnormal DASS score based on the pregnant mothers' demographic and socio-economic status

Maternal information	Abnormal Depression Score		Abnormal Anxiety Score	
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
<b>Maternal age (years)</b>				
< 19 OR > 34 years	169 (31.3)	10 (5.9)	35 (20.7)	2 (1.2)
18 < age < 35 years	371 (68.7)	18 (4.9)	70 (18.9)	3 (0.8)
<b>P value</b>		0.4	0.3	0.5
<b>Marriage duration (years)</b>				
1–5 years	232 (43)	10 (4.3)	49 (21.1)	2 (0.9)
6–10 years	168 (31.1)	8 (4.8)	26 (15.5)	2 (1.2)
> 10 years	140 (25.9)	10 (7.1)	30 (21.4)	1 (0.7)
<b>P value</b>		0.5	0.3	0.9
<b>Number of pregnancies</b>				
First pregnancy	195 (36.2)	11 (5.6)	42 (21.5)	2 (1)
Second pregnancy	166 (30.7)	4 (2.4)	25 (15.1)	0
Third or more pregnancy	179 (33.1)	13 (7.3)	38 (21.2)	3 (1.7)
<b>P value</b>		0.1	0.2	0.2
<b>Gestational age (weeks)</b>				
< 14 weeks	36 (6.7)	3 (8.3)	7 (19.4)	0
14–28 weeks	184 (34.1)	5 (2.7)	41 (22.3)	1 (0.5)
> 28 weeks	320 (59.3)	20 (6.3)	57 (17.8)	4 (1.3)
<b>P value</b>		0.1	0.4	0.6
<b>Residential area</b>				
P value < 0.05 was considered significant				
Depression score > 9 was considered abnormal				
Anxiety score > 7 was considered abnormal				
Stress score > 14 was considered abnormal				

Maternal information	Abnormal Depression Score		Abnormal Anxiety Score	
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
urban	425 (78.7)	22 (5.2)	87 (20.5)	4 (0.9)
rural	115 (21.3)	6 (5.2)	18 (15.7)	1 (0.9)
<b>P value</b>		0.6	0.1	0.7
<b>Job status</b>				
housewife	488 (90.4)	25 (5.1)	88 (18)	5 (1)
employed	52 (9.6)	3 (5.8)	17 (32.7)	0
<b>P value</b>		0.5	<b>0.01</b>	0.6
<b>Highest educational attainment</b>				
Below high school diploma	119 (22)	8 (6.7)	24 (20.2)	2 (1.7)
High school diploma	199 (36.9)	7 (3.5)	27 (13.6)	1 (0.5)
University degree	222 (41.1)	13 (5.9)	54 (24.3)	2 (0.9)
<b>P value</b>		0.4	<b>0.02</b>	0.6
<b>Insurance status</b>				
insured	435 (80.6)	17 (3.9)	83 (19.1)	3 (0.7)
uninsured	105 (19.4)	11 (10.5)	22 (21)	2 (1.9)
<b>P value</b>		<b>0.01</b>	0.4	0.2
<b>Correlation between income and expenditure</b>				
equal	136 (25.1)	4 (2.9)	20 (14.7)	1 (0.7)
Expenditure > income	401 (74.3)	24 (6)	84 (20.9)	4 (1)
Income > expenditure	3 (0.6)	0	1 (33.3)	0
P value < 0.05 was considered significant				
Depression score > 9 was considered abnormal				
Anxiety score > 7 was considered abnormal				
Stress score > 14 was considered abnormal				

Maternal information	Abnormal Depression Score		Abnormal Anxiety Score	
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
<b>P value</b>		0.3	0.2	0.9
<b>Claimed socio-economic status</b>				
high	42 (7.8)	2 (4.8)	9 (21.4)	0
Middle	256 (47.4)	13 (5.1)	47 (18.4)	2 (0.8)
Low	242 (44.8)	13 (5.4)	49 (20.2)	3 (1.2)
<b>P value</b>		0.9	0.8	0.7
<b>Self-rated health</b>				
poor	122 (22.6)	19 (15.6)	46 (37.7)	2 (1.6)
intermediate	257 (47.6)	8 (3.1)	45 (17.5)	3 (1.2)
good	242 (44.8)	1 (6.1)	14 (8.7)	0
<b>P value</b>		<b>&lt; 0.001</b>	<b>&lt; 0.001</b>	0.3
<b>Number of Comorbidities</b>				
No comorbidity	452	22 (4.9)	76 (16.8)	3 (0.7)
1 comorbidity	58	4 (6.9)	15 (25.9)	1 (1.7)
> 1 comorbidity	30	2 (6.7)	14 (46.7)	1 (3.3)
<b>P value</b>		0.7	<b>&lt; 0.001</b>	0.2
P value < 0.05 was considered significant				
Depression score > 9 was considered abnormal				
Anxiety score > 7 was considered abnormal				
Stress score > 14 was considered abnormal				

Regarding DASS-A, we found that it was significantly associated with pregnant mothers' job status (P = 0.01), educational level (P = 0.02), SRH (P < 0.001) and number of comorbidities (P < 0.001). Based on our finding, abnormal DASS-A was more prevalent among employed mothers (32.7% vs 18%), and those who had a university degree (24.3%). Furthermore, mothers who reported their health status poor had the highest frequency (37.7%) of abnormal DASS-A score comparing to intermediate SRH (3.1%) and good SRH (6.1%) groups. Besides, abnormal DASS-A level was much more prevalent in respondents with 2 or more comorbidities, compared to those with one comorbidity and those without any comorbidity; 46.7%,



25.9%, 16.8%, respectively. No statistically significant differences were found in distribution of abnormal DASS-A in the variables' subgroups. (Table 1)

Also, DASS-S was evenly distributed among subgroups of all demographic and socio-economic factors including maternal age, duration of marriage, number of pregnancies, gestational age, residential area, occupation, educational status, insurance status, income, claimed SES, SRH, and number of maternal co-morbidities. (Table 1)

As demonstrated in Table 2, Logistic regression analysis showed that abnormal level of DASS-D was associated with SRH ( $P < 0.001$ ) and insurance status ( $P = 0.03$ ). Those pregnant mothers who reported their health status poor had higher chance of having abnormal DASS-D score ( $OR = 27.8$ ;  $P = 0.001$ ). Besides, respondents who did not have insurance had 2.5 times higher chance of achieving abnormal DASS-D score ( $P = 0.03$ ; CI for OR: 1.1–5.6).

Table 2  
Determinant of having abnormal depression level according to DASS scale

	Odd's Ratio (OR)	95% Confidence Interval for OR	P value
<b>Self-rated health</b>			< 0.001
good	1		
intermediate	5.1	0.6–11.2	0.1
poor	27.8	3.6–52.7	0.001
<b>Having insurance</b>			0.03
yes	1		
No	2.5	1.1–5.6	
Depression score > 9 was considered abnormal			

Table 3 shows factors associated with abnormal level of DASS-A subscale. According to Logistic regression mothers with lower SRH had higher chance of achieving poor DASS-A score. Hence, those with poor SRH had 6.9 times higher chance of having abnormal level of DASS-A subscale ( $P < 0.001$ ; CI for OR: 3.5–13.7), while pregnant mother who rated their health status as intermediate level had 2.3 times higher chance of achieving abnormal DASS-A score ( $P = 0.01$ ; CI for OR: 1.2–4.4). Furthermore, the number of comorbidities was associated with poor DASS-A score; as, those respondents who had two or more comorbidities had 3.7 times higher chance of achieving abnormal DASS-A level ( $P = 0.001$ ; CI for OR: 1.7–8.2).

Table 3  
Determinant of having abnormal anxiety level according to DASS scale

	Odd's Ratio (OR)	95% Confidence Interval for OR	P value
<b>Self-rated health</b>			< 0.001
good	1		
intermediate	2.3	1.2–4.4	0.01
poor	6.9	3.5–13.7	< 0.001
<b>Number of comorbidities</b>			0.003
No comorbidity	1		
1 comorbidity	1.6	0.8–3.1	0.2
> 1 comorbidity	3.7	1.7–8.2	0.001
Anxiety score > 7 was considered abnormal			

## Discussion

The COVID-19 pandemic may contribute to a significant increase in depressive and anxiety symptoms, as the results of this study revealed that an abnormal depression and anxiety levels were reported by pregnant women in initial stage of the COVID-19 pandemic in comparison with usual period of time [13]. The results of our study showed that pregnant mothers who had two or more comorbidities or those with lower SRH had higher chance of having abnormal level of anxiety subscale. Besides, there was a higher depression level in pregnant mothers who did not have any insurance. Additionally, depression symptoms were more prevalent in pregnant mothers who had poor health status compared to those with good or intermediated SRH. Pregnancy is a significant transition period in women life and many physiologic and immunologic changes occurs during this period[18]. Psychiatric disorders such as depression and anxiety during pregnancy has been associated with many complications including preeclampsia, diabetes, premature birth, low birth weight, and postnatal complications[19].

Several countries with different cultures are affected by depression, a common psychiatric disorder [20]. Hormones level changing in women may lead to increased chance of depression progression twice more than men especially during reproductive period and pregnancy [21]. Moreover, previous studies reported that the high rate of psychiatric morbidities such as depression and panic attack during SARS outbreak in 2003 and it may mentioned another aspect of the importance of these infectious disease outbreaks and necessitated the evaluation of mental health in these periods of time [22, 23]. In this study, we showed that pregnant mothers who had reported poor health status and those without any insurance, had higher abnormal depression score in compared with others. In line with our study, Wang et al. reported that poor perceived health was highly associated with depression rates [24].

On the other hand, anxiety is another critical public health concern because it could lead to impairments in social, emotional and physical functioning, resulted in higher level of health care service utilization [25]. Glover et al. revealed that increased anxiety in pregnancy period had significant relationship with plasma and amniotic cortisol levels[26]. Consistent with our findings, Lebel et al. and Wang et al. recently reported that pregnant women had clinically elevated symptoms of pregnancy related anxiety during the COVID-19 pandemic[13, 24].

However, inconsistent with our study, Wu et al. and Durankus et al. reported that low education level was common associated at-risk factors to progress depression and anxiety symptoms during COVID-19 pandemic [19, 27]. Result of our study revealed that abnormal anxiety level was more prevalent among pregnant mother who had a university degree. This may explain that pregnant mothers with high level of educations had obtained more awareness about threat and consequence of this pandemic; so, they are more affected mentally than low educated pregnant mothers.

Our study had several limitations. At first, this study is cross-sectional, and we could not show the long-term effect of depression and anxiety levels on maternal and neonatal outcomes. Second, pregnancy is accompanied by anxiety and stress, and we could not differentiate them; however, researchers mentioned it had been increased compared to the pre-COVID-19 pandemic era[13]. Moreover, this study was conducted only in Shiraz, which is one of the largest cities in Iran, so the results cannot be generalized to the whole of Iran. On the other hand, one of the strongest points of this study is that it was conducted during the first months of the epidemic so, it reflects the real stress and anxiety of expecting mothers. Moreover, this topic has not been addressed in Iran during the COVID-19 pandemic yet. Besides, women felt more comfortable about expressing their anxiety and depression symptoms because they were self-administered in this study.

## Conclusion

The study results revealed that the COVID-19 pandemic contributes to a significant increase in depression and anxiety symptoms among pregnant mothers. Moreover, lack of insurance, poor SRH, and having comorbidities are significantly associated with increasing depressive and anxiety scores. Screening for psychological disorders such as depression, anxiety especially in pregnant women and well-known communication with consistent and precise updates about the COVID-19 pandemic should be provided as a disease-preventive plan for intellectual and cognitive well-being.

## Abbreviations

<b>COVID-19</b>	Coronavirus disease 2019
<b>SARS</b>	Severe acute respiratory syndrome
<b>DASS-21</b>	Depression Anxiety Stress Scales-21
<b>SRH</b>	Sexual and reproductive health

## Declarations

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## Author contributions:

Conceptualization, NM and KL; methodology, NM; formal analysis, NM; resources, NM and PK; writing—original draft preparation, NM and PK; writing—review and editing, NM; visualization, NM; supervision, KL; project administration, PK. All authors have read and agreed to the published version of the manuscript.

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## Availability of data and materials:

Data supporting results in this article is filed and safely locked away in the office of the First Author (Dr. Najmeh Maharlouei) at the Shiraz University of Medical Sciences, Shiraz, Iran. The corresponding author is ready to avail the said data on reasonable request.

## Ethics approval and consent to participate:

The study protocol was written based on the Helsinki ethical principles for medical researches and approved by the Ethics Committee affiliated to Shiraz University of Medical Sciences (SUMS) (IR.SUMS.REC.1398.1424). Informed consent was obtained from all individual participants included in the study.

## Competing interests:

Nothing to be declared.

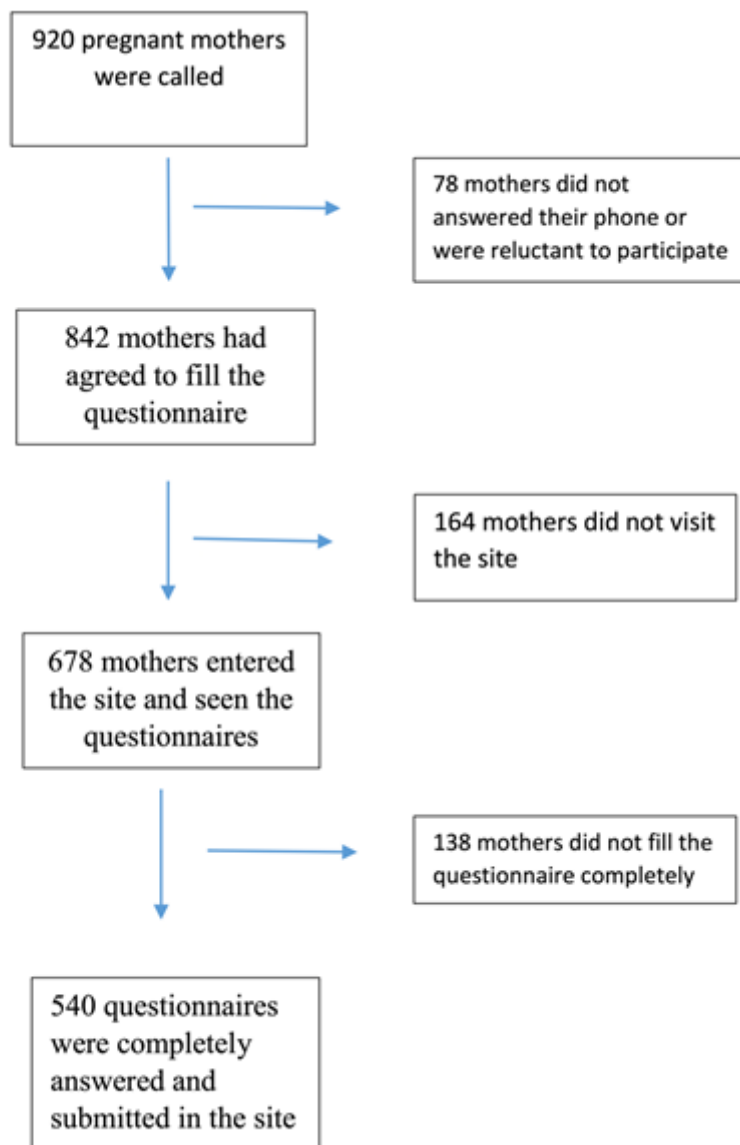
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## Figures



**Figure 1**

Flowchart of study