

Pregnant women's concerns about Coronavirus disease 2019 (COVID-19) and its relationship to their preventive behaviors

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Abstract

Background: As the pandemic of COVID-19 is still present up to now, major concerns are being raised up about its effects on pregnancy and the potential risks of vertical transmission from the pregnant women to their fetuses. **Aim:** the present study aim to assess pregnant women's concerns about Coronavirus disease 2019 (COVID-19) and its relationship to their preventive behaviors. **Subjects and methods: design:** A descriptive cross-sectional research design was used in this study. **Setting:** The study was conducted at obstetric and gynecological outpatient clinics at Tanta University hospital. **Sampling:** A convenient sample of 284 pregnant women. **Tools of data collection:** Three tools were used for data collection. **Tool I** consisted of three parts, **part I:** Socio-demographic characteristics, **Part II:** Obstetric history, **Part III:** Women's Knowledge about Corona Virus, **Tool II:** Pregnant Women's Concerns about Corona Virus and **Tool III:** Pregnant Women's Preventive Behaviors regarding Corona Virus. **Results:** the results of the present study revealed that (55.3%) had high knowledge level, (70.4%) had high concerns about COVID-19 pandemic respectively, and (52.8 %) of studied pregnant women's had satisfactory preventive behaviors against covid-19 virus. **Conclusion:** Based on the findings of the present study, it can be concluded that pregnant women's level of knowledge and concerns significantly correlated to their compliance with recommended preventive behaviors regarding COVID-19. **Recommendation:** The current study suggested that maternity nurses should pay more attention and reach to the lower-educated younger pregnant women especially in rural areas being a group with the least engagement in health preventive behaviors.

Key words: Corona virus, pregnant women's concerns, preventive behaviors

Introduction:

Coronavirus disease 2019 (COVID-19) is a highly infectious respiratory disease that is caused by a novel coronavirus. It is first emerged in December 2019 in Wuhan, China. However, its spreading was very quickly to affect 222 countries and territories all over the world, earning it the moniker "pandemic of the century" by the World Health Organization. The global estimates of incidence and mortality rates are rapidly changing and till December 19, 2021, COVID-19 has been confirmed in 274,554,204 people over the world, with 5,367,089 deaths. COVID-19 is often more severe among older people and people with serious underlying medical conditions, such as hypertension, diabetes, cardiovascular disease, chronic respiratory disease and weakened immune systems⁽¹⁻⁴⁾.

Pregnancy is naturally a period of immunosuppression, in order to protect fetus. Subsequently, Pregnant woman is considered among the high risk group of COVID-19 with substantially increased risk of severe pregnancy complications, including preeclampsia/eclampsia/HELLP syndrome, abortion, preterm birth, intrauterine growth restriction and low birth weight, fetal tachycardia, fetal distress, as well as intensive

care unit admission or referral to higher level of care. The risk of maternal mortality was 1.6%, i.e., 22 times higher in the group of women with COVID-19 diagnosis⁽⁵⁻⁹⁾.

Furthermore, the consequences of COVID-19 extend to affect the psychological status of pregnant women as it is considered one of the most intense emotional experiences in pregnant women's life. This contributes to a greater sense of fear, stress and anxiety. Pregnant women are expressing concerns about greater severity of COVID-19 disease in this population, their infant's safety and the potential vertical transmission from an infected mother to her newborn, increased risk of adverse neonatal outcomes, sudden changes in antenatal healthcare (e.g., modifications of scheduled appointments, restrictions on the presence of family members during childbirth and postnatal visitation), and protection methods^(8, 10-12).

Likewise, no specific treatment exists to prevent or cure this disease. Although COVID-19 vaccines are now available, it is unclear whether vaccines can prevent virus transmission. In this regard, maternity nurses should pay more attention to pregnant women who have health concerns at the same time about themselves and their fetuses. Emphasizing that exercising COVID-19

prevention measures is a crucial way in the COVID-19 pandemic's containment^(11, 13-14).

Practicing preventive measures which recommended by the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) as frequent hand washing, wearing face masks, refraining from excessive outdoor activities unless an emergency, avoiding crowded places, unnecessary journeys, public transportation, and contact with sick people, should be strictly followed by pregnant women. Importantly, they should check their temperature frequently and immediately inform their maternity-care provider if they experience shortness of breath, cough or fever and seek advice regularly⁽¹⁵⁻¹⁷⁾.

Pregnant women's adherence to these control measures is essential to prevent the spread of the disease. However, transmitting large amounts of information and overuse of the media can lead to overreaction, irrational fear, and over perception of risk, which in turn might affect pregnant women's behaviors. Psycho-behavioral surveillance is critical during communicable disease outbreaks because it affects risk awareness strategies targeting high-risk groups such as pregnant women. Measuring the level of pregnant women's concerns as an important

determinant of healthy behaviors is essential for the transmission of information and health protocols as well as in designing interventions to change behaviors in pregnant women^(1, 8,19).

Significance of the study:

In Egypt, from 3 January 2020 to 24 November 2021, there have been 354,836 confirmed cases of COVID-19 with 20,237 deaths, reported by Egyptian Ministry of Health. COVID-19, which has now spread throughout the country, during an outbreak of infectious diseases, pregnant women and their fetuses are particularly vulnerable. Furthermore, there has only been one confirmed case of COVID-19 transplacental transfer so far. SARS is related to COVID-19 and has a 25% case fatality rate in pregnant women, as well as a variety of perinatal problems such as disseminated intravascular coagulation, kidney (renal) failure, secondary bacterial pneumonia, sepsis, and miscarriage. Additionally, mechanical ventilation is required in pregnant women who have been infected with SARS is higher than that for non-pregnant ones.⁽¹⁹⁻²¹⁾

In general, the physiological and mechanical changes that occur during pregnancy enhance infection susceptibility. Emerging infections have been demonstrated to have a major influence on pregnant women and their

fetuses, according to research. Clinical findings during pregnancy can range from moderate symptoms to severe sickness and death, according to previous data from Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) infections. Premature rupture of the membranes, preterm labor, fetal tachycardia, and fetal distress appear to be linked to COVID -19 infections in the third trimester of pregnancy. Besides, coronavirus pandemic causes fear, stress and anxiety for pregnant women worldwide. It is argued that without knowing the level of fear about COVID-19 among different groups it is difficult to know whether education and prevention programs are needed, and if they are needed which groups to target and where. So that, the identification and application of such data could be used to develop targeted education and/or prevention programs to help overcome fear of COVID-19 and help such individuals to engage in preventative behaviors ^(1, 21-23).

Aim of the study:

This study aimed to assess pregnant women's concerns about Coronavirus disease 2019 (COVID-19) and its relationship to their preventive behaviors.

Through the following objectives:

Assessing pregnant women's knowledge about COVID-19 pandemic.

Determining pregnant women's concerns about COVID-19 pandemic.

Appraising pregnant women's preventive behaviors regarding COVID-19 pandemic.

Research questions:

- a) What is pregnant women's knowledge about COVID-19 pandemic?
- b) What are pregnant women's concerns about COVID-19 pandemic?
- c) What are pregnant women's preventive behaviors regarding COVID-19 pandemic?
- d) Are there relation between pregnant women's knowledge, concerns, preventive behaviors and their demographic characteristics?

Subjects and methods

Study design: In this study, a descriptive cross-sectional research design was used.

Setting

The study was conducted at obstetric and gynecological outpatient clinics at Tanta University hospital.

Sampling:

According to the equation of power analysis a convenient sample was utilized to select 284 pregnant women from the previously indicated location, which represents 10% of all pregnant women that visited the same

location over the period from January to June/2021, who have normal course of pregnancy during first, second or third trimester and willing to participate in this study.

Tools of data collection:

To achieve the aim of this study three tools were used by the researchers to obtain the necessary data as follows:

Tool I: A structured interview schedule: It was developed by the researchers after reviewing the recent related literature. It was divided into three parts to collect data about:

Part I: Socio-demographic characteristics of the studied pregnant women: it included name, age, level of education, occupation and residence.

Part II: Obstetric history of the studied pregnant women: it included number gravidity, parity, previous number of abortions, current gestational age at recruitment time, time of initial antenatal visits, place of receiving the antenatal follow up, number of the antenatal follow up visits, and mode of last delivery.

Part III: Pregnant Women's knowledge about COVID-19: This tool was adapted from Gaheen M ⁽²⁴⁾ and was used to obtain pregnant women's knowledge about: causative organism of COVID-19, mode of

transmission, incubation periods, high risk groups, symptoms, effect of COVID-19 on maternal and fetal condition, methods of treatments and vaccination.

Scoring system: This questionnaire consisted of eleven closed ended questions, scored as (0) for no answer or wrong answer, (1) for incomplete answer and (2) for correct complete answer and then total knowledge score level was divided into three categories as "low knowledge level" scored for less than 50%, "moderate knowledge level" scored from 50% to <75 % and "high knowledge level" scored for more than 75 %.

Tool II: Pregnant Women's Concerns about COVID-19:

This tool was developed by the researchers after reviewing the recent related literature and included pregnant women's concerns about: being more alone than usual, if her life is in severe danger during the COVID-19 pandemic, if pregnant women may be more liable for infection than others, if the exposure to COVID-19 virus will harm her unborn baby or leads to fetal congenital anomalies, if she or her fetus is not receiving the care that she need, that COVID-19 infection leads to serious complications during pregnancy, the transmission of COVID-19 virus to her fetus, completion of pregnancy after infection with

COVID-19 virus, being alone during labor without supportive person, that her neonate requires incubator, that she can't breastfeed her baby due to the infection with COVID-19 virus, that she will be isolated from her baby due to the infection with COVID-19 virus, that treatment of the COVID-19 virus may harm her baby during pregnancy or during breastfeeding..... Three points likert scale (disagree, neutral, agree) were used to assess pregnant women's concerns about COVID-19. Disagree was scored as (0), neutral was scored as (1), and agree was scored as (2). Then results were interpreted as follows; A scoring <50% was considered "low concern level", a scoring of 50% - >75% was considered "moderate concern level" while a scoring of $\geq 75\%$ was considered "high concern level".

Tool III: Pregnant Women's Preventive Behaviors regarding COVID-19: This tool was developed by the researchers after reviewing the recent related literature and included the preventive behaviors of pregnant women against Covid-19 as follows; frequent hand washing, frequent use alcohol, avoid touching eyes, nose and mouth, frequent clean surfaces with antiseptic solution, avoid going to crowded places, follow good respiratory hygiene, have enough period of comfort,

assess the fetal movement daily, drink at least 8 glasses of water, have a healthy balanced diet, perform daily and breathing exercises, contact maternity team, keep up to date on the latest information from trusted sources, such as WHO, attend all of her pregnancy scans and antenatal appointments.

Scoring system: This questionnaire consisted of eighteen closed ended questions, scored as (0) for not done, and (1) for done and then total preventive behaviors level was divided into two categories as follows; A scoring of <50% was considered "unsatisfactory behavior" while a scoring of $\geq 50\%$ was considered "satisfactory behavior".

Methods:

1. Following an explanation of the study's purpose and aims, the dean of the faculty of nursing and the general manager of the obstetric and gynecological department were approached for collaboration and permission to perform the study.
2. **A pilot study** was carried out on 10% of the total sample (28 pregnant women who were excluded from the sample) to test the feasibility and applicability of the developed tools. After conducting the pilot study, it was founded that the sentences of the

tools were clear and relevant, few words had been modified. Then, the tools reconstructed and made ready for use .

3. Ethical Considerations:

Pregnant women's oral consent was taken after providing complete and detailed information about the aim and the benefits of the study, as well as the opportunity of withdrawing at any time. The researchers ensured that the nature of the study didn't cause any harm or pain for the entire sample. In addition, confidentiality and privacy were taken into consideration regarding data collection.

4. **Tool I (part I & II), Tool II and Tool III** were developed by the researchers after reviewing the recent related literature. Those tools were translated into Arabic and tested for their content and face validity by a jury of 5 experts in the field of Maternity and Gynecological Nursing to evaluate the individual items as well as the entire instruments as being relevant and appropriate to test what they wanted to measure. The face validity of the tools were calculated based on experts' opinion after

calculating content validity index (%) of their items and it was 97%, 92.8% and 96.6% respectively.

As well as to assess reliability, the study tools were tested by the pilot subjects at first session and retested after 2 weeks as test-retest reliability for calculating Cronbach's Alpha which was 0.88, 0.875, 0.863 respectively.

5. Field of work:

- Data collection was done over a period of six months from the beginning of January 2021 to the end of to June 2021.
- The researchers attended the research settings for data collection in the morning 6 days per week until the predetermined sample size was collected.
- The researchers introduced themselves to the participants, took their informed consent and the interview schedule was then conducted individually for each participant using **Tool I part I& II** to collect basic data about their socio-demographic characteristics and obstetric history.
- Also, the knowledge of the participants about causative organism of COVID-

19, mode of transmission, incubation periods, high risk groups, symptoms, effect of COVID-19 on maternal and fetal condition, methods of treatments and vaccination using **Tool I part III**.

- Then pregnant women's concerns about covid-19 were collected using **Tool II**.
- 6. Finally, pregnant women's preventive behaviors regarding covid-19 were taken using **Tool III**.
- 7. **Statistical analysis:**

Upon completion of data collection, data was computed and analyzed using Statistical Package for the Social Science (SPSS), version 24 for analysis. The P value was set at 0.001. Descriptive statistics tests as numbers, percentage, mean standard deviation, were used to describe the results. Appropriate inferential statistics such as “F” test or “t” test was used as well.

Results

Table (1) presents the socio-demographic characteristics of the studied 284 pregnant women. The analysis showed that their mean age was 27.03 ± 5.19 and 67.3% were housewives. Regarding their residence, 51.4% were from rural areas and 48.6% had higher education.

Table (2) illustrates obstetric history of the studied pregnant women. It was observed that 37.0% of the studied pregnant women were multigravida two times, 36.6% were multipara, and the majority of them (80.3%) hadn't previous history of abortion. Concerning current gestational age at recruitment time, 42.2% were second trimester and 47.9% started the time of initial antenatal visits in first trimester. Among the studied pregnant women, 66.2% received the antenatal follow up visits from private clinic and 32.0% had more than three visits. Regarding the mode of last delivery, more than half of them (52.1 %) previously delivered by cesarean section.

Table (3) shows percent distribution of the studied pregnant women according to their knowledge about COVID-19 that. It was illustrated that the majority of the studied pregnant women (88.0 % and 86.3 % respectively) had high level of knowledge about the type of COVID-19 infection and its mode of spread. As well as, more than three quarters of them (76.4 %) had high level of knowledge regarding isolation and treatment methods as an effective way to reduce the spread of the virus. On the other hand, less than half of the studied pregnant women (46.8%, 45.8%, and 48.6% respectively) had

moderate level of knowledge regarding who are susceptible to COVID-19, the effect of COVID-19 virus on pregnant women and their fetuses as well as (60.9%) of pregnant women had moderate level of knowledge that COVID-19 can be caught from a person who has no symptoms. In addition the table highlighted that, more than half of the studied pregnant women (55.3 %) had high level of total knowledge regarding COVID-19 infection.

Table (4) shows percent distribution of the studied pregnant women according to their concerns about COVID-19 pandemic. The table revealed that, almost an equal proportions of the studied pregnant women (74.3 %, 78.9%, 75.7 %, 76.8%, 77.1%, and 72.2 % respectively) had high concerns about dangerousness of COVID-19 on their life, they are more liable for infection than others, their exposure to the COVID-19 virus will harm their fetuses, they will not receiving the need care, feared from the transmission of COVID-19 virus to their fetuses, as well as serious complications of COVID-19 during pregnancy.

Table (5) reveals percent distribution of the studied pregnant women according to their Level of preventive behaviors regarding COVID-19 pandemic. It was noticed that, the

majority of the studied pregnant women had maintained frequent hand washing (82.7%). Also, almost equal proportions (75.7 % and 70.1% respectively) had frequent use of alcohol on their hands and wear facemask. Moreover, among the studied pregnant women, more than half of them (56.7% and 55.3% respectively) frequent clean surfaces with antiseptic solution and avoid touching eyes, nose and mouth. Moreover, 82.7% attended all their pregnancy scans and antenatal appointments and 65.8% were notifying maternity team with any developing symptoms of corona virus. On the other hand, 66.9% do not maintain at least 1-meter distance with others and do not follow good respiratory hygiene. Additionally, more than half of them (55.3% and 52.5% respectively) do not avoid going to crowded places and hadn't assessed their fetal movement daily and 62.0% don't keep up to date on the latest information about coronavirus.

Figure (1) shows that, two thirds of the studied pregnant women (70.4%) had high concerns about COVID-19 pandemic; while near to one fourth had moderate concerns (22.2%).

As shown in **figure (2)**, more than half of the studied pregnant women (52.8 %) of the studied pregnant women had satisfactory

preventive behaviors regarding covid-19 virus.

Table 6 shows correlation between the concerns score and knowledge score about COVID-19; data revealed that the total knowledge score showed direct significant correlation with the total concerns ($p < 0.001$) and preventive behaviors regarding COVID-19 virus ($p < 0.001$).

Table (7) illustrates relation between knowledge of the studied pregnant women about covid-19 and their socio-demographic characteristics. It was revealed that 29.6% of women whose age 25-<30 had high knowledge, while, 19.4% of women whose age <25 had moderate knowledge about COVID-19. Also, 25.4% of housewives had moderate knowledge compared to 2.5% of employee women. Besides, 32.8% of women who reside urban regions had high knowledge while 21.5% of rural women had moderate knowledge. Additionally, 35.9% of women who earned higher education had high knowledge while 20.1% of secondary educated women had moderate knowledge. The difference was statistically significant ($p < 0.001$).

Table (8) shows that 33.1% of women whose age 25-<30 had high concerns about COVID-19 pandemic, while, 13.4% of women whose

age <25 had moderate concerns. Also, 43.7% of housewives had high concerns compared to 26.8% of employee women. Additionally, 35.9% of women with higher education had high concerns, while, 9.2% of secondary educated women had moderate concerns. The difference was statistically significant ($p < 0.001$).

Table (9) shows that 29.5% of women whose age 25-<30 had satisfactory preventive behaviors regarding COVID-19 virus, while, 29.2% of women whose age <25 had unsatisfactory preventive behaviors. Also, 32.0% of urban women had satisfactory preventive behaviors regarding COVID-19 virus compared to 30.6% of rural women with unsatisfactory preventive behaviors. Additionally, 33.5% of higher educated women had satisfactory preventive behaviors, while, 23.9% of secondary educated women had unsatisfactory preventive behaviors regarding COVID-19 virus. The difference was statistically significant ($p < 0.001$).

Table 1: Percent distribution of the studied pregnant women regarding their socio-demographic characteristics (N= 284)

	N	%
Age (years)		
<25	97	34.15
25- <30	116	40.85
30- <35	35	12.32
35 or more	36	12.68
Mean±SD	27.03±5.19	
Job		
House wife	191	67.3
Employee	93	32.7
Residence		
Rural	146	51.4
Urban	138	48.6
Educational level		
Illiterate	11	3.9
Primary or preparatory	14	4.9
Secondary	121	42.6
University or postgraduate	138	48.6

Table 2: Percent distribution of the studied pregnant women regarding their obstetric history (N= 284)

Obstetric history	N	%
Gravidity		
Primigravida	75	26.4
Two	105	37.0
Three	82	28.9
Four	22	7.7
Parity		
None	95	33.5
Primipara	85	29.9
Multi-para	104	36.6
Previous Number of abortions		
None	228	80.3
One	45	15.8
Two or more	11	3.9
Current Gestational age at recruitment time		
First trimester	92	32.4
Second trimester	120	42.2
Third trimester	72	25.4
Time of initial antenatal visits		
First trimester	136	47.9
Second trimester	96	33.8
Third trimester	52	18.3
Place of receiving the antenatal follow up		
Governmental hospital	73	25.7
Maternal & child health center (MCH)	23	8.1
Private clinic	188	66.2
Number of the antenatal follow up visits		
More than three visits	91	32.0
More than four visits	33	11.6
More than five visits	52	18.3
More than six visits	31	11.0
More than seven visits	77	27.1
Mode of last delivery		
Normal vaginal delivery	53	18.7
Cesarean section	148	52.1
None	83	29.2

Table 3: Percent distribution of the studied pregnant women according to their knowledge about COVID-19 (N= 284)

Women's Knowledge about COVID-19	High		Moderate		Low		Mean
	N	%	N	%	N	%	
What type of infectious disease is COVID-19?	250	88.0	15	5.3	19	6.7	1.81
Mode of COVID-19 spread	245	86.3	16	5.6	23	8.1	1.78
COVID-19 incubation period	125	44.0	111	39.1	48	16.9	1.27
Susceptible people to COVID-19	124	43.7	133	46.8	27	9.5	1.34
Symptoms of COVID-19	113	39.8	159	56.0	12	4.2	1.36
COVID-19 can be caught from a person who has no symptoms	65	22.9	173	60.9	46	16.2	1.38
Vaccine, drug or treatment for COVID-19	144	50.7	91	32.0	49	17.3	1.33
Isolation and treatment of people who are infected with the COVID-19 virus are an effective way to reduce the spread of the virus	217	76.4	9	3.2	58	20.4	1.56
People who have contact with someone infected with the COVID-19 virus should be immediately isolated	194	68.3	21	7.4	69	24.3	1.44
Effect of COVID-19 virus on pregnant women	70	24.6	130	45.8	84	29.6	0.95
Effect of COVID-19 virus on fetus	68	23.9	138	48.6	78	27.5	0.96
Total	157	55.3	79	27.8	48	16.9	1.38

Table 4: Percent distribution of the studied pregnant women according to their concerns about COVID-19 pandemic (N= 284)

Pregnant Women's Concerns about COVID-19 pandemic	High		Moderate		Low		Mean
	N	%	N	%	N	%	
Are you concerned that you will be more alone than usual	237	83.5	33	11.6	14	4.9	1.79
Are you concerned that your life is in severe danger during the COVID-19 pandemic	211	74.3	59	20.8	14	4.9	1.69
Are you worried that pregnant women may be more liable for infection than others	224	78.9	41	14.4	19	6.7	1.72
Are you worried that exposure to the COVID-19 virus will harm your unborn baby or leads to congenital anomalies	215	75.7	50	17.6	19	6.7	1.69
Are you concerned that you or your baby is not receiving the care that you need	218	76.8	44	15.5	22	7.7	1.69
Are you feared from the transmission of COVID-19 virus to your baby	219	77.1	54	19.0	11	3.9	1.73
Are you concerned that COVID-19 infection leads to serious complications during pregnancy	205	72.2	68	23.9	11	3.9	1.68
Are you concerned about completion of pregnancy after infection with COVID-19 virus	188	66.2	82	28.9	14	4.9	1.61
Are you feared from being alone during labor	169	59.5	93	32.8	22	7.7	1.52
Are you concerned that your neonate require incubator	189	66.6	81	28.5	14	4.9	1.62
Are you concerned that you can't breastfeed your baby due to the infection with COVID-19 virus	162	57.0	78	27.5	44	15.5	1.42
Are you concerned that you will be isolated from your baby due to the infection with COVID-19 virus	193	68.0	66	23.2	25	8.8	1.59
Are you concerned that treatment of the COVID-19 virus may harm your baby during pregnancy or during breastfeeding	156	54.9	82	28.9	46	16.2	1.39

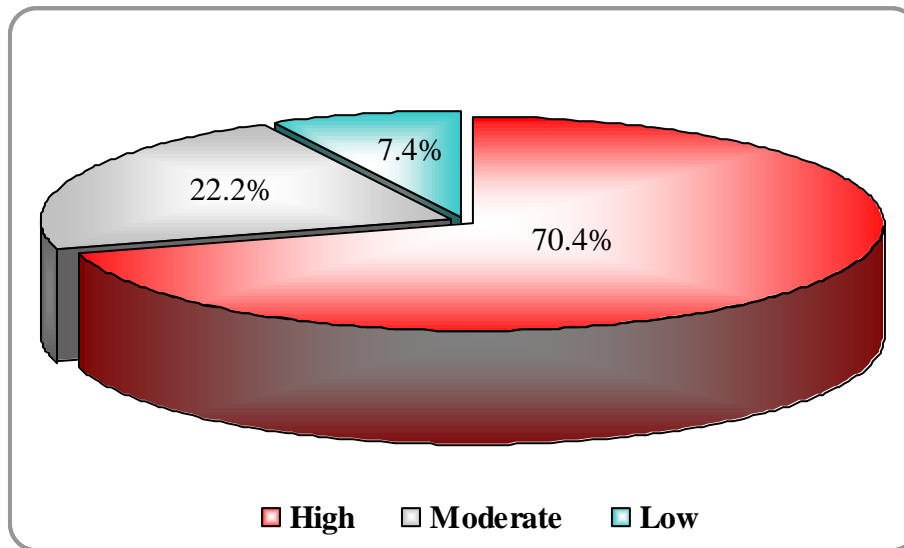


Figure (1) shows that, two thirds of the studied pregnant women (70.4%) had high concerns about COVID-19 pandemic; while near to one fourth had moderate concerns (22.2%).

Table 5: Percent distribution of the studied pregnant women according to their level of preventive behaviors regarding COVID-19 pandemic (N= 284)

Pregnant Women's Preventive Behaviors regarding COVID-19 virus	Done		Not done		Mean
	N	%	N	%	
Frequent hand washing	235	82.7	49	17.3	0.83
Frequent use alcohol on the hand	215	75.7	69	24.3	0.76
Frequent wear face mask	199	70.1	85	29.9	0.70
Avoid touching eyes, nose and mouth	157	55.3	127	44.7	0.55
Frequent clean surfaces with antiseptic solution	161	56.7	123	43.3	0.57
Maintain at least 1 meter distance between yourself and others	94	33.1	190	66.9	0.33
Avoid going to crowded places	127	44.7	157	55.3	0.45
Ensure that you, and the people around you, follow good respiratory hygiene	94	33.1	190	66.9	0.33
Have enough period of comfort	160	56.3	124	43.7	0.56
Assess the fetal movement daily	135	47.5	149	52.5	0.48
Drink at least 8 glasses of water or warm fluid frequently	164	57.7	120	42.3	0.58
Have a healthy balanced diet, and folic acid & vitamin D supplementation	179	63.0	105	37.0	0.63
Perform daily exercise	89	31.3	195	68.7	0.31
Perform breathing exercise	80	28.2	204	71.8	0.28
Attend all of your pregnancy scans and antenatal appointments unless you are advised not to	235	82.7	49	17.3	0.83
Contact your maternity team if you have concerns about the wellbeing of yourself or your unborn baby	173	60.9	111	39.1	0.61
Tell midwife or maternity team when develop symptoms of coronavirus,	187	65.8	97	34.2	0.66
Keep up to date on the latest information from trusted sources, such as WHO	108	38.0	176	62.0	0.38

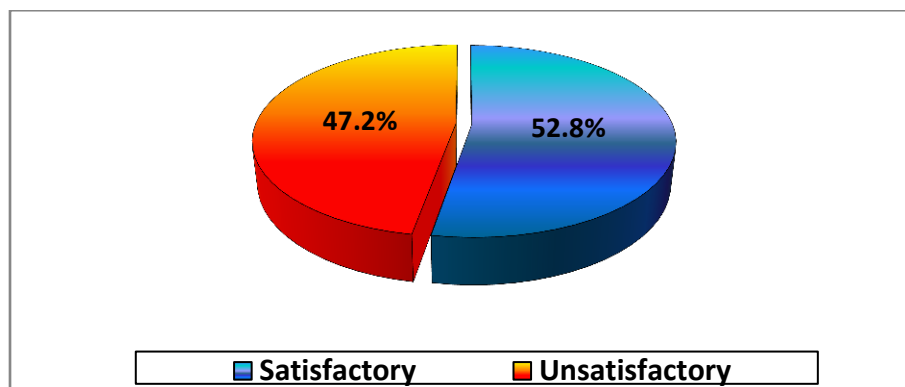


Figure 2: Percent distribution of the studied pregnant women according to their total level of preventive behaviors regarding COVID-19 pandemic (N= 284)

Table 6: Correlation between the knowledge and Concerns about COVID-19 and Preventive Behaviors.

Items		knowledge about COVID-19	Concerns about COVID-19
Concerns about COVID-19	r	0.201	
	P-value	<0.001**	
Preventive Behaviors regarding COVID-19 virus	r	0.324	0.126
	P-value	<0.001**	0.034*

Table (7): Relation between knowledge of the Studied Pregnant Women about COVID-19 and their Socio-Demographic Characteristics.

Items	knowledge about COVID-19							
	High		Moderate		Low		Chi-square	
	N	%	N	%	N	%	X ²	P-value
Age (years)								
<25	14	4.9	55	19.3	28	9.9	105.543	<0.001**
25- <30	84	29.6	16	5.6	16	5.6		
30- <35	28	9.9	3	1.1	4	1.4		
35 or more	31	10.9	5	1.8	0	0.0		
Job								
House wife	81	28.5	72	25.4	38	13.4	41.044	<0.001**
Employee	76	26.8	7	2.5	10	3.5		
Residence								
Rural	64	22.5	61	21.4	21	7.3	29.310	<0.001**
Urban	93	32.8	18	6.3	27	9.5		
Educational level								
Illiterate	0	0.0	0	0.0	11	3.9	120.754	<0.001**
Primary or preparatory	2	0.7	3	1.1	9	3.2		
Secondary	53	18.6	57	20.1	11	3.9		
University or postgraduate	102	35.9	19	6.6	17	6.0		

Table (8): Relation between the Studied Pregnant Women's Concerns about COVID-19 and their Socio-Demographic Characteristics.

Items	Concerns about COVID-19							
	High		Moderate		Low		Chi-square	
	N	%	N	%	N	%	X ²	P-value
Age (years)								
<25	47	16.5	38	13.4	12	4.2	38.854	<0.001**
25- <30	94	33.1	13	4.6	9	3.1		
30- <35	28	9.9	7	2.5	0	0		
35 or more	31	10.9	5	1.8	0	0		
Job								
House wife	124	43.7	53	18.7	14	4.9	10.654	0.005*
Employee	76	26.8	10	3.5	7	2.5		
Residence								
Rural	106	37.3	32	11.2	8	2.8	1.702	0.427
Urban	94	33.1	31	10.9	13	4.6		
Educational level								
Illiterate	0	0	8	2.8	3	1.1	54.253	<0.001**
Primary or preparatory	5	1.8	9	3.2	0	0		
Secondary	93	32.7	26	9.2	2	0.7		
University or postgraduate	102	35.9	20	7.0	16	5.6		

Table (9): Relation between Studied Pregnant Women's Preventive Behaviors regarding COVID-19 virus and their Socio-Demographic Characteristics.

Items	Preventive Behaviors regarding COVID-19 virus					
	satisfactory		unsatisfactory		Chi-square	
	N	%	N	%	X ²	P-value
Age (years)						
<25	14	4.9	83	29.2	87.136	<0.001**
25- <30	84	29.5	32	11.3		
30- <35	26	9.2	9	3.2		
35 or more	26	9.2	10	3.5		
Job						
House wife	81	28.5	110	38.7	25.356	
Employee	69	24.3	24	8.5		
Residence						
Rural	59	20.8	87	30.6	18.556	<0.001**
Urban	91	32.1	47	16.5		
Educational level						
Illiterate	0	0	11	3.9	38.818	<0.001**
Primary or preparatory	2	0.7	12	4.2		
Secondary	53	18.7	68	23.9		
University or postgraduate	95	33.5	43	15.1		

Discussion

The coronavirus disease 2019 (COVID-19) pandemic has represented a major impact to health systems and societies worldwide. Pregnant women and their fetuses are at high risk during the outbreak of infectious diseases. In general, physiological and mechanical changes during pregnancy increase susceptibility to infection. According to recent findings, the risk of maternal mortality in COVID-19 pregnant women with severe illness appears to be considerable. Early Chinese research found that some children born to COVID-19 positive mothers had low birth weight and were preterm. All of these intensified pregnant women's concerns about themselves and their infants. As well, their level of fear and anxiety may affect their adherence to recommended healthy preventive behaviors of COVID -19. The aim of the current study is to highlight assess pregnant women's concerns about Coronavirus disease 2019 (COVID-19) and its relationship to their preventive behavior^(23,25-26).

Regarding socio-demographic characteristics of the studied pregnant women, their mean age was 27.03±5.19 years old. This finding goes in line with

Aghababaei et al., 2020⁽⁸⁾ who assessed "Perceived risk and protective behavior about COVID-19 among Iranian pregnant women", they found that the average age of the women was 30.24 years old. In the same line, the finding of the current study agreed with **Anikwe et al, (2020)**⁽²⁷⁾ who studied "Coronavirus disease 2019: Knowledge, attitude, and practice of pregnant women in a tertiary hospital in Abakaliki, southeast Nigeria" and found that the mean age of the respondents was 30.04 years old. This agreement between the two studies may be related to that the studied samples were taken during their reproductive age.

The findings of the present study also illustrated that about half of studied the pregnant women came from rural areas. These finding matched with **Nwafor et al., (2020)**⁽²⁸⁾ who studied the "Pregnant women's knowledge and practice of preventive measures against COVID-19 in a low-resource African setting ", the researcher concluded that the majority of the study sample were living in rural areas. Higher level educated pregnant women might be more active in seeking for information about COVID-19. Therefore, they may be more well-informed about its

risks and harms and subsequently more likely to express their concerns and fears. But also, they have higher tendency to engage in personal preventive behaviors. As regard the women's education level, the result of the current study demonstrated that about half of the studied pregnant women had higher education degree and about two third of them were housewives. These findings agreed with **Gaheen A, (2020)**⁽²⁴⁾ who studied, "Effect of the New Corona Virus Disease 2019 on Pregnancy Outcome at El-Gharbia Governorate", she stated that almost half of participants had finished university or post-graduate education and slightly less than three fifth of them were housewives.

Regarding the obstetric history, the current study found that slightly more than one quarter of the pregnant women were primigravida, and almost two third of them had no previous history of abortion. In relation to the current gestational age at recruitment time, almost two fifth of women were in second trimester, and more than one third of them had more than three antenatal follow up visits. These results corroborate the findings of **Aghababaei et al., 2020**⁽⁸⁾ who said that the majority of participants were primigravida, had regular

prenatal care, and had no history of abortion. In the same line **Kumbeni et al., 2021**⁽²⁹⁾, who investigated "Knowledge and preventive practices towards COVID-19 among pregnant women seeking antenatal services in Northern Ghana", found that the majority of the women 41.0% were in their second trimester, and women who went to 1:3 antenatal care appointments were 45.8%, while those who went to four or more were 54.2 %.

COVID-19 infection is a public health problem with profound physiological and psychological consequences. Therefore, having adequate knowledge about this pandemic is essential for its management. Concerning the knowledge level regarding COVID-19, the findings of the current study showed that the majority of the studied pregnant women had high level of knowledge about what type of infectious disease is COVID-19 and its mode of spread, and more than three quarters of them had high level of knowledge about isolation and treatment of people who are infected with COVID-19 are an effective way to reduce the spread of the virus. These were in a path with **Anikwe et al,(2020)**⁽²⁷⁾ and **Reuben et al, (2020)**⁽³⁰⁾ who studied the "Knowledge, Attitudes

and Practices towards COVID-19: An Epidemiological Survey in North-Central Nigeria", they reported that the majority of the study subjects had correct answers about corona virus infection. From the researchers' point of view this high level of knowledge is expected due to the social impact of the COVID-19 pandemic on the studied areas.

As the outbreak of COVID-19 continues to unfold, major concerns are being raised about its effects on pregnancy and the potential risk of vertical transmission from an infected mother to her newborn. In this regard, the finding of the current study revealed that less than half of the studied pregnant women had moderate level of knowledge about the effect of COVID-19 infection on pregnant women and their fetuses. This disagreed with **Gaheen A,(2020)** ⁽²⁴⁾ who reported that all the women had incorrect answer regarding the effect of coronavirus infection on pregnancy. This may be due to the fact that this study was conducted in the early period of COVID-19 appearance which is characterized by lack of information about impact of COVID-19 on pregnancy outcomes.

Considering the total score level of COVID-19 knowledge, the study revealed that more than half of the pregnant women had high level of knowledge. This finding agreed with **Maharlouei et al., 2020** ⁽³¹⁾ who published a thesis titled "Knowledge and Attitude regarding COVID-19 among Pregnant Women in Southwestern Iran in the Early Period of Its Outbreak: A Cross-Sectional Study", they reported that pregnant women had a high level of knowledge about COVID-19. In the same line, this agreed with **Clements, 2020** ⁽³²⁾ who studied " Knowledge and behaviors toward COVID-19 among US residents during the early days of the pandemic: cross-sectional online questionnaire". From the researcher point of view this agreement could be related to the outcome of efforts provided by governmental and nongovernmental organizations to educate the public through various methods including newspapers, social media, short message services, and television programs. Additionally, large number of the pregnant women had a family member or more suffered from COVID-19.

However, these finding are contradictory with **Srichan et al. 2020** ⁽³³⁾ who studied "Knowledge, attitude, and preparedness to

respond to the 2019 novel coronavirus (COVID-19) among the bordered population of northern Thailand in the early period of the outbreak: a cross-sectional study," and reported that 74.1 % of women had poor knowledge of COVID-19. The difference in results could be explained by both the baseline characteristics of participants and the period of the study. Also our finding was in contrast to **Nicholas et al, 2020** ⁽³⁴⁾ who studied "COVID-19 knowledge, attitudes and practices in a conflict affected area of the South West Region of Cameroon". They revealed that only 21.9% of the participants had correct knowledge of COVID-19.

During COVID-19 epidemic, pregnant women may face greater psychological pressure and more complicated psychological problems. As they have many questions and concerns about the difficulty of receiving their routine prenatal examinations, to which degree COVID-19 can affect their course of pregnancy or their mode of delivery? ⁽³⁵⁾.

Regarding pregnant women's concerns about COVID-19, the current study found that nearly three quarter of the studied women had high concerns about the

dangerousity of COVID-19 pandemic on their life, Also almost two third of the study sample were concerned that they may be more liable for infection than others, and nearly three quarter of them were worried that their exposure to the COVID-19 virus will harm their fetuses. In addition more than three quarter of pregnant women feared from the inability to receive the care that they need, almost two third of them feared from the transmission of COVID-19 virus to their fetuses, and less than three quarter of them are concerned that COVID-19 infection leads to serious complications during pregnancy.

These findings agreed with **Zhong et al., 2020** ⁽¹⁾ who studied "COVID-19 knowledge, attitudes, and practices among Chinese residents during the rapid rise period of the COVID-19 outbreak". They found that the pregnant mothers were extremely concerned that their lives were in grave danger during the COVID-19 outbreak, that they were more prone to infection, and that their exposure to the COVID-19 virus would harm their fetus. The results of the current study also relatively matched with **Mappa I et al, (2020)** ⁽³⁶⁾, who studied "Effects of

coronavirus 19 pandemic on maternal anxiety during pregnancy". The researchers illustrated that the pregnant women who infected with corona virus had very high level of anxiety and becoming much stressed. This matching was accepted and may be related to the wide use of social media that has the potential to spread the panic in such public health emergencies through the publishing of fabricated nonscientific information which has great risk to cause public anxiety.

Relating to total score level of concerns about COVID-19 pandemic among the studied pregnant women, the findings of the present study showed that two thirds of them had high concerns about the COVID-19 pandemic, while near to one fourth had moderate concerns, and the minority had low concerns. These findings are consistent with those of **Overbeck et al., 2020** ⁽³⁷⁾ who investigated " Pregnant women's concerns and antenatal care during COVID-19 lockdown of the Danish society ", found that more than half of pregnant women believed that they were at a high risk of infection with COVID-19 and the majority were concerned about its possible health consequences. From the researchers' point of view, the COVID-19 pandemic

has triggered the global fear, anxiety and concern. As well as, some of the pregnant women in this study had a family member, a relative or a neighbor who died from COVID-19. Consequently, this has resulted in increased pregnant women's stress, anxiety, loneliness and depression.

Practicing preventive measures should be strictly followed by pregnant women to prevent the spread of COVID 19. In terms of pregnant women's adherence to preventive measures regarding COVID 19, the current study showed that the majority kept up with frequent hand washing, this finding contradict with Egyptian study of **Ahmed et al., 2021** ⁽³⁸⁾, who investigated " the "Effect of the Whats App Educational Program on Pregnant Women's Knowledge, Attitude and PRACTICE regarding COVID -19", and found majority of pregnant women didn't wash hands frequently pre educational program. Additionally, the current study showed that three-quarters of pregnant women used alcohol on their hands, and two-thirds of them wore facemasks frequently, these findings contradict with the Egyptian study that found a majority of women don't wear a face mask as regular pre educational program ⁽³⁸⁾.

Also, **Motrico et al., 2021**⁽¹¹⁾ conducted a study regarding good practices in perinatal mental health during the COVID-19 pandemic, and found majority of women engaged in preventative activities during COVID-19 recommended by public health experts, as washing sanitizing their hands multiple times each day, wore a face mask, avoided crowds, avoided eating in restaurants, avoided contact with high-risk people, and cleansed surfaces. On the other hand, the current study findings showed that about two third of pregnant women, did not keep at least a 1-meter distance from others and more than half of them did not avoid crowded places as well as did not practice good respiratory hygiene. These findings in agreement with Egyptian study of **Hassan et al., 2021**⁽³⁹⁾, who investigated the effect of health awareness program to pregnant women regarding corona virus disease and found more than three-quarters of pregnant women didn't maintain a social distance pre educational program.

Moreover, the present study confirmed that almost two third of the pregnant women attended all their pregnancy scans and antenatal appointments and about two third of them were notified maternity team with

any developing symptoms of corona virus. These findings agreed with **Overbeck et al., 2020**⁽³⁷⁾ who reported that most pregnant women had experienced little disruption in their scheduled prenatal visits with the GP or midwife.

The current study also found that more than half of pregnant women's tested had satisfactory preventive behaviors regarding COVID-19, which agreed with **Maharlouei et al., 2020**⁽³¹⁾ who found that the majority of the participants and their households were very concern about COVID-19 prevention measures. From the researchers' point of view, this may be associated with high level of concerns from COVID-19 health consequences on their pregnancy which motivating them to adhere to preventive behaviors.

In terms of the relationship between pregnant mothers' knowledge, concern, and preventive behaviors, the current study found that pregnant women who lived in cities, had a university degree, and were older had significantly higher knowledge, concern, and preventive behaviors (P-value = 0.001). These findings support those of **Maharlouei et al., 2020**⁽³¹⁾ and **Kumbeni et al.,2021**⁽²⁹⁾ as well as **Wang et al.,2021**⁽⁴⁰⁾ who found that pregnant women who

lived in cities had considerably higher knowledge scores than their rural counterparts. Furthermore, university education (OR = 1.50–1.57) was a significant protective factor, as was older age (OR = 0.42– 0.57). According to **Harper et al., 2020** ⁽⁴¹⁾, a positive relationships were generally noticed in those participants who were more concerned about COVID-19 and their active engagement with public health-compliant behaviors.

Conclusion:

Based on the findings of the present study, it can be concluded that pregnant women's level of knowledge and concerns significantly correlated to their compliance with recommended preventive behaviors regarding COVID-19.

Recommendations:

The current study suggested that regular health education and counseling programs about COVID-19 pandemic and the healthy recommended preventive behaviors to combat its consequences should be provided to all pregnant women who visit obstetrics and gynecology outpatient clinics supported by distributing pamphlets and booklets. Maternity nurses should pay more attention and reach to lower-educated

younger pregnant women especially in rural areas being a group with the least engagement in health preventive behaviors. As well as mass media and telenursing should be utilized for dissemination of simple, correct and relevant information about COVID-19 pandemic.

References:

1. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, Li Y. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. *International journal of biological sciences*. 2020;16(10):1745.
2. Gautam AS, Pathak N, Ahamad T, Semwal P, Bourai AA, Rana AS, Nautiyal OP. Pandemic in India: Special reference to Covid-19 and its technological aspect. *Journal of Statistics and Management Systems*. 2021 Feb 17;24(2):387-410.
3. COVID-19 CORONAVIRUS PANDEMIC, worldmeter <https://www.worldometers.info/coronavirus/>
4. European Centre for Disease Prevention and Control, High-risk

- groups for COVID-19,
<https://www.ecdc.europa.eu/en/covid-19/high-risk-groups>
5. Hossain N, Samuel M, Sandeep R, Imtiaz S, Zaheer S. Perceptions, Generalized Anxiety and Fears of Pregnant women about Corona Virus infection in the heart of Pandemic.2020
 6. Ozalp M, Demir O, Akbas H, Kaya E, Celik C, Osmanagaoglu MA. Effect of COVID-19 pandemic process on prenatal diagnostic procedures. The Journal of Maternal-Fetal & Neonatal Medicine. 2020 Sep 1:1-6.
 7. Villar J, Ariff S, Gunier RB, Thiruvengadam R, Rauch S, Kholin A, Roggero P, Prefumo F, Do Vale MS, Cardona-Perez JA, Maiz N. Maternal and neonatal morbidity and mortality among pregnant women with and without COVID-19 infection: the INTERCOVID multinational cohort study. JAMA pediatrics. 2021 Apr 22.
 8. Aghababaei S, Bashirian S, Soltanian A, Refaei M, Omid T, Ghelichkhani S, Soltani F. Perceived risk and protective behaviors regarding COVID-19 among Iranian pregnant women. Middle East Fertility Society Journal. 2020 Dec;25(1):1-9.
 9. Wang CL. Impact of COVID-19 on Pregnancy. International Journal of Medical Sciences. 2021;18(3):763.
 10. Basu A, Kim HH, Basaldua R, Choi KW, Charron L, Kelsall N, Hernandez-Diaz S, Wyszynski DF, Koenen KC. A cross-national study of factors associated with women's perinatal mental health and wellbeing during the COVID-19 pandemic. PloS one. 2021 Apr 21;16(4):e0249780.
 11. Motrico E, Mateus V, Bina R, Felice E, Bramante A, Kalcev G, Mauri M, Martins S, Mesquita A. Good practices in perinatal mental health during the COVID-19 pandemic: a report from task-force RISEUP-PPD COVID-19. Clínica y Salud. 2020;31(3):155-60.
 12. Hessami K, Romanelli C, Chiurazzi M, Cozzolino M. COVID-19 pandemic and maternal mental health: a systematic review and meta-analysis. The Journal of Maternal-Fetal & Neonatal Medicine. 2020 Oct 30:1-8.
 13. Jia L, Li K, Jiang Y, Guo X. Prediction and analysis of coronavirus disease 2019. arXiv preprint arXiv:2003.05447. 2020 Mar 11.
 14. Haque A, Pant AB. Efforts at COVID-19 vaccine development: challenges and successes. Vaccines. 2020 Dec;8(4):739.

15. Omer S, Ali S. Preventive measures and management of COVID-19 in pregnancy. *Drugs & Therapy Perspectives*. 2020 Jun;36(6):246-9.
16. Overbeck G, Graungaard AH, Rasmussen IS, Høgsgaard Andersen J, Kragstrup J, Wilson P, Ertmann RK. Pregnant women's concerns and antenatal care during COVID-19 lockdown of the Danish society. *Danish Medical Journal*. 2020 Nov 20.
17. Wang Q, Mo PK, Song B, Di JL, Zhou FR, Zhao J, Wu YL, Tian H, Qiu LQ, Xia J, Wang L. Mental health and preventive behaviour of pregnant women in China during the early phase of the COVID-19 period. *Infectious diseases of poverty*. 2021 Dec;10(1):1-1.
18. Ahorsu DK, Imani V, Lin CY, Timpka T, Broström A, Updegraff JA, Årestedt K, Griffiths MD, Pakpour AH. Associations between fear of COVID-19, mental health, and preventive behaviours across pregnant women and husbands: an actor-partner interdependence modelling. *International Journal of Mental Health and Addiction*. 2020 Jun 11:1-5.
19. World Health Organization1. Coronavirus disease (COVID-2019) situation report - 94 2020. World Health Organization. 2020. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>. Accessed February 10, 2020.
20. World Health Organization2. Corona virus Myth Busters. World Health Organization. 2020. https://www.who.int/images/default-source/health-topics/coronavirus/myth-busters/web-mythbusters/mythbuster-4.png?sfvrsn=e163bada_8. Accessed February 10, 2020.
21. Yassa M, Birol P, Yirmibes C, Usta C, Haydar A, Yassa A, Sandal K, Tekin AB, Tug N. Near-term pregnant women's attitude toward, concern about and knowledge of the COVID-19 pandemic. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2020 Nov 16;33(22):3827-34.
22. Zhang L, Jiang Y, Wei M, Cheng BH, Zhou XC, Li J, Tian JH, Dong L, Hu RH. Analysis of the pregnancy outcomes in pregnant women with COVID-19 in Hubei Province. *Zhonghua fu chan ke za zhi*. 2020:166-71.
23. Pakpour AH, Griffiths M D. The fear of COVID-19 and its role in preventive behaviors. *Journal of Concurrent Disorders*. .2020; 2(1), 58-63.
24. Gaheen A, Sayed MA. Effect of the New Corona Virus Disease 2019 on Pregnancy Outcome at El-Gharbia Governorate. Tanta

- Scientific Nursing Journal. 2020 Nov 1;19(1):181-210.
25. Dashraath P, Wong JL, Lim MX, Lim LM, Li S, Biswas A, Choolani M, Mattar C, Su LL. Coronavirus disease 2019 (COVID-19) pandemic and pregnancy. *American journal of obstetrics and gynecology*. 2020 Jun 1;222(6):521-31.
26. Nanjundaswamy MH, Shiva L, Desai G, Ganjekar S, Kishore T, Ram U, Satyanarayana V, Thippeswamy H, Chandra PS. COVID-19-related anxiety and concerns expressed by pregnant and postpartum women—a survey among obstetricians. *Archives of Women's Mental Health*. 2020 Dec;23(6):787-90.
27. Anikwe CC, Ogah CO, Anikwe IH, Okorochukwu BC, Ikeoha CC. Coronavirus disease 2019: Knowledge, attitude, and practice of pregnant women in a tertiary hospital in Abakaliki, southeast Nigeria. *International Journal of Gynecology & Obstetrics*. 2020 Nov;151(2):197-202.
28. Nwafor JI, Aniukwu JK, Anozie BO, Ikeotuonye AC. Knowledge and practice of preventive measures against COVID-19 infection among pregnant women in a low-resource African setting. *MedRxiv*. 2020 Jan 1.
29. Kumbeni MT, Apanga PA, Yeboah EO, Lettor IB. Knowledge and preventive practices towards COVID-19 among pregnant women seeking antenatal services in Northern Ghana. *Plos one*. 2021 Jun 17;16(6):e0253446.
30. Reuben RC, Danladi MM, Saleh DA, Ejembi PE. Knowledge, attitudes and practices towards COVID-19: an epidemiological survey in North-Central Nigeria. *Journal of community health*. 2021 Jun;46(3):457-70.
31. Maharlouei N, Asadi N, Bazrafshan K, Roozmeh S, Rezaianzadeh A, Zahed-Roozegar MH, Shaygani F, Kharmandar A, Honarvar B, Hemyari C, Omidifar N. Knowledge and Attitude regarding COVID-19 among Pregnant Women in Southwestern Iran in the Early Period of its Outbreak: A Cross-Sectional Study. *The American journal of tropical medicine and hygiene*. 2020 Dec;103(6):2368 -2375.
32. Clements JM. Knowledge and behaviors toward COVID-19 among US residents during the early days of the pandemic: cross-sectional online questionnaire. *JMIR public health and surveillance*. 2020 May 8;6(2):e19161.
33. Srichan P, Apidechkul T, Tamornpark R, Yeemard F, Khunthason S,

- Kitchanapaiboon S, Wongnuch P, Wongphaet A, Upala P. Knowledge, attitude and preparedness to respond to the 2019 novel coronavirus (COVID-19) among the bordered population of northern Thailand in the early period of the outbreak: a cross-sectional study. Available at SSRN 3546046. 2020 Feb 24.
34. Nicholas T, Mandaah FV, Esemu SN, Vanessa AB, Gilchrist KT, Vanessa LF, Shey ND. COVID-19 knowledge, attitudes and practices in a conflict affected area of the South West Region of Cameroon. *The Pan African Medical Journal*. 2020; 35(Suppl 2).
35. Zhou, Y, Shi H, Liu, Z. et al. The prevalence of psychiatric symptoms of pregnant and non-pregnant women during the COVID-19 epidemic. *Translational Psychiatry Journal*. 2020; 10, 319.
36. Mappa I, Distefano FA, Rizzo G. Effects of coronavirus 19 pandemic on maternal anxiety during pregnancy: a prospective observational study. *Journal of Perinatal Medicine*. 2020 Jul 1; 48(6):545-50.
37. Overbeck G, Graungaard AH, Rasmussen IS, Høgsgaard Andersen J, Kragstrup J, Wilson P, Ertmann RK. Pregnant women's concerns and antenatal care during COVID-19 lockdown of the Danish society. *Danish Medical Journal*. 2020 Nov 20.
38. Ahmed Mohammed Sabry F, Ahmed Abdelhafez Mohamed A, Mohammed Amein Ghanem N, Saad Abd El-aty N, Hussein Ahmed N. Effect of What Sapp Educational Program Reminder on Pregnant Women's Knowledge, Attitude and Practice Regarding COVID-19 pandemic. *Egyptian Journal of Health Care*. 2021 Sep 1; 12 (3):116-30.
39. Hassan Ali H, Morsy Yousif A, Abdo Abd El-Haleem S. Health Awareness Program to Pregnant Women Regarding Corona virus Disease (Covid 19). *Egyptian Journal of Health Care*. 2021 Dec 1; 12 (4):1285-303.
40. Wang Q, Mo PK, Song B, Di JL, Zhou FR, Zhao J, Wu YL, Tian H, Qiu LQ, Xia J, Wang L. Mental health and preventive behaviour of pregnant women in China during the early phase of the COVID-19 period. *Infectious diseases of poverty*. 2021 Dec; 10(1):1-1.
41. Harper CA, Satchell LP, Fido D, Latzman RD. Functional Fear Predicts Public Health Compliance in the COVID-19 International journal of mental health and addiction, 2021; 19(5), 1875-1888.