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Feto-maternal and neonatal care during COVID-19 pandemic: A perceptual study from Saudi Arabia

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Abstract—The current study aimed to report the pregnant women knowledge and perception about the feto-maternal care during the pandemic's lockdown. A cross sectional anonymous questionnaire-based study took place in Saudi Arabia. Questions were electronically distributed to participants. The questionnaire includes varieties of questions to gauge their knowledge and perceptions of many pregnancy-related topics in general. It also reported their information and attitude to COVID-19 infection regarding its feto-maternal and neonatal effect and the preventive measures. Three thousand one hundred and seventy-six pregnant females participated in the study. Poor knowledge was reported in (87.9%) of respondents. Meanwhile, 384 (12.1%) had good knowledge. More than half of the womenexpressed a poor maternal care during the pandemic, although 1415 (44.6%) had a good one. In Conclusion, Saudi Pregnant women living in areas with a higher COVID-19 prevalence, notably, Western, Central and Eastern provinces, expressed more information about the disease. Pregnant females who previously experienced maternal complications and/ or obstructed labor were more knowledgeable about the importance of maternal care. They were eager to undergo feto maternal care, even during the pandemic lockdown. Accurate information about the relationship between COVID-19 vertical transmission and maternal complications must be widely provided to Saudi pregnant ladies.

Keywords— COVID-19, Pregnancy, Maternal knowledge, Feto-Maternal care, awareness.

1. Introduction

Pregnancy-related morbidity and mortality are high in developing countries. [1,2] This may be attributed to the low efficacy of maternal care program. Therefore, maternal and fetal wellbeing still pose a higher challenge to obstetricians. Immune system is usually challenged during pregnancy. Hence, a higher percentage of infections may take place during the maternity period. Respiratory tract infection constitutes a considerable percentage of such infection. [3]Since the initial reported cases of COVID-19 infections, many issues have emerged. These include numerous items that are not yet fully explored. They include the mode of transmission, prevention, different pathological effect on the body systems as well as different diagnostic and therapeutic options. However, it is currently well documented that this viral infection although mainly affecting the respiratory tract may also affect other body systems. They include the eyes, gastrointestinal tract, the heart plus many other body systems that their affections are still not fully explored. [4] Overall, COVID-19 constitutes an enigmatic disease with very high morbidity and mortality rate.
The Saudi Society for Maternal-Fetal Medicine (SSMFM) has recently issued guidelines for dealing with pregnant women who are at a higher risk of being infected with COVID-19. The guidelines focus on preventing the infection as well as dealing with infected cases. [5] The current study aimed to report women perceptions and knowledge of feto-maternal care during the COVID-19 pandemic within Saudi Arabia.

2. Methodology

This cross-sectional anonymous questionnaire-based survey took place in Saudi Arabia. The ethical approval was obtained from the Institutional Research Board (IRB) after confirming all the ethical issues. Pregnant females were involved. The questionnaire was phrased in Arabic language. They were electronically distributed to women throughout the country. Yet, in certain areas (Abha and Madinah Al-Munawarah) it was directly answered within the maternity care clinics of maternity and children hospitals (MCHs).
The used Arabic questionnaire was divided into three sections. The first section included questions related to the sociodemographic data in relation to pregnancy. The second part concerned with past maternal and obstetric history. While the third one focused on the knowledge and perceptions of participating women about the feto-maternal and neonatal care. Statistical analysis took place using the Statistical Package for Social Sciences (SPSS) for Windows version 26.0 software program Armonk, NY, IBM corporation. Data were presented in tables and graphs where the continuous variables presented as means ± standard deviations.

3. Results

Three thousand one hundred and seventy-six pregnant females participated in the study. Poor knowledge was reported in 2792 respondents (87.9%). Meanwhile, 384 (12.1%) had good knowledge. More than half of the women, 1761 (55.4%) expressed a poor maternal care during the pandemic, yet, 1415 (44.6%) had a good one. Their socio-demographic data are reported in table I. Participating women maternal history is shown in table II. While their knowledge and perceptual concepts to COVID-19 during pregnancy are shown in tables III and IV. Graph 1 portrayed their attitude towards pregnancy-related complications. Sonographic data for maternal outcome is shown in graph 2. Adherence to maternal care clinics is reported in graph 3 while graph 4, represented their knowledge about the maternal perceptions of Covid-19' neonatal manifestation. Tables V and VI represent the participants overall knowledge and perception and also an overall data summary.

4. Discussion

COVID-19 pandemic poses a great challenge to population health. Pregnant women are more vulnerable to complications during the pandemic era. However, their knowledge and concerns as regards this issue have not yet been fully evaluated. The current study aimed to evaluate maternal perception of COVID-19 and its effect on pregnancy outcome. It showed a significant difference among young pregnant women (20-30 years) compared to other different age groups. Pregnant women above the age of 40 years have higher risk of pregnancy-related complications and adverse outcomes compared to their younger peers. This was previously discussed in the literature which reported old nulliparous pregnant females to have more risk of either maternal complications or obstructed labor. [6] Therefore, they must have special maternal care precautions. The present study did not show any statically significant difference in the perception of this notion among the respondents of different age groups.

Medical insurance and healthcare cost effectiveness might have influenced the low perception level among non-Saudi participants. Another factor that might have affected their knowledge and perception, was the educational level. This explained the better maternal perception during the pandemic. These findings coincide with other previously published data which denoted illiterate and low educational level women to attain higher risk of the worst maternal outcomes. [7]

Our study revealed a statistically significant difference among the variant geographical areas of the Kingdom. Pregnant women from northern part of Saudi Arabia did show a lower knowledge about the effect of COVID-19 on pregnancy when compared to other regions including southern area. Yet, those in South have expressed lower knowledge in relation to the rest of Saudi areas. This may be explained by the fact that

COVID-19 infections were more prevalent in the Central, Western and Eastern parts of Saudi Arabia. On the other hand, a quite sufficient information exists among those in the Eastern region. The reason may be the existence of COVID-19 infection in these areas. [8] Therefore, extra concerns must be paid to increase the knowledge and awareness to COVID-19 among pregnant women who live in the North and South of Saudi Arabia. This may add extra educational tasks to obstetricians in with the aim of teaching these concepts to pregnant women during the follow-up period. They have to convey clear information about COVID-19 and pregnancy. Saudi women are the target for the information specially those who live in the Northern and Southern part of Kingdom. [9]

Maternal care did not show any statistically significant difference between early and delayed pregnancy. Moreover, most participants expressed spontaneous pregnancy without any conceptual difficulties. However, those who underwent In Vitro Fertilization (IVF) did not show any significant difference in their perception of maternal care during the pandemic time despite the higher cost of IVF in Saudi Arabia. [10]

The current study data contradicted another report from a similar Middle East nation which expressed a lower perception and knowledge among the pregnant women11. This may be due to lower profile maternal care programs. Contrary to this nation, other reports did not show a higher perceptual competency of maternal care. [12,13] These literature data coincide with our current study results. Nonetheless, we reported a higher perceptual level among multiparous women who had already experienced pregnancy-related complications and/or obstructed labor compared to primigravida or uncomplicated multigravida.

These women who did not experience maternal complications or obstructed labor showed a lower awareness level compared to their peers who have already experienced such complications. The current questionnaire respondents reported some knowledge about the pregnancy-related complications such as hyperemesis gravidarum in 21.9%, vaginal secretions and infections in 16.9% as well as gestational diabetes in 7.9%.
The Royal College of Obstetricians and Gynecologists and the Royal College of Midwives had declared guidelines for antenatal and postnatal services. They mainly rely on regular visits and remote follow-up essential monitoring appointments. These appointments emphasis many parameters; including maternal blood pressure, urine analysis, other blood tests and fetal growth monitoring. [14]These follow-up appointments are of paramount importance for the early detection and dealing with maternal complications such as pre-eclampsia, gestational diabetes and asymptomatic urine infections. [15] The World Health Organization (WHO) has set extra guidelines for maternal care during COVID-19 infection. They necessitate the minimal antenatal care visits to be at least eight. [14] The current study stated that 31.2% of participants were keen to regularly attend their prenatal care clinic appointments, following a special care protocol set by SSMFM. This protocol recommended that the first visit to the antenatal care must be between 11-13 gestational weeks with extra subsequent appointments at 20, 37 and 41 gestational weeks. The remaining appointments might be changed to distancing type such as telephone conversation or web-based consultation. [5] We reported 17.5% of participants who did not have any antenatal care program while 18.9% underwent regular ordinary prenatal care during COVID-19 pandemic without any change. Moreover, antenatal sonographic assessment was performed in 47.6%. These data coincide with the SSMFM guidance for COVID-19 that recommended sonographic fetal assessment to be performed in two/three sessions. The first session should focus on calculation of pregnancy date and nuchal translucency at 11-13 gestational weeks. The second session would focus on the sonographic anatomical assessment at 20 gestational weeks. The third session that takes place during 32 gestational weeks would concern with the growth assessment. [16]

The COVID-19 pandemic has imposed an extra maternal psychological burden and stress. Such maternal stress may have a negative impact on the fetus. This may be expressed postnatally.[17-19] Among the current study participants 60.6% reported a sufficient psychological support during the antenatal care. Nevertheless, extra protective measures were imposed during maternal visits to control the virus spread and to keep the hospital facilities clean of infections. These measures include the initial temperature measurements and general examination to initially elucidate any COVID-19 clinical presentation. Moreover, extra information about COVID-19 manifestations were expressed during the maternal visits or through

online appointments. More than two-thirds (67.4%) of our sample has gained these information during the maternal care. The general MOH recommendations suggested those COVID-19 infected patients whether symptomatic or asymptomatic to have 14 days isolation either at home or health facilities. [5]

Twenty-two and half percent of the participating pregnant females chose to avoid having any radiological assessment in case of suspected COVID-19. They expressed their fear of radiation despite the thorough explanation of the radiology benefit-risk rationale. This rationale stated the possibilities of applying radiation images during pregnancy as long as the proper protective measure are followed. A pre- procedural informed consent must be obtained. [20] It has been postulated that the diagnostic imaging radiation are usually less than 1.5 mGy will not have any maternal or fetal adverse outcomes. [21-23]

Pregnant women are reported to have a higher prevalence of dental problems such as dental caries. This notion necessitates the need of including dental care as a part of the maternal gestational follow up. [24-26] In the current study about 50.6% of participants appreciate the visits to dental clinics, fetal follow-up and anomalies scanning clinics even during COVID-19 pandemics. They showed effective knowledge about the periodontal diseases during pregnancy as precursorsfor preterm delivery, pre-eclampsia and small babies for gestational age (SGA). [27] However, they had good knowledge about gestational diabetes mellitus (GDM) and its relation to fetal malformations and complications. Perhaps, this is related to the local circulating information that GDM is having a high global scale. [28, 29]

COVID-19-related information were well-perceived by 79.4% of our participants. They mentioned that a patient may be positive for viral infection without any clinical manifestations or sometimes minimal symptoms. Such data were previously reported in the literature. [30, 31]

Twenty-two percent of the studied population believed that COVID-19 infection may cause miscarriage while approximately nineteen percent did not have this concept. Contrary to these results, SSMFM reported COVID-19 as non-risk factor for miscarriage. [5] This is based on previous experiences with the Middle East Respiratory syndrome virus (MERS-coV) that belong to the same family of COVID-19. [32]

Moreover, the literature data supports the concept that preterm delivery is not induced by COVID-19. [5, 15] Twenty-seven percent of the current study participants expressed their perception that COVID-19 may also induce fetal teratogenic effect.

Vertical transmission of infection during pregnancy is another debatable issue. [33] Our participants believed on a higher risk of COVID-19 infection transmission during pregnancy, delivery and breastfeeding. They also believed that the mood of delivery may influence the infection transmission contradicting previously published data. [19] The center for disease control and prevention (CDC) recommended a thorough assessment of neonates of infected mother. [34] Our data showed, 22.3% of pregnant respondents to believe that infected mothers would transmit the infections to their babies. This is supported by a study which necessitates infected pregnant women to have special precautions during labor. [35] Most of our sample have expressed their over concern as regards the prevention of infection during labor. On the other hand, 18% did not have sufficient knowledge about the protective measures against COVID-19 infection.

5. Conclusion

Saudi pregnant women who live in areas with a higher COVID-19 prevalence, notably, Western, Central and Eastern provinces, have a higher information about the disease.Moreover, feto-maternal care constitutes a high percentage among our current study participants. They were eager to undergo such services, even during the pandemic lockdown. Accurate information about the relationship between COVID-19 vertical transmission and feto-maternal complications must be widely provided to all Saudi pregnant ladies. This may necessitate the creation of public educational program during pregnancy. This may be achieved by the setting of special guidelines as well as data transformation through different media tools.

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Tables and Graphs legend

Table I: Socio-demographic data. (n =3176)
Table II: Maternal history. (n =3176)
Tables III and IV: Knowledge and perceptual concepts to COVID-19 during pregnancy. (n = 3176)
Tables V and VI: Overall knowledge and perception and also an overall data summary.
Graph 1: Attitude towards pregnancy' related complications.
Graph 2: Sonographic data for maternal outcome.
Graph 3: Adherence to maternal care clinics
Graph 4: Knowledge about the maternal perceptions of Covid-19' neonatal manifestation.
*n= Number

Table I

Demographical Characteristics	n	%
Age		
Less than 20 Years Old	157	4.90
20 – 30 Years Old	1537	48.40
31 – 40 Years Old	1119	35.20
Older than 40 Years Old	363	11.40
Nationality		
Saudi	3001	94.50
Non-Saudi	175	5.50
Educational Level		
No formal education	43	1.40
Primary school	67	2.10
Lower secondary school	134	4.20
Upper secondary school /diploma/ high Institute	815	25.70
University/ Master or higher education	2117	66.70
Place of Residency		
Eastern Region	1017	32.00
Western Region	620	19.50
Central Region	437	13.80
Northern Region	683	21.50
Southern Region	419	13.20

Table II

Questions	n	%
The current pregnancy is:		
First Pregnancy	803	25.30
First pregnancy after waiting and trying to conceive for 1 year or more	196	6.20
Not first pregnancy	1837	57.80
Not first pregnancy but after waiting and trying to conceive for 1 year or more	340	10.70
For current pregnancy, what is the way of conceiving?		
Natural conception	2865	90.20
Conception by induction	175	5.50
Assisted conception / In vitro fertilization (IVF)	101	3.20
Artificial insemination (AI)	35	1.10
Did you have any pregnancy complications in previous pregnancy or now?		
Yes	1092	34.40
No	2084	65.60
Do you have a child/ children's?		
Yes	2279	71.80
No	897	28.20
Was the labor obstructed in the previous deliveries?		
Yes	486	15.30
No	2690	84.70
Previous delivery/ deliveries was/were in which week?		

Less than 32 weeks (8 months) (Pre-Term)	192	6.00
36 weeks (9 months) (Term)	1217	38.30
More than 36 up to 41 weeks (more than 9 months) (Post-Term)	798	25.10
I can't remember	606	19.10
How previous deliveries were?		
Vaginal delivery	1912	60.20
Assisted vaginal delivery (Forceps and vacuum)	0	0.00
Elective cesarean section	170	5.40
Urgent cesarean section	603	19.00
I do not know	192	6.00

Table III

	n	%
Q1/ How you follow-up your prenatal care appointments in pandemic period of COVID-19?		
Go to hospital only in urgent conditions and the rest of appointments do in form of telephone or video call etc.	1029	32.4
Go to hospital in essential appointments and the rest of them do in form of telephone or video call etc.	990	31.2
Follow up my prenatal care appointments was not change during pandemic period of COVID-19	600	18.9
I do not follow up my prenatal care appointments at all	557	17.5
Q2/ Did doctors during appointments concern about your safety and ask you about symptoms of COVID-19 (whether appointments were by visiting or by telephone or other form)?		
Yes	2141	67.4
No	1035	32.6
Q3/ Do you believe the quality of health care during pandemic period was not good enough?		
Yes	1172	36.9
No	2004	63.1
Q4/ During following your appointments, did obstetrician do psychological support, advice and offer you to visit psychologist l if you need?		
Yes	1924	60.6
No	1252	39.4
Q5/ If you pregnant now, did you follow your pregnancy by ultrasound?		
Yes, Once	1122	35.3
Yes, more than once	1512	47.6
No	542	17.1
Q6/ Routine investigation to confirm infection of COVID-10 should do chest x-ray or computerized tomography (CT), if pregnant woman is suspected to be infected what should do in this situation?		
Do chest x-ray or computerized tomography (CT)	196	6.2
Avoid doing chest x-ray or computerized tomography (CT) and suffice with swab	2	22.5
Leave decision to doctors	1402	44.1
I do not know	864	27.2

Table IV

Question	n	%
Q1/ Do you believe visiting other clinics during pregnancy is important?		
Yes (Correct Answer)	1608	50.6
No	1568	49.4
Q2/ Could infected person be positive for COVID-19 test but without having symptoms of infection?		
Yes (Correct Answer)	2521	79.4
No	655	20.6
Q3/ Do you believe being infected with COVID-19 during first and second trimester can cause abortion?		
Yes, Sure	140	4.4
Yes, it may happen	472	14.9
Yes, I heard this condition happened	91	2.9
No, there is no correlation (Correct Answer)	766	24.1
I do not know	1707	53.7
Q4/ Do you believe being infected with COVID-19 can cause preterm delivery?		
Yes, Sure	197	6.2
Yes, it may happen	537	16.9
Yes, I heard this condition happened	124	3.9
No, there is no correlation (Correct Answer)	610	19.2
I do not know	1708	53.8
Q5/ Do you believe being infected with COVID-19 can cause congenital anomalies/ syndromes?		
Yes, Sure	97	3.1
Yes, it may happen	314	9.9
Yes, I heard this condition happened	72	2.3
No, there is no correlation (Correct Answer)	857	27
I do not know	1836	57.8
Q6/ Do believe stress and anxiety due to COVID-19 can cause congenital anomalies/ syndromes?		
Yes (Correct Answer)	332	10.5
No	2844	89.5
Q7/ Risk of transmission of infection to baby during pregnancy is:		
There is no risk of transmission of infection during last 3 months (Correct Answer)	409	12.9
There is risk of transmission of infection during last 3 months	295	9.3
There is no risk of transmission of infection during first 6 months	121	3.8
There is risk of transmission of infection during first 6 months	148	4.7
There is no risk of transmission of infection during entire pregnancy	719	22.6
There is risk of transmission of infection during entire pregnancy	446	14
I do not know	1038	32.7
Q8/Do you believe infection can be transmitted from infected mother to baby during delivery?		
Yes, Sure (Correct Answer)	369	11.6
Yes, it may happen (Correct Answer)	855	26.9
Yes, I heard this condition happened (Correct Answer)	227	7.1
No, there is no correlation	513	16.2
I do not know	1212	38.2

Q9/ If you infected with COVID-19 and you have labor, what should be done as prevention and control guidelines for transmission infection?		
Call the hospital and tell them you have labor and you are infected, and you will arrive soon. (Correct Answer)	1886	59.4
Do labor in emergency department because it is easy to access and to avoid go inside hospital unties. (Correct Answer)	400	12.6
Do labor in isolated room. (Correct Answer)	1031	32.5
Medical staff should wear protective personal equipment. (Correct Answer)	966	30.4
Temporary separation distance around 6 feet from mother and newborn bed in isolated room until do test of newborn. (Correct Answer)	756	23.8
Newborn room should be near to mother room to minimize distance. (Correct Answer)	528	16.6
Newborn should be test around 24 hours after delivery to ensure safety (Correct Answer)	1266	39.9
I do not know	571	18
Q10/ For mothers infected with COVID-19, you believe that newborn .. :		
Might be infected (Correct Answer)	489	15.4
Higher risk to be infected (Correct Answer)	772	24.3
Have good immunity and have antibodies	427	13.4
I do not know	1488	46.9
Q11/ Breastfeeding of newborn from infected mother:		
There is no mind for breastfeeding from infected mother with use protective measures (Correct Answer)	196	6.2
It prefers to avoid breastfeeding until mother cured from infection (Correct Answer)	714	22.5
It must avoid breastfeeding until mother cured from infection	1402	44.1
I do not know	864	27.2

Table V

Variable	Measures	
Knowledge among participants	n	%
Poor	2792	87.90
Good	384	12.10
Perceptual practice among participants	n	%
Poor	1761	55.40
Good	1415	44.60

Table VI

Demographical Characteristics	Practice	Knowledge
Age	p = 0.113	p < 0.001*
Less than 20 Years Old	3.96 +/- 1.53	7.91 +/- 3.74
20 – 30 Years Old	4.12 +/- 1.59	8.83 +/- 4.17
31 – 40 Years Old	4.21 +/- 1.6	8.07 +/- 4.15
Older than 40 Years Old	4.27 +/- 1.73	7.51 +/- 3.71
Nationality	0.002*	0.201
Saudi	4.18 +/- 1.6	8.34 +/- 4.12
Non-Saudi	3.80 +/- 1.67	8.75 +/- 4.05
Educational Level	p = 0.002*	p = 0.004*
No formal education	3.83 +/- 1.41	8.58 +/- 3.93
Primary school	3.61 +/- 1.98	7.01 +/- 3.58
Lower secondary school	3.93 +/- 1.58	7.83 +/- 3.51
Upper secondary school/ diploma/ high Institute	4.1 +/- 1.57	8.14 +/- 4.13
University/ Master or higher education	4.23 +/- 1.61	8.53 +/- 4.16
Place of Residency	p < 0.001*	p < 0.001*
Eastern Region	4.22 +/- 1.56	8.94 +/- 4.18
Western Region	3.98 +/- 1.65	8.86 +/- 4.09
Central Region	4.01 +/- 1.68	8.91 +/- 4.05
Northern Region	4.20 +/- 1.56	6.87 +/- 3.89
Southern Region	4.40 +/- 1.62	8.11 +/- 3.86
The current pregnancy is:	p = 0.026*	p = 0.199
First Pregnancy	4.28 +/- 1.48	8.5 +/- 3.97
First pregnancy after waiting and trying to conceive for 1 year or more	4.22 +/- 1.67	8.81 +/- 3.69
Not first pregnancy	4.14 +/- 1.64	8.3 +/- 4.19
Not first pregnancy but after waiting and trying to conceive for 1 year or more	3.97 +/- 1.68	8.12 +/- 4.28
For current pregnancy, what is the way of conceiving?	p = 0.001*	0.195
Natural conception	4.18 +/- 1.6	8.32 +/- 4.11
Conception by induction	4.16 +/- 1.58	9.01 +/- 4.29
Assisted conception / In vitro fertilization (IVF)	4.06 +/- 1.75	8.46 +/- 4.02
Artificial insemination (AI)	3.11 +/- 1.94	8.51 +/- 4.15
Did you have any pregnancy complications in previous pregnancy or now?	p = 0.88	p < 0.001*
Yes	4.15 +/- 1.64	9.1 +/- 4.16
No	4.16 +/- 1.59	7.95 +/- 4.06
Was the labor obstructed in the previous deliveries?	p = 0.433	p = 0.02*
Yes	4.11 +/- 1.65	8.77 +/- 4.01
No	4.17 +/- 1.60	8.30 +/- 4.14

* Significant at level 0.05.

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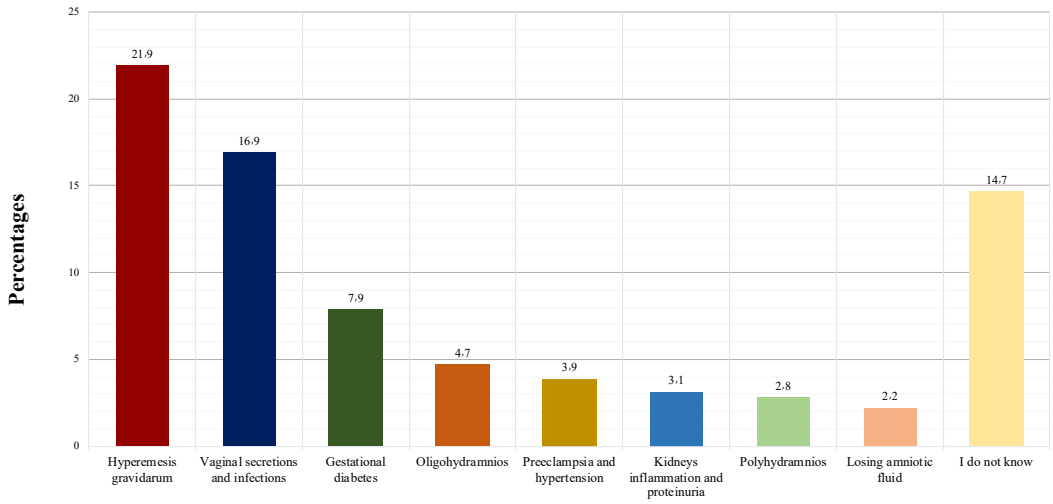
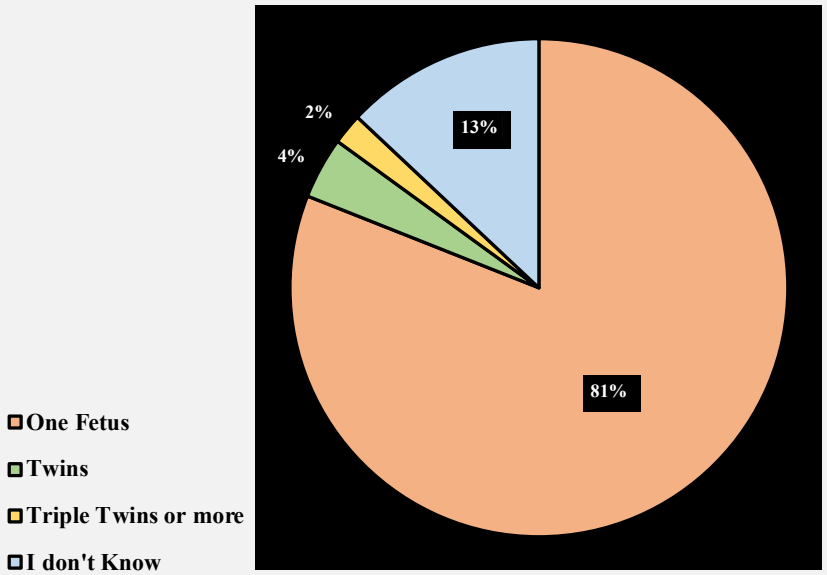
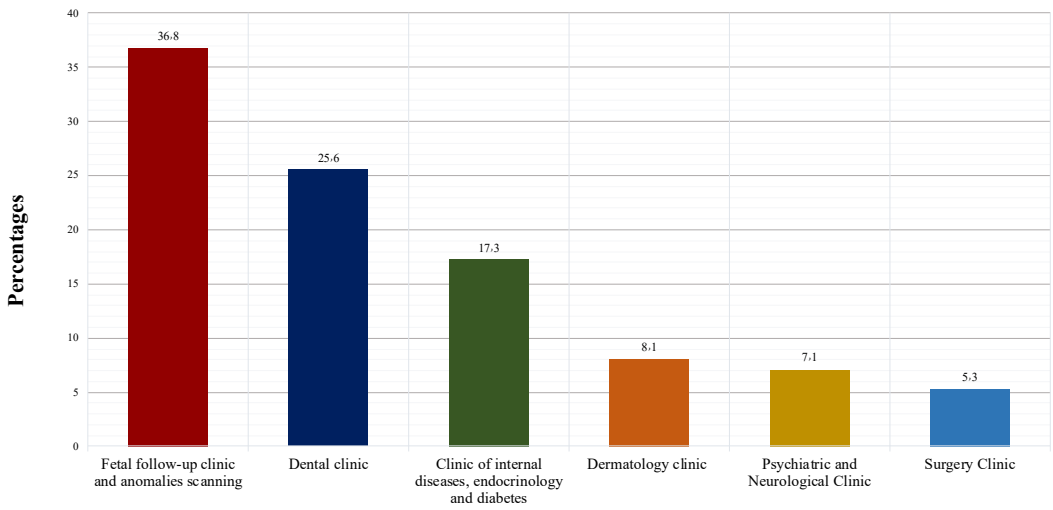


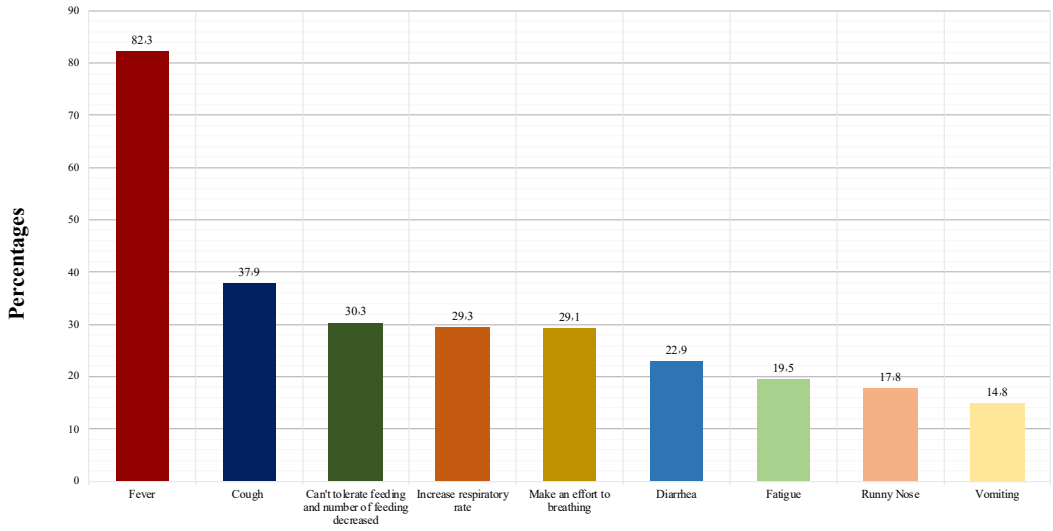
Graph 1, Attitude towards pregnancy' related complications.



Graph 2, Sonographic data for maternal outcome.



Graph 3, Adherence to maternal care clinics



Graph 4, Knowledge about the maternal perceptions of Covid-19' neonatal manifestation.