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Stress, Anxiety and Depression among Pregnant Women during the first wave of the COVID-19 Pandemic in Israel

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Abstract

Background: The new COVID-19 pandemic resulted in tremendous challenges to mankind in health, emotions and economy. A specifically vulnerable group are pregnant and postpartum women. We conducted a study that aimed to shed light on the effects of this pandemic on emotional state of pregnant and postpartum women.

Objective and Study Design: A cross-sectional study in northern Israel based on web questionnaire for the assessment of general stress, anxiety and depression during the quarantine period of COVID-19 pandemics from April 20 until May 7, 2020. Participants were pregnant women and women up to a year after childbirth. Overall, 356 women of whom 251 pregnant and 101 post-partum filled the questionnaire.

Results: Among 251 pregnant women, 199 (79.3 %) reported moderate-high stress, 145 (57.8 %) high anxiety. A hundred and three (41.0%) reported high level of depression (PH2>3). Among pregnant women, the following were the most prevalent stressors: fear that someone in their family will acquire the virus (80.1%), concern for the health of the baby (77.7%), fear that someone close will die from COVID-19 (72.9%) and worry of being infected within the hospital (71.7%). A univariate analysis of stress revealed that age (χ^2=10.93, p<0.004) and income level (χ^2=13.35, p<0.001) were associated with the level of stress. Stepwise logistic regression revealed that both age and income level below the mean were predictors of stress. Among the 165 multiparous pregnant women, age (25-34 vs. 35-44) was a predictor of stress (p<0.04).

Conclusion: Our study clearly showed an enormous negative effect of the COVID-19 pandemic on emotional condition including stress, anxiety and depression on both pregnant and postpartum women. This provides an insight on the relation between economy and emotional state during uncertainty period. This effect adds a huge challenge to healthcare system and social support providers as well as the governments in providing means and solutions during pandemics and worldwide disaster.

Keywords: COVID-19, Pregnant, Postpartum, Depression, Anxiety, Stress

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Highlights:

A. We conducted the study in order to examine the effect of COVID-19 pandemic on emotional and psychological status of pregnant and postpartum women and to find possible predictors of stress, anxiety and depression in this unique population.
B. The most prevalent stressors were fear that someone in their family will acquire the virus, concern for the health of the baby; fear that someone close will die from COVID-19 and worry of being infected within the hospital. The most significant predictors correlated with stress were age and low income.
C. Our findings emphasize the need to draw and implement an interventional program to reduce stress, depression and anxiety rates in pregnant and postpartum women during pandemics.

Introduction

COVID-19 was recognized initially on December 2019 in Wuhan, China. It has spread rapidly to most countries worldwide and consequently by the world health organization (WHO) as public health emergency international concern [1] and later as pandemic [2].

Pregnancy is always followed by fears and concerns, mostly regarding the welfare of the offspring. Not surprisingly, during and after natural disasters and pandemics pregnant women are at increased risk of psychological and mental disorders including higher levels of anxiety and depression [3-6]. Moreover, a negative cognitive and neurological development was observed in children in whose mothers were exposed to a natural disaster during pregnancy [7,8]. The effect of COVID-19 on pregnancies and their outcome is gradually being unraveled. Recent studies from Canada and turkey, reported an alarmingly elevated levels of psychological distress, especially anxiety and depression, among pregnant individuals [9,10]. In addition to negative psychological effect during and after natural disasters, pregnant women are at increased risk for developing pre-eclampsia, preterm labor, rupture of membranes, spontaneous abortions, and intrauterine growth restriction [3,7,11,12]. These complications need close follow up and hospitalization.

In general, pregnant women are vulnerable to infectious diseases like Influenza-A, MERS-CoV, Sars-CoV, and Ebola. Serious complications of pregnancy were reported with these infections, including increased maternal mortality and morbidity, intrauterine fetal death (IUFD), spontaneous abortions, and preterm deliveries [13]. Compared to theses, COVID-19 outcomes for the mother appear more promising, as no maternal mortality was reported and most infected women develop mild respiratory symptoms [14]. Fetal complications of COVID-19 infection include miscarriage (2%), intrauterine growth restriction (IUGR; 10%), and preterm birth (39%), but no confirmed cases of vertical transmission were reported. Naturally, no data is yet available on perinatal outcomes when the infection was acquired early in pregnancy [14].

A significant factor in the adequacy of medical follow up during pregnancy is the fear of women from any contact with hospitals or medical staff, due to understandable concern regarding acquiring the infection, which has so many unknowns regarding its consequences. In

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China this was formally evaluated and reported [15]. This fear was prominent during labor and breastfeeding especially with the need for social isolation, which influenced the emotional support given by the staff [16].

In the study presented herein we aimed to evaluate by web-based questionnaires the emotional status and predictors of stress, anxiety and depression among pregnant women who gave birth during the pandemic in Israel, compared to those who had their recent baby during the year before.

Methods

A cross-sectional study in which pregnant women and women up to a year after childbirth (hereafter referred to as post-partum), residents of northern Israel, Jewish and Arab, were asked through social networks to fill in an online questionnaire during the COVID-19 epidemic. Overall, 356 women, 251 pregnant and 101 post-partum responded. The questionnaire included an assessment of general stress, anxiety and depression, stress specific to COVID-19, and other obstetric and demographic variables of the study population. The reliability of each part of the questionnaire was tested separately using Cronbach's alpha test. The data collection was completed during the general quarantine period, (April 20 to May 7, 2020).

Sample size considerations: A sample size of 193 is needed to be within 7% of the true rate of stress among pregnant women during the pandemic, assuming a 50% rate of stress. The number for anxiety evaluation within 7% of the true rate of stress should be 189, assuming an anxiety rate of 57%. The sample size for the evaluation of depression had to be 180, assuming a 37% rate of depression. Allowing for 15% rate of inconsistent or missing data the total sample size had to be 222. According to Peduzzi (1996), a sample size of 222 will allow the use of 8 predictors of depression, assuming rate of depression is 37%.

Ethics: This study was conducted in accordance with the Helsinki Declaration and approved by the Institutional Review Board of the Nazareth Hospital (reference number: MD739), in addition to the Ethics Committee of the Yezreel Valley College (reference number: 91-2020 YVC EMEK). On the first page of the questionnaire, electronic informed consent was obtained from each participant before beginning the questionnaire.

Stress Assessment: PSS-10 - Perceived Stress Scale [17] developed by Spacapan, Oskamp, Cohen, & Williamson (1988), a questionnaire that examines the extent to which an individual assesses life stresses and refers to perceptions and emotions related to the overall stress level recently. Likert scale from 0 = never to 4 = Often, the questionnaire included 10 items. A score of 14-26 indicates moderate stress level, and higher scores indicated high stress level. Cronbach's alpha in our study $\alpha = 0.89$.

Anxiety questionnaire: Generalized Anxiety Disorder 7-item questionnaire (GAD -7) [18] developed by Spitzer, Kroenke, Williams & Löwe, (2006) was used to assess subjective anxiety symptoms over the past month. The answers to the questions are given on a 4-point Likert scale from 0 = not at all to 3 = almost every day. A score of 0-4 indicated minimal, 5-9 mild, 10-14 moderate, and >15, severe anxiety. At the end of the questionnaire, the women were asked to rate the degree of difficulty that their anxiety caused them at work, at home or in contact with other people on a 4-point Likert scale, from 1= not causing any difficulty to 4 = caused the highest level of difficulty. Cronbach's alpha in our study $\alpha = 0.92$.

Depression Questionnaire: The 2-PHQ questionnaire [19] developed by Kroenke, Spitzer, Williams (2003) was used, of which at least one positive item is required to diagnose major depressive disorder (MDD) for any depressive disorder according to DSM-IV. PHQ-2 scores can range from 0 to 6, and a cut-off point ≥3 indicates significant clinical depression. The correlation between the two items in the current study was $r = 0.72$ ($p<0.001$).

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COVID-19-related stress perception: The questionnaire was composed by us for this study. Six statements reflecting the degree of concern, such as "I fear someone in my family will acquire COVID-19" or "I'm afraid of acquiring COVID-19 in a hospital during labor". The answers were given on a 5-point Likert scale from 1 = totally disagree and up to 5 = strongly agree. The sum of all answers was considered to indicate the level of stress specific to the pandemic. The higher the score, the higher the perception of related stress from Covid-19. Cronbach's alpha in our study α = 0.74.

Statistics: Demographic and study measures of pregnant women were compared to post-partum women, using χ^2 test and t-test as applicable. Differences in demographic and study measures between high and low risk pregnancies were similarly compared. Stress, anxiety and depression were dichotomized into high and low levels with high stress defined as PSS>13, high anxiety as GAD>9 and high depression as PH2>3. Stepwise logistic regression was performed to identify which COVID-19-related stressors and worries predicted high stress, anxiety, and depression. In the first step, the significant univariate demographic variables were tested and in the second step, the significant stressors were added to the model. All analyses were performed using IBM SPSS Statistics for Windows, Version 21.0. Statistical significance was considered when p<0.05.

Results

Of the 352 women included in this study, 251 were pregnant women and 101 post-partum. The demographics of pregnant women did not differ from that of their post-partum counterparts, except that a significantly higher percentage of pregnant women worked remotely during the pandemic, compared to their post-partum counterparts (37.1 vs. 19.8%, χ^2=9.80, p<.0002).

Table 1: Demographic and health data, by study group (n=352).

	Group						
	Pregnant women (N=251)		Up to a year after childbirth (N=101)		p value	Entire group (N=352)	
	N	%	N	%	p	N	%
Age					0.12		
24-18	33	13.1	6	5.9		39	11.1
34-25	181	72.1	76	75.2		257	73.0
44-35	37	14.7	19	18.8		56	15.9
Religion					0.49		
Jewish	53	21.1	25	24.8		78	22.2
Muslim	126	50.2	53	52.5		179	50.9
Christian	72	28.7	23	22.8		95	27.0
Religiosity					0.52		
Secular/atheist	59	23.5	31	27.6		88	25.0
Traditional	103	41.0	43	38.5		139	39.5
Religious/ultra-orthodox	89	35.5	37	34.9		125	35.5
Marital status					0.80		
Married	247	98.4	99	98.0		356	98.3
Unmarried	4	1.6	2	2.0		6	1.7
Number of children					---		
0=Nulliparous	84	33.5	0	0.0		84	23.9

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1=Primiparous	81	32.3	43	43.0		124	35.3
2-6=Multiparous	86	34,3	57	57.0		143	40.8
Education					0.32		
Non-academic	50	19.9	25	24.8		75	21.3
Academic	201	80.1	76	75.2		277	78.7
Partners education[1]					0.65		
Non academic	119	47.8	51	50.5		170	48.6
Academic	130	52.2	50	49.5		180	51.4
Employment					0.24		
Housewife	43	17.1	11	10.9		54	15.3
Employee	168	66.9	69	68.3		237	67.3
Self employed	15	6.0	11	10.9		26	7.4
Other	25	10.0	10	9.9		35	9.9
Work outside the home					0.52		
Yes						260	73.9
No	183	72.9	77	76.2		92	26.1
	68	27.1	24	23.8			
Work remotely during					0.002		
pandemic							
Yes	93	37.1	20	19.8		113	32.1
No	158	62.9	81	80.2		239	67.9
Income level					0.44		
A lot below average	53	21.1	18	17.8		71	20.2
Below the average	76	30.3	37	36.6		113	32.1
The average	73	29.1	23	22.8		96	27.3
Above the average	49	19.5	23	22.8		72	20.5
Residence					0.34		
City	135	53.8	60	59.4		195	55.4
Other	116	46.2	41	40.6		157	44.6
Health status					0.86		
Normal	240	95.6	97	96.0		337	95.7
Background diseases	11	4.3	4	4.0		15	4.3
Subjective health evaluation					0.62		
Excellent							
Very good	130	51.8	58	53.2		187	53.1
Good/not so good	101	40.2	40	36.7		136	38.6
	20	8.0	11	10.1		29	8.2
[1]N=249 in pregnant women group, [2]N=246 in pregnant women group, [3]N=246 in pregnant women group, N=100 in the post group,[4]N=241 in pregnant women group							

Among 251 pregnant women, 41 (16.9 %) reported high stress and 56 (22.3%) high anxiety (Table 2). A hundred and three (41.0%) reported high level of depression (PH2>3). No differences in stress, anxiety, depression and stress from COVID-19 was found between pregnant and post-partum women.

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Table 2: Comparison of stress, anxiety, depression and stress from Corona between pregnant women and women up to a year after childbirth (N=352).

	Pregnant women (N=251)	Up to a year after childbirth (N=101)	p value	Total women of the 2 groups (N=352)
2.1 Continuous variables	**Mean±SD**	**Mean±SD**		**Mean±SD**
Stress-PSS	19.4±7.5	20.6±6.4	0.15	19.8±7.2
Anxiety-GAD	10.8±5.8	11.1±5.3	0.71	10.8±5.8
Depression-PH2	2.92±1.82	3.05±1.66	0.52	2.95±1.78
Stress from Corona	21.8±5.0	21.0±5.0	0.08	21.5±5.1
Fear get corona	3.65±1.26	3.41±1.39	0.13	3.58±1.30
Increased perceived risk to acquire COVID-19	3.20±1.42	2.11±1.29	0.001	2.89±1.47
Fear someone in family will acquire COVID-19	4.25±1.10	4.19±1.16	0.66	4.23±1.12
Fear someone close to me will die from COVID-19	4.11±1.19	4.26±1.11	0.29	4.15±1.17
I worry about my financial situation	3.50±1.30	3.72±1.24	0.14	3.56±1.27
I feel busy because the kids are at home	2.78±1.47 (N=172)	3.06±1.47	0.14	2.88±1.48 (N=268)
2.2. Categorical variables	**N (%)**	**N (%)**		**N (%)**
Stress Level			0.45	
Low (0-13) Moderate-High (>13)	52 (20.7) 199 (79.3)	15 (14.9) 86 (85.1)	0.20	67 (19.0) 285 (81.0)
Anxiety Level Minimal-low (0-9) Moderate-high (>9)	 106 (42.2) 145 (57.8)	 36 (35.6) 65 (64.4)	0.46 0.26	 142 210
Anxiety influence None Some Moderate amount A lot	 66 125 54 6 (2.4)	 20 58 20 3 (3.0)	0.52	 66 125 54 6 (2.4)
Depression			0.93	
Low (0-3)	148 (59.0)	59 (58.4)		217 (61.6)
High (4-6)	103 (41.0)	42 (41.6)		135 (38.4)

The most prevalent stressors attributable to COVID-19 among the pregnant women were fear that someone in their family will acquire the virus (80.1%), concern for the health of the baby (77.7%), fear that someone close will die from COVID-19 (72.9%) and worry of being infected within the hospital (71.7%) (Table 3).

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Table 3: Stress from COVID-19 among pregnant women - Absolute numbers and percentage (N=251).

Stress from Corona	**Yes (4+5) N (%)**	**No (1,2,3) N (%)**
Fear of acquiring COVID-19	154 (61.4)	97 (38.6)
Perceived increased risk to acquire COVID-19	112 (44.6)	139 (55.4)
Fear someone in family will acquire COVID-19	201 (80.1)	50 (19.9)
Fear someone close to me will die from COVID-19	183 (72.9)	68 (27.1)
I worry about my financial situation	129 (51.4)	122 (48.6)
I feel busy because the kids are at home	62 (36.0)	110 (64.0)
Worried of being alone in hospital or at home after delivery	131 (56.2)	120 (43.8)
Afraid being infected within the hospital	180 (71.7%)	71 (28.3%)
Afraid to breastfeed for fear of infecting the baby	105 (41.8%)	146 (58.2%)
I am concerned for the health of the baby	195 (77.7%)	56 (22.3%)
Family work status		
Both works remotely during the pandemic	33 (13.1)	
One work remotely during the pandemic	90 (35.9)	
Neither works remotely during the pandemic	128 (51.0)	
Unpaid leave of one or both of the couple	98 (39.0)	153 (61.0)

Predictors of Stress among pregnant women

A univariate analysis of stress revealed that age (χ^2=10.93, p<0.004) and income level (χ^2=13.35, p<0.001) were associated with the level of *stress*. A lower percentage of women aged 25-34 had high stress as compared to women aged 35-44 (OR: 0.25, 95% CI: 0.07-0.86). A higher percentage of women with family income level below the mean had high stress as compared to women with family income level at or above the mean (OR: 3.31, 95% CI: 1.71-6.41). Remote work of the husband/partner was associated with stress (χ^2=4.47, p<0.04), with more than twice the stress found in women whose husband/partner did not work remotely. Worry about being alone in the hospital and or/at home (χ^2=22.80, p<0.001), fear of acquiring infection within the hospital (χ^2=8.22, p<0.004) and concern about the health of the baby (χ^2=4.08, p<0.04) were also associated with high level of stress. In addition, general fear of acquiring COVID-19 (χ^2=6.39, p<0.01) was also associated with high level of stress.

Multivariate stepwise logistic regression analysis revealed that only fear of being alone in the hospital and or/at home was a predictor of stress (Table 4).

Among the 165 multiparous pregnant women, who answered the question regarding children at home, age (25-34 vs. 35-44) was a predictor of stress (p<0.04). In the second step, after controlling for age, fear of being alone in the hospital or at home and having kids at home were predictors of stress. Both these predictors increased the odds of stress more than 5-fold.

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Table 4: Stepwise logistic model of high levels of stress among pregnant women, with significant univariate demographic predictors in the first step (n=251).

	First step						**Second step**					
	β	**SE**	**Wald**	**P**	**OR**	**95% CI**	**β**	**SE**	**Wald**	**p**	**OR**	**95% CI**
Age			8.558	0.01					6.67	0.04		
18-24	-0.294	0.971	0.092	0.76	0.74	0.11-5.00	-0.540	0.992	0.30	0.59	0.58	0.08-4.07
25-34	-1.573	0.635	6.14	0.01	0.21	0.06-0.72	-1.507	0.646	5.44	0.02	0.22	0.06-0.79
35-44	---	---	---	---	1.00	Reference	---	---	---	---	1.00	Reference
Income level below mean	1.171	0.350	11.18	0.001	3.22	1.62-6.40	0.827	0.382	4.70	0.03	2.29	1.08-4.83
Fear of being alone in the hospital/at home							1.367	0.374	13.34	0.001	3.92	1.88-8.17
Partners remote work							---	---	1.05	0.30	---	---
Fear of contracting infection in the hospital							---	---	0.80	0.37	---	---
Worry about health of baby							---	---	0.02	0.89	---	---
Fear of contracting COVID-19							---	---	0.49	0.48	---	---

Predictors of Anxiety among pregnant women

Analysis of anxiety showed that religion (χ^2=10.62, p<0.005), education (χ^2=6.74, p<0.009) and income level (χ^2=13.35, p<0.001) were univariate variables associated with anxiety. Higher percentage of Muslim pregnant women reported a high level of anxiety as compared to their Christian counterparts (OR: 2.59, 95% CI: 1.43-4.70). In addition, a higher percentage of pregnant women without academic education reported a high level of anxiety as compared to the women holding academic degrees (OR: 2.45, 95% CI: 1.23-4.89). A higher percentage of women with family income level below the mean experienced high anxiety as compared to women with family income level at or above the mean (OR: 2.00, 95% CI: 1.20-3.33). The work-related variables (working remotely, on unpaid leave) were not associated with anxiety. Worried about being alone in the hospital or at home (χ^2=33.72, p<0.001), afraid of being infected within the hospital (χ^2=18.15, p<0.001), afraid to breastfeed (χ^2=20.18, p<0.001) and concern for the health of the baby (χ^2=16.79, p<0.001) were all stressors associated with anxiety. Responses to all 6 COVID-19-related stress questions were also associated with anxiety (fear of acquiring COVID-19: χ^2=30.48, p<0.001, perceived increased risk of acquiring COVID-19: χ^2=5.71, p<0.02, a relative acquiring COVID-19: χ^2=19.74, p<0.001, a relative die from COVID-19: χ^2=8.74, p<0.003, financial worries: χ^2=19.97, p<0.001, children at home:

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χ^2=8.96, p<0.003). However, support from family, friends and medical staff was not associated with anxiety.

Multivariate stepwise logistic regression analysis revealed that religion and income level below the mean were predictors of anxiety (Table 5). There were no 2-way interactions between religion and income level or academic education and income level. The fears of acquiring COVID-19 and being alone in the hospital or at home after delivery each increased the odds of having a high level of anxiety 4-fold as compared to women without these fears. Financial worries increased the odds of having a high level of anxiety 3-fold as compared to women without these worries.

Table 5: Stepwise logistic model of high levels of anxiety among pregnant women, with significant univariate demographic predictors in the first step (n=251).

	First step						**Second step**					
	β	**SE**	**Wald**	**p**	**OR**	**95% CI**	**β**	**SE**	**Wald**	**p**	**OR**	**95% CI**
Religion			8.18	0.02					11.28	0.004		
Jewish	---	---			1.00	Reference	---	---			1.00	Reference
Muslim	0.461	0.344	1.80	0.18	1.59	0.81-3.11	0.511	0.404	1.60	0.21	1.67	0.76-3.68
Christian	-0.414	0.369	1.26	0.26	0.66	0.32-1.36	-0.715	0.429	2.78	0.10	0.49	0.21-1.13
Income level below mean	0.589	0.269	4.80	0.03	1.80	1.06-3.05	-0.080	0.324	0.06	0.81	0.92	0.49-1.74
Nonacademic education	0.677	0.369	3.37	0.07	1.97	0.96-4.06	---	---	---	---	---	----
Fear of contracting COVID-19							1.408	0.318	19.56	0.001	4.09	2.19-7.49
Fear of being alone in the hospital/at home							1.398	0.314	19.80	0.001	4.05	2.19-7.49
Financial worries							1.178	0.313	14.00	0.001	3.29	1.75-5.96
Afraid of contracting COVID-19 in hospital							---	---	1.18	0.28	---	---
Afraid to breastfeed							---	---	0.88	0.35	---	---
Fear of health of baby							---	---	0.21	0.64	---	---
Increased risk of COVID-19							---	---	0.00	0.99	---	---
Fear relative will contract COVID-19							---	---	0.83	0.36	---	---
Fear death of relative from COVID-19							---	---	0.01	0.93	---	---

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Among the 172 multiparous pregnant women who had children, education level was the only significant demographic predictor of anxiety. In the second step, after controlling for education level, fear of acquiring COVID-19, fear of being alone in the hospital and having children at home were the only stressors that predicted of anxiety. Financial worries variable was no longer a predictor.

Predictors of depression among pregnant women

Religion, religiosity and high-risk pregnancy were univariate variables associated with depression. A higher percentage of Muslim pregnant women reported a high level of depression as compared to their Christian counterparts (χ^2=12.71, p<0.001). In addition, a higher percentage of religious pregnant women reported depression as compared to secular women (χ^2=5.22, p<0.02). A higher percentage of women with high-risk pregnancy reported depression as compared to women with normal risk pregnancies (χ^2=4.56, p<0.03). Interestingly, after adjusting for religion and religiosity, high-risk pregnancy was no longer associated with depression (χ^2=1.99, p>0.16).

Worried about being alone in the hospital or at home (χ^2=17.43, p<0.001), afraid of being infected in the hospital (χ^2=5.37, p<0.02), afraid to breastfeed (χ^2=17.13, p<0.001) and concern for the health of the baby (χ^2=7.67, p<0.006) were all stressors associated with depression. With the exception of fear of a death of a relative, all responses to the COVID-19 stress questions were also associated with depression (fear of acquiring COVID-19: χ^2=13.23, p<0.001, perceived increased risk: χ^2=4.31, p<0.04, a relative acquiring COVID-19: χ^2=11.42, p<0.001, a relative dying of COVID-19: χ^2=8.74, p<0.003, financial worries: χ^2=17.01, p<0.001, children at home: χ^2=13.19, p<0.001). However, support from family, friends and medical staff was not associated with depression.

As shown in Table 6, multivariate stepwise logistic regression analysis showed that religion was the only significant predictor of depression.

After correcting for religion, fear of acquiring COVID-19, financial worries and fear of being alone in the hospital were the only predictors of depression with odd ratio of 2.3, 2.8 and 2.6 respectively (Table 6).

Among the 172 multiparous pregnant women, religion was the only significant demographic predictor of depression.

After correcting for religion, fear of acquiring the infection, financial worries and fear of being alone in the hospital and children at home were the only significant predictors of depression.

Discussion

Principal Findings: We found that most pregnant women reported high stress, anxiety and depression during the COVID-19 pandemic due to a variety of factors the leading factors were fear that someone in their family will acquire the virus, concern for the health of the baby, fear that someone close will die from COVID-19. Age and income level below the mean were also predictors of stress.

Table 6: Stepwise logistic model of high levels of depression among pregnant women, with significant univariate demographic predictors in the first step (n=251).

	First step						**Second step**					
	β	**SE**	**Wald**	**p**	**OR**	**95% CI**	**β**	**SE**	**Wald**	**p**	**OR**	**95% CI**
Religion			13.21	0.001					12.94	0.002		
Jewish	---	---			1.00	Reference	---	---			1.00	Reference
Muslim	0.598	0.393	2.32	0.13	1.82	0.84-3.93	0.879	0.427	4.24	0.04	2.41	1.04-5.56
Christian	1.162	0.325	12.76	0.001	3.20	1.69-6.05	1.262	0.351	12.94	0.001	3.53	1.78-7.03
Religiosity			2.42	0.30					---	---		
Secular					1.00	Reference						
Traditional			0.52	0.47	----	---						
Orthodox			2.07	0.15	---	---						
High risk pregnancy			2.14	0.14	---	---			---	---		
Fear of contracting covid-19							0.850	0.307	7.69	0.006	2.34	1.28-4.27
Fear of being alone in the hospital/at home							0.938	0.298	9.94	0.002	2.56	1.43-4.58
Financial worries							1.021	0.291	12.29	0.001	2.78	1.57-4.91
Afraid of contracting covid-19 in hospital							---	---	0.00	0.99	---	---
Afraid to breastfeed							---	---	2.41	0.12	---	---
Fear of health of baby							---	---	0.09	0.77	---	---
Increased risk of covid-19							---	---	0.00	0.99	---	---
Fear relative will contract covid-19							---	---	0.92	0.34	---	---

Results

During a large-scale disaster or a deep change of life, emotional responses are overwhelming. In some aspects, depression, anxiety and stress may overlap. However, these are separate entities, which demand adjusted interventions if corrective measures are considered. In the light of this view, it is of prime importance to define the main factors that act in inducing any of these three emotional states.

Overall, the group of women who responded to our questionnaire had higher level of education than the Israeli average (80% vs. 60%) [20]. This overwhelming presence of people of this higher tier of education should be considered when viewing the results. Interestingly, lower education was a predictor only for higher anxiety, but not for stress or depression. This suggests that depression and stress affect equally academically educated and less educated women.

Somewhat surprising is the fact that the systems usually serving to reduce the three emotional states, i.e. family, social and medical/social workers' support, did not seem to affect their prevalence in the studied population, neither were they predictive of the occurrence of any of the three emotional states. These unexpected results may be partially explained by the enforced distancing from extended family members and friends, as well as the inevitable estrangement created by the mask-covered faces with gloved hands that one encounters upon reaching for medical support. This becomes even more pronounced when one

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factor in the understandable stressful and worried manners of medical team members, being themselves under the risk of acquiring the infection.

In the northern part of the country during the first wave of the pandemic, very few cases were recorded and the chances of acquiring the virus for an average northern district Israeli citizen were exceptionally low. Yet, financial condition or concern about the future of the financial condition were important predictors of all three emotional states, emphasizing the central importance of economy aspects during the current pandemic, which left the country with about 20% unemployment rate. It is worth noting in this regard that the north of Israel is considered as a periphery, which historically had been hit economically worse than the central regions of the country during crisis times. Admittedly, at those initial stages of the outbreak, both information about COVID-19 and pregnancy and focused information and education by the authorities were fragmentary. This in turn put pregnant women under tremendous level of uncertainty, which could serve to increase any aspect of negative emotional response. Of all these, anxiety, by its nature, is the one which is most affected by uncertainty [21,22]. Indeed, we found that financial worries, fear of acquiring the virus and fear of being trapped alone in the hospital, all reflecting uncertainty, were the most prominent predictors of anxiety. Interestingly, religious denomination was also a predictor of anxiety, Muslims at the highest level, followed by Jews and Christians. Contrary to this, depression was more prevalent among Christians, followed by Muslims and Jews. Previous studies indeed described higher levels of depression among Arab women as compared to Jews [23-27] and crisis may strengthen this tendency.

The other element, being a predictor of all three conditions is fear of remaining alone. This may reflect both adequate response to a reality which left relatives separated due to mere chance, and a reflection of Middle Eastern cultural tendency to view oneself as just a unite of the larger entity of the whole family. This might hold true especially for women.

Clinical Implications: In future crises, like the current one, all attention should be given first to a coherent flow of information from authorities to the public and then to a conscious effort to overcome the "mask barrier", which alienates patients and serve to put them under stress.

Research Implications: Looking to the future, one must draw practical guidelines for future major crises, which according to some authorities are imminent. The points to be considered are:

1. Educations of medical and allied professions regarding the central issues, concerning pregnant women during crisis. Among these should be alleviation of uncertainty by the provision of maximum information; addressing individual concerns regarding the economic effects of the situation; advocating regarding the need for family adaptation to address the situation.
2. Drawing the required response by the network of social workers and community nurses following declaration of crisis state.
3. Preparing scripts to address those parts of the population who have an inevitable event, such as labor or major planned operation, to provide clear guidelines for behavior under the new crisis.

Future studies that we can think of can touch on the level of patients' compliance with follow-up schedule for pregnancy during the COVID-19 pandemic. An additional subject that may yield insight can be the eating habits, weight gain/loss and their reflection in newborns' characteristics.

Strengths and Limitations: The main limitation of our study lies in its reliance on the web, which is a powerful selecting force. This might be reflected in the fact that 80% of the respondents were academically educated, who are naturally more familiar with the internet. The other limitation is the size of the study, which is modest. However, considering the worries and schedules of the subjects, any level of participation is customary.

Conclusions: Our study clearly showed an enormous negative effect of the COVID-19 pandemic on emotional condition including stress, anxiety and depression on both pregnant and postpartum women. This provides an insight on the relation between economy and emotional state during uncertainty period. This effect adds a huge challenge to healthcare system and social support providers as well as the governments in providing means and solutions during pandemics and worldwide disaster.

Competing interests: All authors declare that they have no conflict of interest.

Trial registration: This study was conducted in accordance with the Helsinki Declaration and approved by the Institutional Review Board of the Nazareth Hospital (reference number: MD739), in addition to the Ethics Committee of the Yezreel Valley College (reference number: 91-2020 YVC EMEK).

Condensation: This study focused on the emotional and psychological effect of COVID-19 Pandemic on pregnant and postpartum women in Israel.

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