

## COVID-19 Risk Perception of Pregnant Women and its Relationship with their Protective Behaviors

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### Abstract

**Aim:** This study aimed to assess COVID-19 risk perception of pregnant women and its relationship with their protective behaviors. **Methods:** A descriptive-correlational design was used to conduct this study at an obstetric and gynecologic center at Mansoura University Hospitals, Egypt, involving 233 pregnant women, who were selected using the convenient sample technique. A self-administrated structured questionnaire was used to assess women's demographic characteristics, obstetrics history, COVID-19-related risk perception, and protective behaviors. **Results:** The age of the pregnant women ranged from 18- to 35 years with a mean of  $27.3 \pm 5.0$  years and nearly half (46.4%) of them were in their third trimester. Social media were a major source of COVID-19-related information (57.1%). Among the pregnant women included in this study, 37.8% were in contact with COVID-19 positive patients. Meanwhile, 78.5% had a high level of risk perception related to COVID-19 and 45.1% had a moderate level of protective behaviors. A significant positive correlation was observed between the risk perception of COVID-19 and the protective behaviors of the pregnant women under study ( $r = 0.147$ ;  $P = 0.025$ ). **Conclusion:** Most of pregnant women had a high level of risk perception and less than half of them had moderate level of protective behaviors related to COVID-19. The educational level and history of COVID-19 infection had a statistical significant predictive effect on protective behaviors against COVID-19. This study **recommended** that maternity nurses should establish virtual training classes and counseling to enhance the protective behaviors among pregnant women against COVID-19.

**Keywords:** COVID-19, Pregnant Women, Protective Behaviors, Risk Perception

### Introduction

The new Coronavirus disease 2019 (COVID-19) pandemic is a serious community health emergency related to a group of RNA viruses caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and primarily affects the respiratory system (Yuksel & Ozgor, 2020). Moreover, SARS during pregnancy is associated with an increase in the susceptibility to spontaneous abortion, preterm labor, and respiratory distress syndrome; however, the risk of vertical transmission to newborns is absent (Rasmussen et al., 2020).

Meanwhile, COVID-19 is associated with considerably serious and deadly effects, especially in vulnerable populations, including people over 60 years, immune-compromised individuals, and pregnant women and their fetuses (Yuksel & Ozgor, 2020).

Pregnancy represents a critical time of life for every woman, through each woman undergoes several physiological changes, including decreased immunity resulting in increased susceptibility to infection and severe illnesses (Fakari & Simbar, 2020; Farnoosh, et al., 2020 & Omer et al., 2020). However, knowledge of the effects of COVID-19 on

pregnancy and its complications is limited (Tuite et al., 2020 & Moquillaza, 2020); COVID-19 appears to increase the risk of fetal distress, premature rupture of the membranes, and premature labor (Liang & Acharya, 2020; Zhang et al., 2020). Additionally, COVID-19 represents one of the most stressful emotional experiences for pregnant women (Li et al., 2020).

Several studies have reported high levels of psychological distress and fears among pregnant women related to COVID-19 (Li et al., 2020; Li et al., 2020 & Li et al., 2020). Such fears are due to the worries of pregnant women about their old relatives, their children, and their unborn child being infected with COVID -19. Another reason for this fear is the strict rules by the World Health Organization (WHO) and different governments worldwide, such as border closures, transportation restrictions, curfew, social distancing, isolation, and quarantine for public safety (Corbett et al., 2020 & WHO, 2020). Accordingly, these significant changes changed the health-seeking behaviors among pregnant women, affecting their physical and psychological well-being (Corbett et al., 2020). In this context, pregnant women suffer from fears and anxieties about termination of their pregnancy and perinatal outcomes, resulting in negative effects on fetal health (Fakari & Simbar, 2020).

Risk perceptions are precursors to health-related behaviors; it is defined as the beliefs about possible harm or loss. In other words, it is the subjective judgment that people express about the severity and criteria of risks, such as injury, illness, disease, and death (Darker, 2013). Moreover, risk perception motivates people to change their healthy behavior,

and helps experts make their decision to either deal with risks or prevent those (Paek & Hove, 2017).

COVID-19 risk perception among pregnant women is a key determinant predicting their protective behaviors, encourages them to practice protective behaviors to reduce potential risks, and plays a vital role in designing strategic interventions for behavior change (Aghababaei et al., 2020). Indeed, evidence suggests that higher protective behaviors were related to a greater risk of depression, suicidal attempt, and fear from COVID-19 (Ahorsu et al. 2020). Meanwhile, the success of protective measures depends on an individual's ability to change their health behavior in response to the perceived risk, and the adoption of the necessary protective measures (Bai et al.2020).

### Significance of the study

At these hard times during COVID-19 outbreaks, monitoring risk perception, associated cofactors, and related protective behaviors among pregnant women, is a key determinant for choosing the most appropriate risk awareness strategies for pregnant women and important for medical data recording and transmitting medical information (Wong & Sam, 2011). Furthermore, pregnant women deeply need support during this critical period; thus, this conducted study contributed to understand the weaknesses that need to be improved during the epidemic, thus preventing the possible deterioration of the healthcare system in future waves. Hence, this study was designed to assess COVID-19 risk perception of pregnant women and its relationship to their protective behaviors.

## Aim of the Study

This study aimed to assess COVID-19 risk perception of pregnant women and its relationship with their protective behaviors.

## Research questions

1. What was the level of risk perception for infection with COVID-19 among pregnant women?
2. What was the level of protective behaviors related to COVID-19 among pregnant women?
3. Is there a correlation between pregnant women' risk perception and their protective behaviors?
4. What are the variables that affect pregnant women' risk perception and protective behaviors?

## Research design

A descriptive-correlational design was utilized to conduct this study; this design fits the nature of the study because it used to describe the study variables (pregnant women' COVID-19 risk perception and their protective behaviors). Also it will help to identify the relationship among the studied variables.

## Setting and sampling

A convenient sample of 233 pregnant women was chosen from an obstetric and gynecologic center at Mansoura University Hospitals, Egypt. All pregnant women coming to the outpatient center for routine antenatal checkups during the study period and those who accepted to participate were included in the study.

## Sample size

Based on data from the literature (Aghababaei et al., 2020), to calculate the sample size with precision or an absolute error of 5% and type 1 error of

5%, the following equation was used:  
sample size =  $[(Z_{1-\alpha/2})^2 \cdot P(1-P)]/d^2$ .

## Where;

- $Z_{1-\alpha/2}$  = is the standard normal variate, at 5% type 1 error ( $p < 0.05$ ) it is 1.96.
- P = the expected proportion in population based on previous studies.
- d = absolute error or precision.

So, sample size =  $[(1.96)^2 \cdot (0.938) \cdot (1 - 0.938)] / (0.031)^2 = 232.5$ , hence, based on this formula, the sample size required for the study is 233.

## Data collection tools

A self-administered structured questionnaire was developed by the researchers to fit the objectives of the study with the help of the related literature and had four parts:

- **Part I** included questions about demographic characteristics and obstetric history of the study subjects, including age, education, parity, and the number of living children.
- **Part II** used to assess the sources of information about COVID-19 among subjects and their history of COVID 19 infection.
- **Part III** was used to assess the subjects' COVID-19-related risk perception, it consisted of two parts: risk perception about themselves (5 items) and risk perception about pregnancy (11 items) (Din et al., 2020). Regarding scoring, responses were provided based on 5-point Likert scale, ranging from "zero", indicating strongly disagree, to "five", indicating strongly agree. The total score was classified as follow: scores  $\leq 50$  % were considered low risk perception, scores 50%:75% were

considered moderate risk perception, and scores  $\geq 75\%$  were considered high risk perception.

- **Part IV** was used to assess the subjects' protective behaviors related to COVID-19 (15 items); the items were developed according to the WHO protocols and study by **Aghababaei et al. (2020)**. "Yes" or no questions were used to determine the aspects of preventive behaviors including the frequency of hand washing, social distancing, and outdoor and shopping activities. Regarding scoring, one point was provided to the appropriate behavior, and zero point was provided to the inappropriate one; the total score was classified as high (75%), moderate (50% - 75%), and low ( $\leq 50\%$ ) levels.

### Validity

To validate the content of the study tools, a panel of five academic experts was contacted, and after which, some questions were added or modified to achieve the objectives of the study.

### Reliability

Cronbach's alpha values of the tools for determining the subjects' COVID-19 risk perception and COVID-19-related protective behaviors were 0.902 and 0.927, respectively.

### Pilot study

A pilot study was conducted on 24 (10%) pregnant women to ensure the feasibility and validity of the tools. Accordingly, to achieve the aim of the study, some modifications were performed such as rephrasing some statements, and changing and adding some questions. The subjects in the pilot study did not involve in the study sample.

### Field work

Official permission to conduct the study was obtained upon a letter issued from the Faculty of Nursing to responsible authorities of the study setting. The aim of the study was clarified to the pregnant women before soliciting their written informed consent. The researchers interviewed the subjects of the study in a convenient location at the study setting. The self-administered questionnaires were administered to the educated pregnant women, while the researchers conducted interviews with the illiterate women to fill the questionnaire. The time spent to fill the questionnaire with each participant ranged from 30 minutes to 40 minutes.

### Ethical considerations

Ethical approval was obtained from the Ethical Review Committee, Faculty of Nursing-Mansoura University, Egypt. The informed consent was obtained from the subjects under study.

### Statistical analysis

Statistical Package for the Social Sciences, version 20.0 (IBM Corp., Armonk, NY, USA) was used to perform all statistical analyses. Continuous data were distributed and expressed as mean  $\pm$  standard deviation (SD). Categorical data were expressed as number and percentage. To compare variables with categorical data, the chi-square test was used. Linear regression analysis was performed to explore variables that are strongly associated with the risk perception of COVID-19 and the related protective behaviors. Cronbach's alpha was calculated to assess the reliability (internal consistency) of tools for determining the risk perception of COVID-19, and COVID-19-related protective behaviors among the pregnant women. P-values of less than 0.05 were used to denote statistical significance.

## Results

**Table (1)** clarified the demographic characteristics of the studied subjects; the majority of them were married and within the 24-35 age group with a mean age of  $27.3 \pm 5.0$  years. Additionally, the table showed that more than half of them were from urban areas (55.8%) and were working mothers (55.4%).

**Table (2)** showed the obstetric history among the studied subjects; the results revealed that the mean of gestational age of the pregnant women under study was  $25.6 \pm 8.8$  weeks; less than half of them were primigravida (40.3%) and nulliparous (48.5%). Additionally, more than three-quarters of them wanted their pregnancy (76.8%) and had no previous abortion (75.5%).

**Figure (1)** illustrated that the primary source of information related to COVID-19 among the subjects under study was social media (57.1%), followed by television as a secondary source (51.5%).

**Table (3)** showed the subjects' experience with COVID-19. Less than one-quarter (23.6%) of the study subjects had been infected with COVID-19 before pregnancy whereas no subject had COVID-19 during pregnancy. Approximately 37.8% of the subjects under study had contact with COVID-19-positive patients, especially their family members (38.6%).

**Table (4)** represented that 78.5% of the studied subjects had a high level of risk perception related to COVID-19. Less than half of them strongly agreed that they were at risk to be infected with coronavirus (46.8%) and that getting COVID-19 will lead them to depression (49.4%) and endanger their life (42.9%). Moreover, less than half of the subjects

strongly agreed that the infection with COVID-19 could affect the health of their fetuses and birth outcomes, causing birth defects, premature delivery, and/or intrauterine fetal death (47.6%, 47.2%, and 45.5%, respectively).

**Table (5)** clarified that 45.1% of the subjects had a moderate level of protective behaviors related to COVID-19. Regarding the most prominent positive behavior, a high percentage of the subjects were cleaning and disinfecting items purchased from abroad, avoiding crowded places, and increased the antenatal follow-up schedule (88.4%, 87.6% & 72.1%, respectively) whereas, a low percentage of them reduced the use of public transportation, avoided hugging and kissing children or family members, and avoided eating foods prepared outside the home or in restaurants (36.5%, 45.9% & 48.9% respectively).

**Table (6)** showed a high statistically significant relation between a history of COVID-19 infection before pregnancy and the total scores of risk perception and protective behaviors among pregnant women  $p < 0.001$ .

**In Table (7)** a regression analysis was performed to identify the independent factors that may predict the risk perception of COVID-19. Data revealed that educational level and the history of COVID-19 infection were the strongest factors predicting higher scores of risk perception of COVID-19 ( $p = 0.004$  and  $p = 0.022$ , respectively).

**Table (8)** represented the regression analysis of the independent factors that may predict protective behaviors related to COVID-19. The educational level and history of COVID-19 infection were the strongest factors predicting higher scores of protective behaviors for COVID-19 ( $p$

= 0.047 and  $p = 0.030$ , respectively). Moreover, the findings revealed a significant association between the risk perception of COVID-19 and most demographic characteristics of pregnant women (i.e. age, education, occupation, and residence). Moreover, a significant association was observed between age

and protective behaviors for COVID-19 ( $p < 0.001$ ).

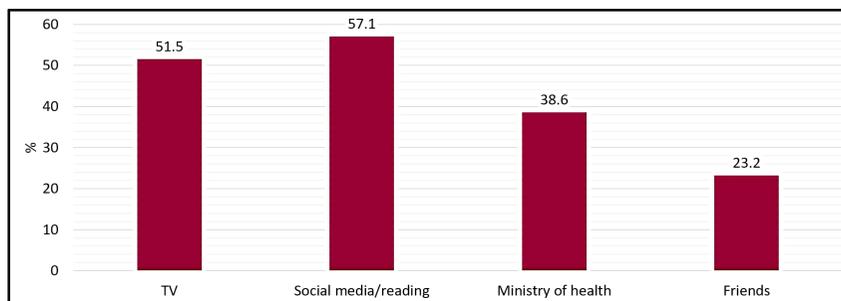
**Figure (2)** showed a statistically significant positive correlation between the subjects' risk perception related to COVID-19 and their protective behaviors ( $r = 0.147$ ;  $p = 0.025$ ).

**Table (1):** Distribution of the demographic characteristics of the studied subjects

Variables	No=233	%
<b>Age (years)</b>		
18–23	72	30.9
24–29	78	33.5
30–35	83	35.6
<b>Mean <math>\pm</math>SD</b>	<b>27.3 <math>\pm</math>5.0</b>	
<b>Educational status</b>		
Illiterate	77	33.0
Basic education	91	39.1
Higher	65	27.9
<b>Occupational status</b>		
Housewife	104	44.6
Working	129	55.4
<b>Residence</b>		
Rural	103	44.2
Urban	130	55.8
<b>Marital status</b>		
Married	210	90.1
Divorced	23	9.9

**Table (2)** Distribution of the obstetric history among the studied subjects

Variables	No=233	%
<b>Gestational age (weeks)</b>		
1–12	21	9.0
13–26	104	44.6
27 or more	108	46.4
<b>Mean <math>\pm</math>SD</b>	<b>25.6 <math>\pm</math>8.8</b>	
<b>Gravida</b>		
One	94	40.3
Two to three	91	39.1
More than three	48	20.6
<b>Para</b>		
None	113	48.5
One	44	18.9
Two or more	76	32.6
<b>Abortion</b>		
None	176	75.5
One	38	16.3
Two	19	8.2
<b>Number of children</b>		
None	101	43.3
One	47	20.2
Two	85	36.5
<b>Pregnancy status</b>		
Wanted	179	76.8
Unwanted	54	23.2



**Figure (1):** Number and frequency of the source of information related to COVID-19 of the subjects under study (multiple answers are possible)

**Table (3)** Distribution of the subjects' past experience with COVID-19

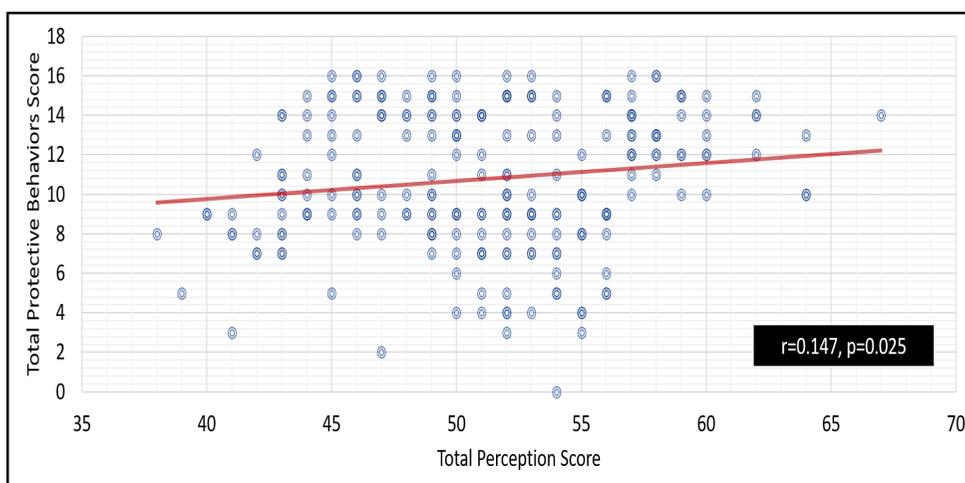
Variables	No=233	%
Had infected with COVID-19 before pregnancy?	55	23.6
Had contact with a COVID-19-positive patient?	88	37.8
If yes, how close are you with this patient? (n=88)		
Friend	22	25.0
Family members	34	38.6
Neighbor	17	19.3
Co-worker	15	17.0

**Table (4):** Distribution of risk perception related to COVID-19 among the studied subjects (n = 233)

Variables	Strongly disagree		Disagree		Uncertain		Agree		Strongly agree	
	No	%	No	%	No	%	No	%	No	%
<b>Risk perception about themselves</b>										
Do you think you have a higher risk of suffering from this disease?	12	5.2	20	8.6	21	9.0	71	30.5	109	46.8
Isolation can be imposed	27	11.6	34	14.6	34	14.6	70	30.0	68	29.2
Develop depression	13	5.6	21	9.0	19	8.2	65	27.9	115	49.4
May become critically ill	25	10.7	24	10.3	34	14.6	74	31.8	76	32.6
Endanger life to death	14	6.0	27	11.6	31	13.3	61	26.2	100	42.9
<b>Risk perception about pregnancy</b>										
COVID -19 can affect pregnancy?	21	9.0	22	9.4	28	12.0	58	24.9	104	44.6
If the mother has an infection, then COVID -19 can be transmitted to the fetus?	23	9.9	24	10.3	25	10.7	72	30.9	89	38.2
COVID -19 infection leads to premature delivery	14	6.0	22	9.4	20	8.6	67	28.8	110	47.2
COVID -19 infection leads to intrauterine growth retardation	20	8.6	20	8.6	35	15.0	58	24.9	100	42.9
COVID -19 infection leads to intrauterine fetal death	17	7.3	19	8.2	30	12.9	61	26.2	106	45.5
COVID -19 infection leads to risk for cesarean section	21	9.0	25	10.7	41	17.6	64	27.5	82	35.2
COVID -19 infection leads to postpartum hemorrhage	17	7.3	18	7.7	28	12.0	72	30.9	98	42.1
COVID -19 infection leads to nursery admission	18	7.7	20	8.6	24	10.3	70	30.0	101	43.3
COVID -19 infection leads to the fetus having a birth defect	18	7.7	17	7.3	21	9.0	66	28.3	111	47.6
COVID -19 infection leads to baby go to neonatal intensive care	21	9.0	20	8.6	32	13.7	73	31.3	87	37.3
I believe the virus can be transmitted to newborns	27	11.6	24	10.3	33	14.2	70	30.0	79	33.9
<b>Total risk perception</b>										
Low	21	9.0								
Moderate	29	12.4								
High	183	78.5								
<b>Mean ±SD</b>										

**Table (5):** Distribution of COVID-19 related protective behaviors among the studied subjects

Variables	No=233	%
1. Meeting with my family and friends was reduced.	168	72.1
2. I don't eat food prepared outside the home or in restaurants.	114	48.9
3. I canceled my visit to the hairdresser.	164	70.4
4. My utilization of public transport was reduced.	85	36.5
5. I do not go shopping.	105	45.1
6. I have kept visits to enclosed spaces such as theaters, libraries and cinemas to a minimum.	168	72.1
7. I avoid coughing around people as best I can.	143	61.4
8. I have avoided crowded places where many people have gathered.	204	87.6
9. The easily touched objects by hand were continuously cleaned and disinfected (e.g., door handles).	159	68.2
10. I wash my hands more than usual.	148	63.5
11. I prevent my children and family members from hugging and kissing.	107	45.9
12. I keep a distance between myself and others at home.	164	70.4
13. I clean and disinfect items bought abroad.	206	88.4
14. My family and I watch television shows that teach the basics of health care.	198	85.0
15. I spoke to my family and friends about prevention of the COVID-19 virus.	211	90.6
16. I increase the antenatal follow-up schedule	168	72.1
<b>Total COVID-19-related protective behaviors score</b>		
Low (<50%)	38	16.3
Moderate (50–75%)	105	45.1
High (>75%)	90	38.6
<b>Mean ± SD</b>		<b>10.8 ±3.5</b>

**Figure (2):** Correlation between the distribution of the subjects' risk perception related to COVID-19 and their protective behaviors

**Table (6):** The relation between the history of COVID-19 infection with the subjects' COVID-19 risk perception and their protective behaviors

Variables	History of COVID-19 infection				Chi square test	
	No No=178	%	Yes No=55	%	X <sup>2</sup>	p
<b>Total score for risk perception</b>						
Low	38	21.3	0	0.0		
Moderate	81	45.5	24	43.6	17.638	<0.001**
High	59	33.1	31	56.4		
<b>Total score for COVID-19-related protective behaviors</b>					58.057	<0.001**
Low	38	21.3	0	0.0		
Moderate	95	53.4	10	18.2		
High	45	25.3	45	81.8		

\*Statistically significant at  $p \leq 0.05$ , \*\* Highly statistically significant at  $p < 0.001$

**Table (7):** Linear regression analysis for variables associated with risk perception of COVID-19 among the studied subjects

Variables	Unstandardized coefficients		Standardized coefficients	t	p
	B	Stand. Error	Beta		
<b>(Constant)</b>	49.670	1.258		39.495	<0.001**
Age	0.078	0.053	0.096	1.468	0.143
Educational status	0.151	0.052	0.196	2.903	<b>0.004**</b>
Occupational status	0.188	0.097	0.127	1.939	0.054
Residence	-0.029	0.083	-0.023	-0.352	0.725
Marital status	-0.048	1.333	-0.003	-0.036	0.972
Gravida	0.708	0.531	0.142	1.334	0.184
Para	-0.095	0.608	-0.015	-0.156	0.876
Abortion	0.793	0.553	0.127	1.434	0.153
History of COVID 19 infection	0.189	0.082	0.150	2.312	<b>0.022*</b>

\*Statistically significant at  $p \leq 0.05$ , \*\*highly statistically significant at  $p < 0.001$

**Table (8):** Linear regression analysis for variables associated with protective behaviors related to COVID-19 among the studied subjects

Variables	Unstandardized coefficients		Standardized coefficients	t	p
	B	Std. Error	Beta		
<b>(Constant)</b>	9.720	1.618		6.009	< <b>0.001</b> **
Age	0.018	0.050	0.026	.364	0.716
Educational status	0.604	0.302	0.138	1.997	<b>0.047*</b>
Occupational status	0.108	0.490	0.016	0.221	0.825
Residence	-0.226	0.511	-0.032	-0.442	0.659
Marital status	-0.996	0.875	-0.086	-1.139	0.256
Gravida	-0.002	0.330	-0.001	-0.006	0.996
Para	0.353	0.378	0.090	0.932	0.352
Abortion	0.059	0.395	0.011	0.149	0.881
History of COVID 19 infection	1.225	0.562	0.150	2.182	<b>0.030*</b>

\*Statistically significant at  $p \leq 0.05$ , \*\* Highly statistically significant at  $p < 0.001$

## Discussion

This study was designed to assess the COVID-19 risk perception of pregnant women and its relationship with their protective behaviors. This aim was achieved through the findings of this study; most of the subjects under study had a high level of risk perception related to COVID-19, and less than half of them had a moderate level of protective behaviors related to COVID-19. Also, a significant positive correlation was observed between the subjects' risk perception of COVID-19 and their protective behaviors; thus, the research questions had been answered.

Regarding the pregnant women' level of risk perception and their protective behaviors, the current research findings was consistent with the results of **Din et al., (2020)**, reported that there was limited empirical evidence on the perceived

risk of pregnant females related to their health and pregnancy outcomes during the COVID-19 pandemic. Meanwhile, this study result was different from those of a study that was conducted in Iran where the majority of pregnant women had a high performance in protective behaviors and most of them had a moderate level of risk perception related to COVID-19 (**Aghababaei et al., 2020**). In disagreement with a study conducted in China has reported that pregnant women in the third trimester had a medium level of risk perception of COVID-19 (**Yue et al., 2021**). This difference may be because risk perception is a personal response based on life experiences and the degrees of risk obtained from various sources. Moreover, Pregnancy risk perception is a highly personalized matter and numerous aspects might affect the perception of pregnancy risk (**Bassetti et al., 2020**).

Regarding the risk perception of COVID-19 among the pregnant women under study, a higher percentage of the subjects under study strongly agreed that their risk of COVID-19 infection and the presence of COVID-19 lead to feelings of depression, life endangerment, and imposed isolation. This study results agreed with those of a previous study (**Din, et al., 2020**). Also, the findings of this study were congruent with those of **Lee et al., (2021)** who mentioned that many prenatal and postnatal women in China were worried that they might be infected with COVID-19. The media publish a continuous stream of news reports about COVID outbreaks including the number of cases and mortality related to the pandemic and it was a major source of information among the study subjects (**Zhong et al., 2020**). Moreover, some of the people in Egypt did not comply with protective measures. These factors may be the reasons why the risk perception of pregnant women was high in the current study.

Regarding the protective behaviors to avoid the infection with COVID-19, among the pregnant women under study, the most prominent positive behaviors were cleaning and disinfecting items purchased from abroad, avoiding closed and crowded places, increasing antenatal follow-up schedule, learning the basics knowledge about COVID-19, keeping distance from others, and continuous cleaning of door handles and surfaces. From the researchers viewpoint, the pregnant women had a tendency to change their health behaviors after they perceived a risk to avoid potential hazard of being infected with the disease, preserving their health and maintaining of family wellbeing. These findings agreed with those of the study by **Ning et al.,**

**(2020)**, reported higher levels of actions for protecting others (e.g., avoiding contact with ill people), compliance with official advice and self-protection measures such as hand hygiene, avoiding crowds, maintenance of physical health and avoiding contact with wild animals.

These study findings agreed with those of a study conducted in Egypt at Kalioubia governorate among the pregnant women which has concluded that more than three-quarters of the study group had highly satisfactory practices of hand washing and less than three-quarters of them reported practices regarding social distancing and avoidance of crowded areas after the received educational program (**Mohamed et al., 2020**). Another study reported that most pregnant women took protective measures such as wearing masks, washing their hands frequently, and staying home during the epidemic (**Yue et al., 2021**). However, these findings disagreed with **Nwafor et al. (2020)**, who found that less than one-third of participants practiced frequent hand washing with soap and water while one-fifth of them practiced social distancing of at least one meter between them and others.

Concerning the source of information on COVID-19, the subjects under study had multiple sources, and the most prominent sources were social media and television. In the same line, **Olapegba and Ayandele, (2020) & Fikadu et al., (2021)** have reported that the participants of their studies usually had their information about communicable diseases through watching televisions and the internet. In contrast, **Izhar et al., (2021)** found that more than the half of the studied subjects used WHO website as the main source of information during the

COVID-19 pandemic. Moreover, **Lee et al., (2021)** reported that the top three sources that participants got their information on COVID-19 were nurses / midwives, doctors, and television.

The current study findings showed a significant positive correlation between the risk perception of COVID-19 of the subjects and their protective behaviors. When the risk perception increased, the protective behaviors increased. In the same line, **Aghababaei et al. (2020)** have found that the level of risk perception had a significant positive correlation with protective behaviors, and the study by **Shabu et al., (2020)** conducted in Iraqi Kurdistan region has showed a weak, statistically positive, significant correlation between risk perception and protective behaviors against COVID-19. In contrast, **Aenishaenslin et al. (2015)** have reported that preventive behaviors are reduced when risk perception is high but the likelihood of success in managing it is low.

Regarding the variables associated with risk perception of COVID-19 among the pregnant women, this study result indicated that educational level, occupational status, history of COVID -19 infection, gestational age, gravidity and parity numbers, as well as the number of children had a significant predictive effect on the risk perception of COVID-19. A Lebanon study has indicated that the risk perception score of pregnant women increased when they were unemployed, had a lower educational level, had a high precaution score, and were in an advanced pregnancy stage, and a high levels of perception were unrelated to nationality, region, place of residence, complications of pregnancy, first time pregnancy, and trimester of pregnancy (**Awad et al., 2020**).

Concerning the variables associated with protective behaviors related to COVID-19 among pregnant women, the findings of this study revealed that educational level and history of COVID -19 infection were significantly strong predictors of a higher score of protective behaviors related to COVID-19. Meanwhile, the other variables either in other demographic or obstetric data did not have a significant relationship. The results among Iranian people showed a significant relationship between the variables of education and preventive behavior of COVID-19 (**Baghernezhad et al., 2021**). Another study revealed that the preventive behavior of pregnant women who had more children was better and they cared more about their children and their families than about themselves; in this way they increase their protective behavior in order to save their children (**Nwafor et al., 2020**). From researcher's viewpoint, the study results may be because the subjects had a higher level of education, which increased awareness and readiness for reading and searching for news, and much bad news around the world may affect women' risk perception.

Moreover, the linear regression analysis in the study by **Awad et al., (2020)** involving pregnant women showed that the precaution score increased when the pregnant women were healthcare providers, had a high perception score towards COVID-19, had a high knowledge level on COVID-19, and were in an advanced pregnancy stage.

A statistically significant relationship was observed between a history of COVID-19 infection before pregnancy and the subjects' total score of risk perception and their protective behaviors. This would be because there

was a relationship between individuals past experience with COVID-19 infection and their risk perception, and the followed protective behaviors. Additionally, the experience of contracting COVID-19 was fearful as stated by many studies.

With the rise in global awareness, much has been done to better understand and control COVID-19 from different perspectives. Pregnant women are a vulnerable group that needs attention, support, and care. So, this conducted study was vital to reflect the viewpoint of pregnant women and enhances more understanding of the crisis situation and how to address it.

## **Conclusion**

The results of the current study concluded that the majority of Egyptian pregnant women under the study had a high risk perception level regarding COVID-19 and less than half of them had moderate level of protective behavior regarding COVID-19. In addition, the level of education and the history of COVID-19 infection before pregnancy had a statistically significant positive effect on risk perception. Moreover, the protective behavior of the pregnant women in the study increased when the risk perception for COVID-19 increased.

## **Recommendation**

- Implementation of effective health education programs aims to improve self-protective behaviors to COVID-19 among pregnant women.
- Maternity nurses should establish virtual training classes and counseling to enhance protective behaviors

related to COVID-19 infection among the pregnant women.

### ● **Further studies:**

- Assessment of risk perception and protective behaviors related to COVID-19 among high-risk pregnant women.
- Assessment of COVID-19 vaccine acceptance among pregnant women as a protective behavior and its predictors.

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