Prevalence and Factors Affected to Covid-19 Infection among Pregnant Women in Urban Area Bangkok Metropolitan, Thailand

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Abstract

Pregnant women were the risky group for COVID-19 infection. COVID-19 infection affected the health of pregnant women as well as the fetus. This study was a cross-sectional descriptive research aimed to seek for the prevalence and factors affected to COVID-19 infection among pregnant women in urban area Bangkok Metropolitan, Thailand. Samples were 284 pregnant women who received services at the antenatal care clinics in the hospitals and public health center affiliated to Bangkok Metropolitan during July to August 2023, retrieved via stratified sampling method. Research tools consisted of questionnaires for personal information, the prevention of COVID-19 infection in pregnant women, and mindset questionnaire on the issue of COVID-19 infection and pregnancy.Data analysis was conducted using descriptive statistics and multiple logistic regression analysis.

Results showed that the prevalence of COVID-19 infection among pregnant women in urban area Bangkok Metropolitan, Thailand was equal to 52.11 percent. The factors affected to COVID-19 infection among pregnant women were having close person infected with COVID-19 (OR = 2.080; 95% CI = 1.02 - 4.23), wearing face mask (OR = 0.178; 95% CI = 0.04 - 0.77), fixed mindset (OR = 4.110; 95% CI = 2.50 - 6.75), and growth mindset (OR = 0.037; 95% CI = 0.02 - 0.09) at statistical significance level of 0.05. Research results could be the information for COVID-19 infection preventive planning in order to arrange for pregnant women care service, especially the risky group in order to prevent COVID-19 infection. Changing toward growth mindset would lower the impact on pregnant women and fetus. Moreover, it requires further planning to prevent respiratory infections in pregnant women and other groups.

Keywords: COVID-19 Infection/ Pregnant Women/ Prevalence/ Growth Mindset

Introduction

Coronavirus Disease 2019 or COVID-19 has widely spread from person to person through coughing, sneezing, or contacting with COVID-19 contaminated surfaces similar to other respiratory infections (Asadi, Tabatabaei, Safinejad, & Mohammadi, 2020). After being infected, patients may experience different symptoms from mild to severe, mostly starting from fever, coughing, phlegm, a loss of smell, tried, muscle aches, diarrhea, and breathing difficulty (Ali Khan, et al., 2020). Pregnant women are the group with high risk to experience severe symptoms when the infection takes place since the body of pregnant women experiences physiological changes in all systems during pregnancy. This causes risk toward more severe infection especially, when heart and respiratory systems being affected, it would stimulate failure in respiratory system, severe illness, and fatality (Dashraath, et al., 2020; Hammad, Beloushi, Ahmed, & Konje, 2021). The symptoms and showing symptoms are different in each person from no symptom at all to mild, and severe symptoms up to acute pneumonia or respiratory failure (de Sousa, et al., 2020). COVID-19 outbreak has resulted on large infections and fatalities with the increasing amount of new infected people. Based on data from 1June 2024, COVID-19 infections worldwide were 775,522,404 people with 7,049,617 of deceased, while the number of new infections within 7 days was 36,014 people. For Thailand, we were ranked at NO. 32 with number of COVID-19 infections in 4,779,858 people, 34,641 of deceased, the amount of new infections was 1,882 people and 16 deceased; also the number of new infections within 7 days reached the highest at the 5th rank (WHO, 2024).

Besides, during 21-27 April 2024, Thailand had new COVID-19 infection cases that received treatment in the hospitals up to 200 people per day from the former that new infection cases were around 100 people per day. The latest information from Department of disease control during 26 May – 1 June 2024 showed that new patients admitted to the hospital at the average of 266 people per day. Total number of infected people in hospital was 1,863 cases, while among them 738 were the pneumonia patients and 316 of them were the patients who required intubation (Phuworrawan, 2024). For COVID-19 infections in pregnant women, according to the information from 27 February – 5 March 2022, pregnant women and postpartum were reported with COVID-19 infections for 224 cases. The follow up information on pregnant women, postpartum women after six weeks and newborn babies since 5 March – 1 April 2022 found that pregnant women and six weeks postpartum women were infected with COVID-19 for 7,210 cases with 110 cases of fatality in which accounted to be 1.5 percent. While 4,013 newborn babies were infected with 67 cases of fatality accounted to be 1.6 percent (Wattanayingchareon, 2022). However, there was no clearly report on the amount of infected pregnant women in Bangkok.

Pregnant women experience immune system changes during pregnancy. It may cause severe reactions that affect on respiratory system since the physical changes within the chest and diaphragm position. Thus, this would lead to breathing difficulty, severe respiratory system failure after infected. Moreover, changes also found related to blood coagulation system, the increasing of thrombin could add higher risk for the occurrence of embolism (Wastnedge, et al., 2021). This was in line with statistics found that COVID-19 infected pregnant women had 2 or 3 times of higher chances to enter into ICU [intensive care unit] than people in general. They had 2.6-2.9 times of higher chances to use intubation with the chance for fatality around 1.5-8 from 1,000 people. COVID-19 infection added higher risk for premature birth at 1.5 times, infant death after birth for 2.8 times, and infant treatment in ICU at 4.9 times. The infection found in infant was at 3-5 percent since none of symptom detected; cesarean section rate was higher comparing to general group of uninfected pregnant women, thus it increased risk for the newborn baby to weight below 2,500 Gram (Piensriwatchara, 2021; Wang, Chen, & Zhang, 2022)

Research on the factors affected to COVID-19 infection among pregnant women found that pregnant women with age above 35 years old, or having chronic health conditions and complications during pregnancy such as obesity, hypertension, asthma, anemia, etc. would increase risk for COVID-19 infection and the degree of disease severity. Especially, pregnant women with more than 35 weeks of gestational age would have higher chances to experience with more severe symptoms (Tutiya, et al., 2021). Besides, the residential characteristics in urban society, many members living together, and occupations that required to meet with many people or close contact with other people, having close person infected with COVID-19 would increase the risk of COVID-19 infection in pregnant women (Liu, et al., 2020). Receiving vaccination against COVID-19 reduced the chance of infection for 66 percent (Israel, et al., 2022). Strict adherence to the preventive principles for the spread of infection, receiving news and information related to COVID-19 prevention are the key factors to prevent COVID-19 infection. Moreover, personal mindset took main part in self-care by seeking for the methods to effectively prevent the infection since it affected individual's motivation to behave and to be able to control themselves toward goals (Dweck, 2006).

Bangkok Metropolitan is the capital city of Thailand. It is an urban society where most of the people live in single family under high competitiveness, and urgent ways of living. It requires pregnant women to look after their health since those mentioned factors are the risks that could result on health and behavioral problems, quality of life, and prevention of COVID-19 infection among pregnant women. This research aimed to study on the prevalence and factors affected to COVID-19 infection among pregnant women in urban area Bangkok Metropolitan, Thailand in order to obtain useful data to plan for pregnant women care during COVID-19 outbreak or other emerging diseases in the future. This study would lead toward the expansion of theoretical knowledge into further nursing service for maternity, infant, and midwifery care.

Research Objectives

1. To study on the prevalence to COVID-19 infection in pregnant women who receive services at the hospitals affiliated to Bangkok Metropolitan.

2. To study on the factors affected COVID-19 infection in pregnant women who receive services at the hospitals affiliated to Bangkok Metropolitan.

Research Design

This was a cross-sectional descriptive research that studied on the prevalence and factors affected to COVID-19 infection in pregnant women in Bangkok Metropolitan using questionnaire to collect data from the target group which was the pregnant women who came for prenatal care at the hospitals affiliated to Bangkok Metropolitan between July and August 2023.

Research Methodology

Sample and population

The population in this research was the pregnant women who came for prenatal care at the antenatal care clinics in the hospitals and public health center affiliated to Bangkok Metropolitan. The research sample was retrieved from sample size using ready-program G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009), selected logistic regression to set Odds ratio = 1.50 with moderate effect size = 0.20, powers = 0.85, and reliability = 0.05. There were six predictive variables. The amount of sample was 280 and in order to prevent drop out, the authors collected data in five percent more accounted to be 294 samples. Stratified sampling and simple random sampling methods were applied. Inclusion criteria were 1) Pregnant women with ages above 18 years old and living in Bangkok for more than one year; 2) No complications during pregnancy; 3) No mental health problem; 4) Be able to communicate well in Thai language; and 5) Agree to participate into the project. The exclusion criterion was unable to complete the whole questionnaire.

Research Tools

Research tool was the questionnaire containing the covered content to research objectives as follows:

Part 1: Questionnaire for personal information for instance, age, marital status, residential characteristics, occupation, Body Mass Index (BMI), gestational age, chronic health conditions, and complications during pregnancy.

Part 2: Questionnaire asking about the prevention of COVID-19 infection in pregnant women such as having close person infected with COVID-19, vaccination history against COVID-19, face mask wearing, and news/information receiving about the prevention of COVID-19 infection.

Part 3: Mindset questionnaire on the issue of COVID-19 infection and pregnancy. The authors created questionnaire from the concept of Dweck and Leggett (1988) divided into two mindsets which were 1) fixed mindset; and 2) growth mindset in ten items. The characteristics of question items were in five levels of Likert scale rating from 1–5 with following criteria.

5	refers to	Your opinion conforms to the question in	Highest level
4	refers to	Your opinion conforms to the question in	High level
3	refers to	Your opinion conforms to the question in	Moderate level
2	refers to	Your opinion conforms to the question in	Low level
1	refers to	Your opinion conforms to the question in	Lowest level

For the interpretation of the average mindset scores, the opinion scores were divided into interval class according to the formula (Best, 1981)

$$\text{interval class} = \frac{\text{highest score} - \text{Lowest score}}{\text{number of class}} = \frac{5-1}{5} = 0.8$$

Dividing the range of scores into five ranges as follows:

1.00 – 1.80	refer to	Lowest
1.81 – 2.60	refer to	Low
2.61 – 3.40	refer to	Moderate
3.41 – 4.20	refer to	High
4.21 – 5.00	refer to	Highest

Quality Appraisal on Research Tools

1. Checking content validity by giving the questionnaires to five experts to check on the accuracy and consistency between the question items and Index of Item Objective Congruence: IOC. The level of opinion was set in three levels with the meaning as follows:

    1 refers to ensure that the question items conform to the objectives

    0 refers to unsure whether the question items conform to the objectives or not

  -1 refers to when confirmed that the question items have not conformed to the objectives

The opinions from five experts were brought to analyze to find out for the value of index of item-objective congruence according to the following formula.

$$IOC = \frac{\sum R}{N}$$

IOC   stands for Index of item-objective congruence

$\sum R$ stands for the sum of experts' opinion scores

N   stands for number of the experts

It was found that IOC values were between 0.67 - 1.00 in which higher than 0.50 and more than the criteria set; this indicated that the question items had content validity along with the objectives (Kittheewuttiwong, 2017).

2. Reliability was checked by bringing the questionnaire with IOC value above 0.50 to try out with 30 of pregnant women out of sample group, then analyzed data to find out for Cronbach's alpha coefficient value.

It was found that mindset questionnaire passed the criteria set at above 0.70 with reliability value of 0.89, the questionnaire contained suitable reliability quality (DeVeLiis, cited in Kittheewuttiwong, 2017).

Ethical Considerations in Research

This research project did not define the identity of questionnaire respondents. Data from the questionnaire were kept in confidential and individual information were not revealed to public. Individual information were destroyed after published the overall research results. The research project passed the examination from the Human research ethics committee, Bangkok certification no. E010hh/66.

Data Collection

1. Presenting research project to the Human Research Ethics Committee of an institute where the data were collected to request for the consideration on human research ethics.

2. After received an approval, the authors/research assistant met with head nurse of antenatal care unit and head of public health center to inform the details related to research objectives and data collection procedure and asked for cooperation in data collecting from pregnant women.

3. When sample group received service at antenatal care unit, they received normal services, then the authors/research assistant came to meet them face to face for self-introduction and explaining to them research objectives, as well as procedure and data collection methods. The authors answered to all doubts and asked for voluntary in research participation by allowed the sample with time to determine independently before signing the consent to join in the research.

4. Sample group took approximately 15-20 minutes to answer the questionnaire. Then, the authors/research assistant checked on data and answers in order to obtain complete information, while 284 complete questionnaires were returned in which accounted to be 96.60 percent.

Data Analysis

The authors analyzed data using ready statistical program as follows:

1. Descriptive statistics were used in general data analysis from sample group such as frequency, percentage, mean, and standard deviation.

2. Multiple logistic regression analysis selected variables via enter selection by presenting the values of Crude Odds Ratio (COR), Adjusted Odds Ratio (AOR), and reliability value at 95 percent (95% of confidence interval). Results interpretation from Odds Ratio (OR) in case that the value of OR was higher than 1, it meant the factor was the risky factor toward COVID-19 infection. If the value of OR was lesser than 1, it referred that the factor was the COVID-19 infection preventive factor, setting the statistical significance level at 0.05.

Research Results

General data, sample group consisted of 284 pregnant women divided into the group of 148 pregnant women (52.11 percent) with COVID-19 infected and another of 136 pregnant women (47.89 percent) without COVID-19 infection. It was found that prevalence to COVID-19 infection among pregnant women in urban area Bangkok Metropolitan was 52.11 percent. The group of pregnant women had the average age of 27.88 years old (SD = 6.72) by COVID-19 infected group (mean = 28.28, SD = 6.45) had an average age that was not different from the uninfected group (mean = 27.45, SD = 7.00). Most of pregnant women were in married status for 79.23 percent and most of them lived in private single house for 34.15 percent, second by living in rental room and commercial buildings or townhouses at 30.63 and 14.79 percent, respectively. Most of pregnant women worked for 73.24 percent. Pregnant women had an average BMI at 22.77 (SD = 4.91), while the group with COVID-19 infected (mean = 22.89, SD = 4.80) had an average BMI that was not different from the uninfected group (mean = 22.64, SD = 5.04). The average gestational age of pregnant women was at 24.52 weeks (SD = 9.35) and most of pregnant women had no chronic health conditions for 67.61 percent. Complications during pregnancy were anemia for 20.07 percent, diabetes for 8.80 percent, hypertension for 3.17 percent and others for 1.06 percent (Table 1).

Table 1 General data of pregnant women (n = 284)

General data	Total (n = 284)	COVID-19 (n = 148)	Non COVID-19 (n = 136)	p-value
age (years old); Mean (SD)	27.88 (6.72)	28.28 (6.45)	27.45 (7.00)	0.159
Marital status				0.239
Single	48 (16.90%)	30 (20.27%)	18 (13.23%)	
With partner	225 (79.23%)	112 (75.68%)	113 (83.09%)	
Separate	3 (1.06%)	2 (1.35%)	1 (0.74%)	
Divorced	2 (0.70%)	2 (1.35%)	0 (0.00%)	
Others	6 (2.11%)	2 (1.35%)	4 (2.94%)	
Residential characteristics				0.087
Private single house	97 (34.15%)	53 (35.81%)	44 (32.35%)	
Commercial buildings or townhouses	42 (14.79%)	22 (14.86%)	20 (14.71%)	
Apartment	31 (10.92%)	17 (11.49%)	14 (10.29%)	
Condominium	9 (3.17%)	2 (1.35%)	7 (5.15%)	
Rental room	87 (30.63%)	40 (27.03%)	47 (34.56%)	
Others	18 (6.34%)	14 (9.46%)	4 (2.94%)	
Occupation				0.484
Do not work	76 (26.76%)	37 (25.00%)	39 (28.68%)	
Working	208 (73.24%)	111 (75.00%)	97 (71.32%)	

| General data | Total | COVID-19 | Non COVID-19 | p-value |
	(n = 284)	(n = 148)	(n = 136)	
BMI (kg/m^2); Mean (SD)	22.77 (4.91)	22.89 (4.80)	22.64 (5.04)	0.542
Gestational age (weeks); Mean (SD)	24.52 (9.35)	24.09 (9.19)	24.99 (9.53)	0.374
Chronic health conditions				0.622
None	192 (67.61%)	102 (68.92%)	90 (66.18%)	
Have	92 (32.39%)	46 (31.08%)	46 (33.82%)	
Complications during pregnancy				
Hypertension	9 (3.17%)	4 (2.70%)	5 (3.68%)	0.741
Diabetes	25 (8.80%)	11 (7.43%)	14 (10.29%)	0.395
Anemia	57 (20.07%)	31 (20.95%)	26 (19.12%)	0.701
Others	3 (1.06%)	0 (0.00%)	3 (2.21%)	0.122

Regarding the information of COVID-19 infection prevention in pregnant women, results showed that pregnant women with close person infected with COVID-19 were 38.38 percent. The group of pregnant women infected with COVID-19 for 44.59 percent had their close person infected with COVID-19. It was more than the group of uninfected pregnant women at 31.62 percent with the statistical significance (p-value = 0.025). Most of pregnant women received vaccination against COVID-19 at 55.28 percent. Pregnant women wore face mask every time they went out for outside activities or met with people other than family members for 70.78 percent. It can be seen that the group of pregnant women infected with COVID-19 wore face mask when going out lesser than an uninfected group with statistical significance (p-value = 0.004). In addition, most of pregnant women received news/information about COVID-19 prevention for 98.24 percent (Table 2).

Table 2 Information related to COVID-19 prevention in pregnant women (n = 284)

| COVID-19 prevention | Total | COVID-19 | Non COVID-19 | p-value |
	(n = 284)	(n = 148)	(n = 136)	
Close person infected with				
COVID-19				0.025
None	175 (61.62%)	82 (55.41%)	93 (68.38%)	
Have	109 (38.38%)	66 (44.59%)	43 (31.62%)	
History of vaccination against COVID-19				0.318
No vaccination	127 (44.72%)	62 (41.89%)	65 (47.79%)	
Vaccinated	157 (55.28%)	86 (58.11%)	71 (52.21%)	
Face mask wearing				0.004
Not wearing face mask	24 (8.45%)	20 (13.51%)	4 (2.94%)	
Wearing every time	201 (70.78%)	96 (64.87%)	105 (77.21%)	
Wearing sometimes	59 (20.77%)	32 (21.62%)	27 (19.85%)	
Receiving news/information related to COVID-19 prevention				0.673
Not received	5 (1.76%)	2 (1.35%)	3 (2.21%)	

COVID-19 prevention	Total (n = 284)	COVID-19 (n = 148)	Non COVID-19 (n = 136)	p-value
Received	279 (98.24%)	146 (98.65%)	133 (97.79%)	

Regarding the mindset on the issue of COVID-19 infection and pregnancy, results showed that pregnant women had moderate level of opinion toward fixed mindset (mean = 2.69, SD = 0.84), and pregnant women had high level of opinion toward growth mindset (mean = 3.44, SD = 0.68). When comparing the mindsets of pregnant women, it was found that pregnant women uninfected with COVID-19 (mean = 2.31, SD = 0.73) had lower fixed mindset than the group infected with COVID-19 (mean = 3.04, SD = 0.78) at statistical significance (p-value < 0.001). While the group of pregnant women uninfected with COVID-19 (mean = 3.87, SD = 0.59) had higher growth mindset than the group infected with COVID-19 (mean = 3.05, SD = 0.50) at statistical significance (p-value < 0.001) (Table 3).

Table 3 Mean and standard deviation of mindset on the issue of COVID-19 infection and pregnancy

Mindset	Total (n = 284)		COVID-19 (n = 148)		Non COVID-19 (n = 136)		p-value
	Mean (SD)	Results interpretation	Mean (SD)	แปลผล	Mean (SD)	Results interpretation	
Fixed mindset	2.69 (0.84)	moderate	3.04 (0.78)	moderate	2.31 (0.73)	low	<0.001
Growth mindset	3.44 (0.68)	high	3.05 (0.50)	moderate	3.87 (0.59)	high	<0.001

According to univariable analysis, results showed that the factor of having close person infected with COVID-19 (p-value = 0.025), wearing face mask (p-value$_{every time}$ = 0.003, p-value$_{sometimes}$ = 0.018), fixed mindset (p-value < 0.001) and growth mindset (p-value < 0.001) affected COVID-19 infection in pregnant women at statistical significance. In order to confirm that these factors remain affected on COVID-19 infection in pregnant women, the factors affected COVID-19 infection in pregnant women were brought to do multivariable analysis. It was found from the results that having close person infected with COVID-19 (p-value = 0.043), wearing face mask (p-value$_{every time}$ = 0.021), fixed mindset (p-value < 0.001), and growth mindset (p-value < 0.001) affected on COVID-19 infection in pregnant women at statistical significance. This referred to that if the close person to pregnant women infected with COVID-19, pregnant women would have 2.080 times (OR = 2.080; 95% CI = 1.02 - 4.23) of higher chances to get COVID-19 infected. Wearing face mask every time when going out, pregnant women could have lesser chances to get COVID-19 infected comparing to pregnant women who did not wear face mask when going out for 0.178 times (OR = 0.178; 95% CI = 0.04 - 0.77). The higher scores of fixed mindset in pregnant women led to more chances to get COVID-19 infected for 4.110 times (OR = 4.110; 95% CI = 2.50 - 6.75). The lower scores of growth mindset in pregnant women led to higher chances to get COVID-19 infected for 0.037 times (OR = 0.037; 95% CI = 0.02 - 0.09).

The factor of having close person infected with COVID-19, wearing face mask every time going out from home, fixed mindset, and growth mindset could explain the variation by logistic regression analysis at 84.80 percent (Table 4).

Table 4 The analysis on factors affecting to COVID-19 infection in among pregnant women in urban area via logistic regression analysis (n = 284)

Factors	Univariable analysis			Multivariable analysis		
	Beta	OR (95% Cl)	p-value	Beta	Adj.OR (95% Cl)	p-value
Having close person infected						

Factors	Univariable analysis			Multivariable analysis			
	Beta	OR (95% Cl)	p-value	Beta	Adj.OR	(95% Cl)	p-value
with COVID-19							
None		1.000 (References)					
Have	0.554	1.741 (1.07 - 2.83)	0.025	0.732	2.080 4.23)	(1.02 -	0.043
History of vaccination against COVID-19							
No vaccination		1.000 (References)					
Vaccinated	0.239	1.270 (0.80 - 2.03)	0.318				
Face mask wearing							
Not wearing face mask		1.000 (References)			1.000 (References)		
Wearing every time	-1.699	0.183 (0.06 - 0.55)	0.003	-1.728	0.178 0.77)	(0.04 -	0.021
Wearing sometimes	-1.440	0.237 (0.07 - 0.78)	0.018	-1.434	0.238 1.16)	(0.05 -	0.076
Receiving news/information related to COVID-19 prevention							
Not received		1.000 (References)					
Received	0.499	1.647 (0.27 - 10.01)	0.588				
Mindset							
Fixed mindset	1.297	3.657 (2.49 - 5.38)	<0.001	1.414	4.110 6.75)	(2.50 -	<0.001
Growth mindset	-3.130	0.044 (0.02 - 0.09)	<0.001	-3.304	0.037 0.09)	(0.02 -	<0.001

Nagelkerke R^2 was equal to 0.848, Overall Percentage = 78.10

Discussion

Results from this study showed that the prevalence to COVID-19 infection among pregnant women in urban area Bangkok was as high as 52.11 percent. The factors of having close person infected with COVID-19, wearing face mask every time going out from home, fixed mindset, and growth mindset affected on COVID-19 infection among pregnant women at 84.80 percent. According to logistic regression analysis, it was found that pregnant women with close person infected with COVID-19 had higher chances to get COVID-19 infected for 2.08 times comparing to the group without close person infected with COVID-19. Since COVID-19 can spread from person via coughing, sneezing, or touching on COVID-19 contaminated surfaces. Asadi et al. (2020) and Liu, Zhang, & Zhang (2022) found that having close person infected with COVID-19 could increase the chances of infected since Coronavirus could spread from contacting to those with symptoms. Virus could spread through breathing when an infected person coughed, sneezed, or talked. It could also transmitted via skin touching or contacting to other surfaces with germs contaminated or contacting to the contaminated objects touched by the one who was infected then rub the eyes, nose or mouth.

Face mask wearing among pregnant women was the factor affected to COVID-19 infection with the statistical significance level of 0.05. Wearing face mask every time when going out from home led pregnant women to have lesser chances to get infected with COVID-19 than those pregnant women who did not wear the face mask for 0.178 times. Wearing face mask could reduce COVID-19 spreading from droplets that released when people coughed, sneezed, or

talked. It also helped reducing the chance of contacting with virus via nose and mouth or other objects that could be contaminated. This was in line with previous research in which found that wearing face mask could reduce COVID-19 infection for 50 to 70 percent (Chu, et al., 2020; Howard, et al., 2021). In line with Apanga & Kumbeni (2021), it was found that pregnant women wore face mask when acknowledged that face mask helped avoiding touch into the eyes, nose, and mouth; and could prevent COVID-19. Besides, it was defined by the Centers for Disease Control and Prevention (2021) that wearing face mask was among the key measures to reduce the chance of COVID-19 infection according to the suggestion provided by World Health Organization and many other public health agencies, including the Centers for Disease Control and Prevention in the United States. In addition, the study by Mutsaka-Makuvaza, et al. (2024) found that during COVID-19 pandemic the lack of confidence and knowledge related to the significance of face mask wearing, accessing and anxiety related to side effects, social, culture, and religious belief were the key obstacles of none face mask wearing in Zimbabwe.

Mindset was the factor affected to COVID-19 infection with statistical significance level of 0.05. The higher scores of fixed mindset in pregnant women led to more chances to get COVID-19 infected for 4.110 times and the lower scores of growth mindset resulted on higher chances to get infected with COVID-19 for 0.037 times. According to previous research, mindset was significance toward COVID-19 infection on the aspect of changing attitude or thinking method of person to aware of the significance to follow the disease control and preventive measures. Changing attitude may allow person to understand and accept the importance of the measures such as wearing face mask, social distancing, and regular hands washing to reduce chance of infection and spreading of COVID-19. Pregnant women with fixed mindset tended to hardly change their behavior, while pregnant women with growth mindset tended to see the opportunity of learning and better adapting with the situation. Pregnant women with growth mindset would seek for the ways to develop themselves and improve the environment to effectively handle with the infected situation (Bavel, et al., 2020, Van Bavel, et al., 2022).

Received vaccination against COVID-19 had no effect on COVID-19 infection (p>.05). It can be explained that vaccinated against COVID-19 was unable to reduce COVID-19 infection rate in pregnant women. This could be because number of times that each pregnant woman received vaccination against COVID-19 was varied as well as types of vaccine. Besides, belief toward vaccination against COVID-19 since it was a new vaccine that some people believed after vaccinated they had no need to protect themselves from infection. They, then did not follow COVID-19 preventive measure, or some may experience adverse reaction symptoms from vaccination and deny to receive next injection. Vaccination against COVID-19 then had not affected on COVID-19 infection. This was in line with the study by Riemersma, et al. (2021) who found that those received vaccination tended to have similar chance to get COVID-19 infected like those unvaccinated people especially, the group that did not receive vaccination in suggested amount. In addition, some of those got vaccinated, but failed to comply with COVID-19 outbreak control measure. This conformed to the study in Japan, were it was found that people in working age went out to work more after received COVID-19 vaccination (Yamamura, Kohsaka, Tsutsui & Ohtake, 2023). Together with the outbreak of new virus strains that may resist the vaccine effectiveness according to research by Schrag, et al (2022) in which found that during the outbreak of Delta strain COVID-19, those who received two shots of COVID-19 vaccination could prevent the infection up to 84 percent. During Omicron strain COVID-19 pandemic, those who received two shots of COVID-19 vaccination could prevent the infection only 42 percent, as a result COVID-19 vaccination was unable to predict COVID-19 infection at statistical significance.

Received news/information related to COVID-19 prevention had no effect on COVID-19 infected (p>.05). This could be explained as receiving news/information related to COVID-19 prevention was unable to lower the rate of COVID-19 infection in pregnant women since the information received from media or online social media may be uncertain or incorrect. It may create confusion and inability to make proper self-protection. Because sometimes medical and scientific information may be complicate or difficult to understand, pregnant women may not understand the information. It may cause inconfidence and misunderstanding on the information, behavior or personal belief that resulted on improper self-protection such as denying the accurate information about disease protection, do not practice according to the preventive measure and useful suggestions, etc. This conformed to the research by Maykrantz, Gong, Petrolino, Nobiling, & Houghton (2021) who found that reliability of the information affected on COVID-19 prevention behavior. Those who felt confidence in the information received tended to practice more accordingly with the preventive measure. Clear communication and understanding on COVID-19 prevention were crucial to stimulate COVID-19 preventive behavior in people. This showed that reliable information source was a key factor to enhance understanding and conformance practice to COVID-19 preventive measures. Besides, Hao, Anand, Wang, & Rao (2022) found that providing information

to shift the mindset could change the decision to receive COVID-19 vaccination. Having proper disease prevention mindset and behavior were the key factors to reduce the chance of COVID-19 infection in pregnant women.

Recommendations

1.   Information from this research can be used as the guidelines to handle pandemics in the future related to respiratory diseases such as planning and operation related to prevention and control on disease outbreak.

2.   Under pandemic situation, the correct understanding and reliability of data are the key factors to promote preventive behavior over disease among people. Therefore, it requires the development for clear and easy understanding communication related to the preventive measure and useful suggestions, especially, in the target group together with support and stimulation to regularly practice based on the measures. It requires developing of tools to follow up on measures compliance such as medical application or notification toward people to wear face mask.

3.   Developing policies in supporting to the conformance to disease preventive measure is crucial. It requires considering on social, cultural, and economic factors that might affect the behavior to conform to such measure for instance, supporting cost saving for face mask purchasing, or developing policy measures to enhance immunity of the target group to mitigate the risk of COVID-19 infection.

Limitations

Scope of target group: This research had to scope the target group only on pregnant women. This may reduce the ability to apply results with other groups or general population. It requires considering on the appropriateness to bring the study results to use with the group of older or other risky groups. It may also require to conduct addition research to confirm the results in those groups.

Acknowledgments:

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