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Unplanned pregnancy as a social predictor of COVID-19 severity among pregnant women in Yogyakarta: Study of path analysis

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ABSTRACT

Introduction: Pandemic Corona Virus Disease-19 (COVID-19) has passed, but social determinants severity of COVID-19 in pregnant women are still under report. Pregnant women have a higher risk of experiencing severe COVID-19 infection, with the potential for serious complications for maternal and fetal health. The impact of pregnancy planning towards severity of COVID-19 in pregnant women is still lack reported. Objective: this study conducted to determine social factors that predict COVID-19 with severe symptoms among pregnant women at *Rumah Sakit Lapangan Khusus* COVID-19 (RSLKC) in Yogyakarta Province, Indonesia.
Method: through the case-control study, 99 pregnant women who had experienced COVID-19 between August 2021 and May 2022 and were treated at RSLKC self-reporting the retrospective data. Chi square test and path analysis were used for determining the relationship and the direction on the dependent variable, respectively.
Results: severe symptoms of COVID-19 were experienced by pregnant who were not vaccinated (p=0.032), undergo daily physical work (p = 0.023) and undergo unplanned pregnancy (p=0.027). The three variables have a direct influence coefficient magnitude -2.62; 4.05; 2.12, respectively. Unplanned pregnancy is directly influenced by age ≥35 years and the number of children, with a coefficient magnitude of 2.81; -1.69, respectively.
Conclusion: Unplanned pregnancy is a potential social determinant of severe COVID-19 symptoms in pregnant women and several other factors, such as vaccine status and physical work (as direct factors), as well as age > 35 years and number of children (as indirect factors that predict unplanned pregnancy).

Keywords: COVID-19; severity; pregnant women, unplanned pregnancy, RSLKC.
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INTRODUCTION

While it was declared a global pandemic by the World Health Organization (WHO) from 2020 to 2023, Corona Virus Disease-19 (COVID-19) posed a serious threat to almost all countries in the world. Until now, there are still many studies regarding the determinants or health impacts of COVID-19, especially studies in developing countries experiencing COVID-19 cases based on domestic settings.[1-4] COVID-19 during pregnancy causes adverse maternal and perinatal outcomes.[5] Pregnant women who experience COVID-19 infection have been shown to experience increased morbidity and higher mortality, including premature birth,[6] preeclampsia,[7] neonatal morbidity, and perinatal morbidity and mortality, spontaneous abortion, LBW, neonatal asphyxia, including stillbirth,[8] where most of the increased risk of maternal death occurs in developing countries.[8] The number of deaths of pregnant women in Indonesia in 2021 reached 7,389, or equivalent to 59.69% of cases from the previous year.[9]

Many studies have been conducted regarding the impact of COVID-19 on pregnant women,[10,11] but studies on the causes of the severity of COVID-19 in pregnant women have not yet been reported. Besides clinical factors, social and human factors can also impact health,[12] including pregnant women.[13] One social determinant often a concern during the antenatal period is pregnancy planning.[14] This needs to be explicitly studied because unwanted pregnancies have dire consequences for the mother's mental state,[15] including potential complications during pregnancy.[16] Unwanted pregnancies also have a negative impact on social and economic conditions, reducing the quality of life of the mother and her family.[17] Unfortunately, there is still little research that reveals the impact of unintended pregnancy on the severity of COVID-19, even though severe COVID-19 can contribute to maternal[18]

and infant[19] deaths.

COVID-19 pandemic has an impact on increasing birth rates due to a lack of access to contraceptive services.[20] This pandemic also has an impact on the environment and social pressures, which cause an increase in the number of forced marriages, gender-based sexual violence, sexual exploitation, and a decrease in reproductive health autonomy in women, which causes a high number of pregnancies, especially unwanted pregnancies.[21]

Women are believed to have "*personal integrity*" or rights to their bodies, where every woman has the right to determine what she can and cannot do to her body.[22] This is also consistently associated with the principle of the *Pro-Choice* group, which believes that every human being has the right to determine when and whether they want to have children or not, so pregnancy planning is women's prerogative over their bodies.[23] Several previous studies have discussed the social determinants and behaviour of pregnant women in the third trimester regarding the prevention of COVID-19,[24] the behavioural determinants of transmitting COVID-19 in pregnant women[25] or the availability of pregnant women to participate in COVID-19 vaccination.[26] However, it is still rare to find studies on how pregnancy planning influences the severity of COVID-19 or not, which would be new in this study. This study provides insights for enhancing awareness regarding the importance of pregnancy planning and its impact on maternal health. Health education initiatives can be tailored to emphasize access to family planning services to reduce the risk of severe COVID-19 outcomes among pregnant women.

METHOD

Quantitative research analysis with a case-control study design on 99 suspected pregnant women diagnosed with COVID-19, who received hospitality at the *Rumah Sakit Lapangan Khusus* COVID-19 (RSLKC) Yogyakarta Special Region, Indonesia. Case-control based on the self-reported severity of symptoms from the respondent, divided into '*severe*' and '*mild or moderate*' symptoms. The population in this study includes all pregnant women diagnosed with COVID-19 in Bantul Regency, Yogyakarta, between August 2021 and May 2022. The sample consisted of 99 respondents, calculated using the method recommended by Hair et al. (1998) for multivariate analysis, which requires a minimum subject-to-independent variable ratio of 5:1. With 6 independent variables, the minimum required sample size was 90 respondents. To account for a potential 10% dropout rate, the final sample size was adjusted using the formula n' = n / (1 - L), resulting in 99 respondents. A purposive sampling technique was employed to select subjects based on inclusion and exclusion criteria, specifically pregnant women with a history of COVID-19 who were treated at the RSLKC in Yogyakarta during the study period. Subjects were taken from RSLKC medical record data. The Indonesian regulation for pregnant women's vaccination came into force on 2nd August 2021. Therefore, this study's respondents were those treated between August 2021 and May 2022.

The data obtained is self-reported by respondents via Google Form, which researchers share through the RSLKC intermediary. According to the Indonesian Ministry of Health, the questions originated from the criteria for symptoms and severity of COVID-19. Pregnant women with mental disorders who dropped out during data collection were excluded from the study. The Chi-square test is used to determine the relationship between variables. Path analysis is used to predict the direction of each independent variable towards the dependent variable. All analysis tests were carried out via Stata MP 17.0. The study was ethically approved based on the letter e-KEPK/POLKESYO/0452/V/2022.

RESULT

Table 1 shows the characteristics of respondents based on the classification of severe and mild/moderate COVID-19. Education level did not show a significant difference between the two groups (p=0.051). The group with severe COVID-19 was dominated by women who did physical work (18.4%), and non-physical workers were more often found to experience mild/moderate symptoms (96.0%) (p=0.023). Most respondents were aged 20-35, with 11.0% in the severe group and 89.0% in the mild/moderate group (p=0.261). Unplanned pregnancies were more often found to be severe (25.0%) compared to mild/moderate (75.0%) (p=0.027). The third gravida more often had a severe degree (40.0%) compared to the mild/moderate group (60.0%) (p=0.015). Most severe groups had one child (18.4%) compared to the mild/moderate group, which was more variable (p=0.006). Most respondents who had not been vaccinated experienced severe rather than mild/moderate symptoms (p=0.032). Although not significant, the mild/moderate group sunbathed more often every day (92.8%) compared to the severe group (7.2%) (p=0.064). Daily consumption of vitamins C, D, and zinc did not show significant differences between the two groups. These data indicate that occupational factors, pregnancy planning, gravida, number of children, and vaccination status may influence the severity of COVID-19 infection in pregnant women. This data is then analysed through a pathway highlighting the influence of pregnancy planning, age, number of children, type of work, and vaccination status on the severity of COVID-19 in pregnant women. This test summarizes the coefficient, standard error, confidence interval, z-value, and p-value for each variable tested.

The pathway analysis results in Table 2 show that unplanned pregnancy has a significant influence on the severity of COVID-19 in pregnant women. Planned pregnancy was caused directly by older age (β=2.806, p=0.001) and number of children (β=-1.69, p=0.004). The relationship between cause-and-effect variables is visually depicted in Figure 1.

Pathway analysis in Figure 1 shows that unplanned pregnancy significantly increases the risk of COVID-19 severity in pregnant women (logit coefficient 2.12). Pregnant women aged >35 years are more likely to experience an unplanned pregnancy (2.81), while the desire to have more children reduces the likelihood of an unplanned pregnancy (-1.69). Apart from pregnancy planning, undergo daily physical work also increases the severity of COVID-19 with a higher coefficient (4.05), and vaccination reduces the risk of severity of COVID-19 (-2.62).

Table 1. Characteristic of Respondents (Self-Reported)

Characteristic	COVID-19 Classification				P-Value
	Severe		Mild or moderate		
	N	%	n	%	
Level of education					
Primary	2	50.0	2	50.0	
Middle School	0	0.0	13	100.0	0.051
High School	5	10.6	42	89.4	
Diploma/Bachelor	3	8.8	31	91.2	
Group of age					
<20 Years Old	0	0.0	9	100.0	0.261
20-35 Years Old	9	11.0	73	89.0	
> 35 Years Old	2	25.0	6	75.0	
Daily work					
Physical Work	9	18.4	40	81.6	0.023
Non-physical Work	2	4.0	48	96.0	
Pregnancy planning					
Planned Pregnancy	6	7.6	73	92.4	0.027
Unplanned Pregnancy	5	25.0	15	75.0	
Gravida					
First	3	5.7	50	94.3	
Second	4	12.1	29	87.9	0.015
Third	4	40.0	6	60.0	
Fourth or more	0	0.0	3	100.0	
Number of Children					
0	0	0.0	43	100.0	
1	9	18.4	40	81.6	0.006
2	2	40.0	3	60.0	
3 or more	0	0.0	2	100.0	
Vaccine status					
Not yet vaccinated	9	10.0	81	90.0	0.032
First dose	0	0.0	5	100.0	
Second dose	2	50.0	2	50.0	
Behavior during COVID-19 exposure					
Sunbathing everyday	5	7.2	64	92.8	0.064
Non sunbathing everyday	6	20.0	24	80.0	
Consume daily Vitamin C 1000mg	8	10.8	66	89.2	0.870
Not consume daily Vitamin C 1000mg	3	12.0	22	88.0	
Consume daily Vitamin D 400 IU	10	12.8	68	87.2	0.297
Not consume daily Vitamin D 400 IU	1	4.8	20	95.2	
Consume daily Zinc Supplementation	9	11.8	67	88.2	0.674
Not consume daily Zinc supplementation	2	8.7	21	91.3	

Table 2. Pathway Analysis

Pathway	Coefficient (β)	Std err	95% Conf. Interval		z	P Value
Unplanned Pregnancy						
>35 Years Old	2.806776	.8571825	1.12673	4.486823	3.27	0.001
Number of Children	-1.69562	.5942791	-2.860385	-.5308539	-2.85	0.004
_cons	-2.791846	1.359044	-5.455523	-.1281688	-2.05	0.040
Severe COVID-19						
Unplanned Pregnancy	2.126136	.8089314	.5406594	3.711612	2.63	0,000
Physical Work	4.053217	1.763988	.5958638	7.510571	2.30	0,001
Vaccine Status	-2.62387	1.011974	-4.607302	-.6404376	-2.59	0,089
_cons	-0.0189033	.6727071	-1.337385	1.299578	-0.03	0,742

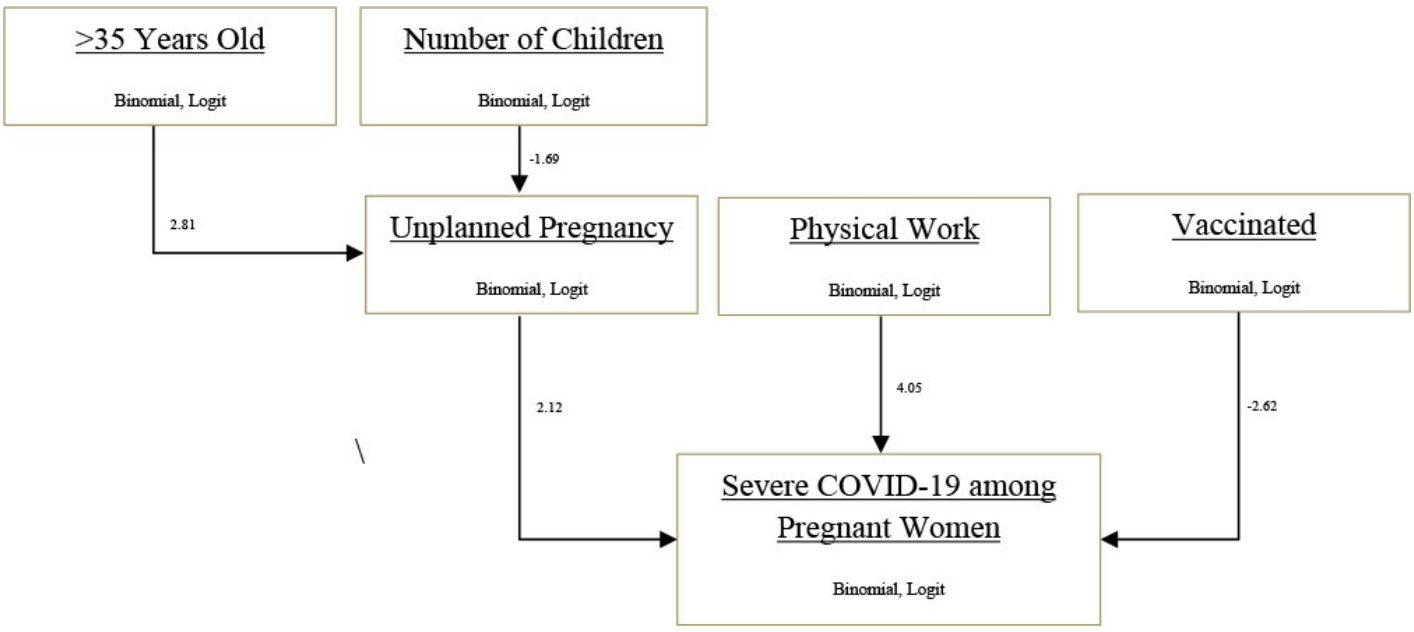

Figure 1. Pathway Analysis Unplanned Pregnancy as Social Determinant of COVID-19 Severity among Pregant Women.

DISCUSSION

Based on research results. It is known that an unplanned pregnancy significantly increases the risk of severe COVID-19 in pregnant women. An unplanned pregnancy is caused directly by age. Pregnant women aged >35 years are more likely to experience an unplanned pregnancy. Previous studies have suggested that the older a woman is, the higher their chances of experiencing an unwanted pregnancy. Another study explains that the 35–39-year age group has 0.712 times the risk of experiencing an unwanted pregnancy compared to those in the 15-19 years age group.[27]

According to Andini and Mutahar, women over 35 years old have risky pregnancies and are susceptible to complications during pregnancy and childbirth.[28] Other findings explain that the ideal age for pregnancy is between 20-35 years. However, the difference is insignificant, so health service improvements are needed. This improvement could take the form of education regarding the risks of planning a pregnancy for women of childbearing age who are less than 20 years old and more than 35 years old. Apart from that, the desire to have more children is a factor that reduces the incidence of unplanned pregnancy. This is because high maternal parity will increase her experience and knowledge, thereby reducing the incidence of unplanned pregnancies.[29]

These unplanned pregnancies contribute to the severity of COVID-19 infections. According to the research results, it was found that pregnant women with unplanned pregnancies had a higher proportion of severe symptoms (25.0%) compared to those whose pregnancies were planned (7.6%), and this was proven by the p-value of 0.027, which shows this difference is significantly statistics. Stress factors and lack of access to health services likely cause this difference. An unplanned pregnancy can cause higher emotional and psychological stress in pregnant women. Chronic stress can weaken the immune system and make individuals more susceptible to viral infections, including COVID-19. Then, pregnant women with unplanned pregnancies may have lower access to prenatal and postnatal health services, so they may not receive optimal care for COVID-19.[30] Unfortunately, there are not many related studies that explain the severity of COVID-19 directly in pregnant women with unplanned pregnancies, so further research is needed.

Based on research, most pregnant women with non-physical work were more often found to experience mild/moderate symptoms of COVID-19 (96.0%) (p=0.023). These findings suggest that type of employment may be an essential risk factor for the severity of COVID-19 in women. Non-physical work such as implementing Work from Home (WFH) during COVID-19. Xiao et al. found that transitioning from work to WFH reduces physical and mental health.[31] Contributing indirect factors include decreased physical activity,[31,32] changes in eating patterns,[33] family dynamics and higher workloads,[31,34] and poor ergonomics in homework spaces.[31,34] These factors are related to the impact of non-physical work and influence pregnant women to experience levels of COVID-19 infection with mild/moderate symptoms.[31] Further research is needed to understand the impact of non-physical work on pregnant women in the long term.

Meanwhile, the group with severe COVID-19 is dominated by women who do physical work (18.4%) because physical work has a higher risk of exposure to the virus, physical stress and fatigue, which can weaken the immune system and make women more susceptible to complications. The study found that work activities that involve lifting heavy weights, standing for long periods, and heavy physical workloads can increase the risk of pregnancy complications, such as lifting weights of more than 11 kg per time, which is associated with an increased risk of miscarriage and preeclampsia. Standing for more than 3 hours per day increases the risk of preterm labour by 10%. These findings are important as a

basis for the importance of consultation with working pregnant women regarding the management of their prenatal health risks[35]. There are vaccination factors that reduce the risk of severity of COVID-19. Vaccination provides benefits during pregnancy to prevent maternal morbidity and mortality or provide passive immunity to the baby. Moreover, COVID-19 vaccination is safe during pregnancy. Pregnant women are recommended to receive the COVID-19 vaccine.

This study provides new insights into the social determinants of COVID-19 severity among pregnant women, highlighting the impact of unplanned pregnancies—an aspect that has not been widely explored in previous studies. Our study identifies socio-behavioural contributors such as pregnancy planning, age, and number of children as significant predictors. It is recommended to enhance the awareness of this novelty through community empowerment activities, due to its necessary for mitigation the impact of severe COVID-19 among pregnant women. Moreover, our findings suggest an intervention aimed at family planning education and workplace adjustments for pregnant women, so it could further reduce the risks associated with COVID-19 severity.

This research emphasizes the role of social determinants, especially unplanned pregnancies, in combating COVID-19 severity among pregnant women. This novel highlights the need for interdisciplinary approaches that incorporate community, social, behavioural, and medical interventions to enhance maternal health resilience in such pandemic situations. This research collected data retrospectively through self-reported questionnaires distributed online to respondents. This approach is prone to information bias, such as recall bias and social bias (answers adjusted to social expectations). The study only involved 99 respondents from one COVID-19 referral hospital in Yogyakarta Province. This limits the generalizability of the results to a wider population, both geographically and demographically.

CONCLUSION

Women who experience unplanned pregnancies if they experience COVID-19 have the potential to experience more severe COVID-19 compared to women with planned pregnancies. Unplanned pregnancies are more common in women aged >35 years and women with fewer children. The type of work and vaccination status can also influence the severity of COVID-19 in pregnant women. This finding highlights the need to fulfill women's reproductive rights to access contraceptive services, which can be catalysed through community empowerment to increase awareness about the need for access to contraceptive services in the community.

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All authors involved in this manuscript have approved it for publication. Ethical Considerations: This research was conducted in accordance with a protocol that has been reviewed and approved by KEPK Poltekkes Kemenkes Yogyakarta Indonesia with number e-KEPK/POLKESYO/0452/V/2022. Written informed consent was obtained from all subjects in this study.

CONFLICT OF INTERESTS

This project has no conflict of interest.

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AUTHOR CONTRIBUTION

First author take contribution in finding the idea, writing the proposal, collecting data, and finishing the manuscript and coordinating other authors. The second authors take roles in quality control of the manuscript from the determination of the research question until the completion of data collection. The third author collaborated with the first author to rewriting the background by current conditions. The fourth and fifth author collaborated with the first author in organizing the discussion.

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