Factors associated with having COVID-19 among unvaccinated pregnant and non-pregnant women in Metro Manila, Philippines: a multicentre longitudinal cohort study

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ABSTRACT

Objective To determine the potential risk factors associated with having COVID-19 among unvaccinated pregnant and non-pregnant women.

Design A multicentre prospective cohort study among eligible women in Metro Manila, Philippines, from 2020 to 2022.

Setting Five national and local hospital research sites altogether recruited and screened 500 consenting eligible individuals.

Participants Pregnant and non-pregnant participants meeting the eligibility criteria were admitted for a reverse-transcription PCR determination of SARS-CoV-2, pregnancy testing and ultrasound, and an interview with an administered questionnaire.

Exposures Primary exposure was pregnancy; secondary exposures involved sociodemographic, lifestyle and obstetric-gynaecologic factors.

Outcome measure Outcome being measured was COVID-19 status.

Results The significant COVID-19 risk factors were: pregnancy (PR=1.184, 95% CI 1.096, 1.279), having a white-collar job (PR=1.123, 95% CI 1.02, 1.235), travelling abroad (PR=1.369, 95% CI 1.083, 1.173) and being infected by at least one vaccine-preventable disease (VPD) (PR=1.208, 95% CI 1.113, 1.310). Protective factors included having graduate-level education (PR=0.787, 95% CI 0.649, 0.954), immunisation against a VPD (PR=0.795, 95% CI 0.733, 0.862) and practising contraception (PR=0.889, 95% CI 0.824, 0.960).

Conclusion This study is the first in the country to determine the risks influencing COVID-19 infection among unvaccinated pregnant and non-pregnant women. Pregnancy is a significant risk for COVID-19 among women in Metro Manila. Educational attainment and positive health behaviours seem to confer protection.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This article provides the first Philippine multicentre study in public hospitals in the National Capital Region to serve as a baseline for the determination of risk factors of COVID-19 in women that incorporates in the analysis the pre-existing conditions and pressures experienced by Filipino women as a driving force behind COVID-19 risk.

⇒ The study was conducted during the unpredictable height of the pandemic which may have introduced variability in the collection of exposed respondents, owing to the duration of the study which spanned six surges with three different prevailing variants, and pre-existing burdens of healthcare which may have caused consistently few enrolments.

⇒ Further studies with an emphasis on the longitudinal nature of the disease throughout the gestation period to determine the differential progression of the disease in terms of gestational development may supplement the methodological approaches of the study.

INTRODUCTION

Background

The rapid transmission of SARS-CoV-2 caused cases of COVID-19 to rise in many countries...
since it was first reported in Wuhan, China, in December 2019. By the time WHO declared it a pandemic, significant repercussions were already observed in worldwide social and economic life. The multifaceted nature of this pandemic gives rise to concerns about identifying relevant risk factors, especially for the vulnerable and under-represented groups. Men have higher mortality risks when infected, but women may have higher risks of worse health outcomes and less healthcare access due to pre-existing socioeconomic gaps exacerbated by the pandemic. At par or greater risks are pregnant women and their unborn; both susceptible to infection due to their weakened immune system. However, these findings are largely dominated by white/Caucasian populations resulting in the under-representation of other races and ethnic minorities. Evidence of sex-based and pregnancy-based differences in COVID-19 vulnerability indicates a need to determine the relevant sociodemographic, lifestyle and obstetric-gynaecologic (Ob-Gyn) risk factors, especially in the Philippine context.

Two years have passed since the pandemic started, with several variants emerging such as the Alpha, Beta, Delta and Omicron, that resulted in several surges that took the lives of millions. In the Philippines, the Delta variant dominated COVID-19 cases in 2021 while the Omicron variant dominated in 2022 despite the numerous variants circulating in the country, genomic sequencing of COVID-19 variants remains limited and not part of routine case reporting of the Department of Health (DOH). Regardless of this limitation, there are limited studies that identified the common risks attributed to COVID-19 infection in the local population, especially with unvaccinated pregnant women and their unborn. Furthermore, studies on the matter are yet to incorporate the intersectionality of pre-existing socioeconomic pressures on women which may compound the risk determination for the disease.

Objective
This study aimed to identify the risk factors associated with COVID-19 in unvaccinated pregnant and non-pregnant women in five hospitals in the City of Manila, Philippines. More specifically, this explored the sociodemographic and lifestyle factors that potentially predisposed women to COVID-19 infection.

METHODS
Study design and setting
This study is part of a comprehensive prospective multicentre cohort study protocol to determine the risk factors, clinical manifestations, progression and maternal-neonatal outcomes of COVID-19 vertical transmission among pregnant and non-pregnant women in Metro Manila. Specific details on the procedures can be found in the said protocol.

Target population and eligibility criteria
Women at least 18 years old regardless of pregnancy status who consulted among the five public hospital research sites under DOH or the Manila City Government, ranging from 30 November 2020 to 31 March 2022. Included are women who will consult for any medical or Ob-Gyn condition at the departments of internal medicine, Ob-Gyn emergency room and labour or delivery rooms without any uterine or adnexal lesions which would influence the course of the disease. Excluded are those who are less than 18 years old, who cannot or are not able to provide informed consent, who cannot commit to the length of time of the study, who will not deliver in any of the five hospital sites or those with malignant or congenital reproductive tract abnormalities or infection as seen on ultrasound. Incidental findings were referred to appropriate subspecialty services. All study participants meeting the inclusion criteria were admitted to the study following a thorough briefing and with their written and continuing consent. Respondents were informed of their right to withdraw at any time without fear of compromising medical care and were encouraged to state their reasons for documentation.

Sample size calculation, handling of bias and non-response
A two-sided 95% CI with an 80% power and a ratio of 1, and a least extreme OR to be detected at around 2.0, the computed sample size was 576. To accommodate a 10% non-response rate, the final sample size was 640, of which 320 were to be pregnant, and which were proportionately allocated to the hospital sites. The hospital sites were selected because they have the highest capacities of public healthcare institutions and were anticipated to admit individuals representing the target population. Pregnant women were all invited regardless of age of gestation, provided they met the inclusion criteria, to comprehensively capture information about COVID-19 at all developmental stages of pregnancy. The duration of the study has exposed the population to at least three prevailing COVID-19 variants and their corresponding surges. However, as DOH has not made genomic surveillance routine operation on identification of cases, and that during the height of the pandemic, such operations were beyond the capacity of the study, further stratification of respondents according to SARS-CoV-2 strain was not carried out. The researchers were cognisant of the differing virulence and progressions of these strains. However, more pressing was the need to determine the common denominator of predisposing risks and protective factors to the local population.

Sampling and data collection
The Research Institute of Tropical Medicine processed the collected samples using reverse-transcription PCR (RT-PCR) for diagnosis and analyses of unconventional samples. Laboratory determination of SARS-CoV-2 and pregnancy status were carried out after collection of samples from the participants. They were also given a validated self-administered structured COVID-19 infection in adults questionnaire adapted from the New South Wales Department of Health. The questionnaire will profile
the sociodemographic, lifestyle, Ob-Gyn, medical history and pregnancy-related characteristics of each participant.

Patient and public involvement
Patients and (or) the public were not involved in the design.

Outcome and exposures
Outcome measurement was COVID-19 status, which is confirmed from the RT-PCR test. Primary exposure was pregnancy status, determined from pregnancy test and (or) ultrasound. Secondary exposures were sociodemographic, lifestyle and Ob-Gyn factors, as will be discussed in later sections.

Statistical analysis
The data are expressed as the summation of all respondents that exhibited either infected or uninfected outcomes throughout the entire study duration as the prevalence period. Quantitative variables (ie, age, income) were categorised following the protocol for this study. Descriptive statistics profiled the sociodemographic, lifestyle and Ob-Gyn characteristics of pregnant and non-pregnant cohorts. The crude prevalence ratio (cPR) and the corresponding 95% CI were calculated after regressing a bivariable generalised linear model using a Poisson distribution with robust variance correction and a log link function between the characteristics as predictors, and COVID-19 status as the outcome. This model was the best option to minimise the overestimation of the true prevalence ratio among other alternatives. The same regression model was used to create adjusted prevalence ratios (aPRs) and to determine which among the characteristics are better risk indicators of COVID-19 susceptibility among the women in the study.

RESULTS
Five hundred respondents were included from the five hospitals throughout the study period. Of them, 267 (53.5%) were pregnant. Among pregnant women, the median age of gestation was 39 weeks (Quartile Deviation=1 week), with the most recent being 16 weeks and the oldest being 40 weeks and 5 days. After omitting missing observations in the variables of interest, only 352 (70.4%) cases remained for regression analyses and calculation of prevalence ratios. Most participants were lost to follow-up, particularly during delivery, when most of them preferred to deliver out of the hospital research sites. Online supplemental table 1 shows the sociodemographic and lifestyle characteristics of the respondents. Most respondents tested negative for COVID-19 during the study, which is also consistent for pregnant (29.4%) and non-pregnant (24.0%) cohorts. More than half of all respondents reside in Manila City (n=269, 54.3%) and were admitted to DOH partner hospitals, which are among the highest capacity tertiary institutions in the country. Furthermore, most respondents live in households, are Catholic, have never smoked nor drank alcoholic beverages, have not consumed illicit drugs, have an O blood type or have never left the country during the pandemic. Among pregnant respondents, the majority were younger, high school graduates, unemployed, single, making less than US$90.91 (PHP5000) per month, not practising contraception, have been infected or immunised against at least one vaccine-preventable disease (VPD), have been twice pregnant at most or with up to two viable pregnancies.

Table 1 shows the cPRs and aPRs for potential risk factors of COVID-19. Significant risk factors among unvaccinated women include being pregnant, white-collar worker, having been infected with at least one VPD and leaving the country during the pandemic. Protective factors are having graduate-level education, practising contraception and being immunised for at least one VPD. Blood type does not seem to be a significant predictor of COVID-19 among women, as well as gravidity, parity, smoking history and alcohol use.

DISCUSSION
This is the first multicentre study in the country to address relevant gaps in the literature by elucidating the systemic inequities and circumstances that contextualise the differential risks in sociodemographic, lifestyle and Ob-Gyn factors between pregnant and non-pregnant women during the early pandemic when vaccines were still unavailable. Further research with consideration of the temporal interaction of the disease with pregnancy is suggested in view of the cumulative nature of this cohort study. This study found that risk factors for unvaccinated women include pregnancy, white-collar jobs, overseas travel and VPD history. Protective factors, on the other hand, include graduate school education, immunisation against VPD and contraception practice.

Population profile in this present study reveals that pregnant women are younger, single, unemployed or hold unstable jobs, or make lesser monthly income. Before the pandemic, there were already fewer women in the Philippine labour force in 2015. Filipinas also had a higher incidence of vulnerable employment like self-employment and unpaid home duties, often associated with insufficient income and unsafe working conditions. Prevailing conservative gender roles also translate to women usually being housemakers, even as the Philippines ranks first in gender equality among Asian countries in 2022. This cultural practice relegates women from the job market, causing insecure, lower income employment with lesser bargaining power in most national economies. Pregnancy compounds these intersecting inequities due to behavioural tendencies to take lesser risks even in decisions that may benefit their physical or financial well-being. Multivariable analysis and risk determination found that COVID-19-positive women may more likely present as pregnant, white-collar workers, have had at least one VPD infection or have travelled outside the country during the pandemic.
# Table 1  Crude prevalence ratio (cPR) and adjusted prevalence ratio (aPR) with 95% CIs for associations between COVID-19 and covariates

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total, n=352</th>
<th>COVID-19 negative, n=220</th>
<th>COVID-19 positive, n=132</th>
<th>cPR (95% CI)</th>
<th>aPR (95% CI)</th>
</tr>
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<tbody>
<tr>
<td><strong>Obstetric-gynaecologic factors</strong></td>
<td></td>
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<tr>
<td>Pregnancy status</td>
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<tr>
<td>Non-pregnant</td>
<td>120 (34.1)</td>
<td>85 (24.1)</td>
<td>35 (9.9)</td>
<td>1.000</td>
<td>1.000</td>
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<tr>
<td>Pregnant</td>
<td>232 (65.9)</td>
<td>135 (38.4)</td>
<td>97 (27.6)</td>
<td>1.149 (1.063, 1.242)*</td>
<td>1.184 (1.096, 1.279)*</td>
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<tr>
<td>Gravidity</td>
<td></td>
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<tr>
<td>Two at most</td>
<td>225 (63.9)</td>
<td>142 (40.3)</td>
<td>83 (23.6)</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>At least three</td>
<td>127 (36.1)</td>
<td>78 (22.2)</td>
<td>49 (13.9)</td>
<td>1.012 (0.938, 1.093)</td>
<td>1.075 (0.975, 1.185)</td>
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<td>Parity</td>
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<tr>
<td>Two at most</td>
<td>270 (76.7)</td>
<td>165 (46.9)</td>
<td>105 (29.8)</td>
<td>1.000</td>
<td>1.000</td>
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<tr>
<td>At least three</td>
<td>82 (23.3)</td>
<td>55 (15.6)</td>
<td>27 (7.7)</td>
<td>0.957 (0.877, 1.044)</td>
<td>0.934 (0.842, 1.036)</td>
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<td><strong>Sociodemographic factors</strong></td>
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<tr>
<td>Age</td>
<td></td>
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<td></td>
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<tr>
<td>18–30</td>
<td>189 (53.7)</td>
<td>118 (33.5)</td>
<td>71 (20.2)</td>
<td>1.000</td>
<td>1.000</td>
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<tr>
<td>31–48</td>
<td>140 (39.8)</td>
<td>87 (24.7)</td>
<td>53 (15.1)</td>
<td>1.002 (0.928, 1.082)</td>
<td>0.968 (0.896, 1.045)</td>
</tr>
<tr>
<td>&gt;49</td>
<td>23 (6.5)</td>
<td>15 (4.3)</td>
<td>8 (2.3)</td>
<td>0.980 (0.841, 1.142)</td>
<td>0.999 (0.857, 1.163)</td>
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<tr>
<td>Resides in Manila</td>
<td></td>
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<tr>
<td>No</td>
<td>175 (51.0)</td>
<td>128 (36.4)</td>
<td>48 (13.6)</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Yes</td>
<td>168 (48.9)</td>
<td>92 (26.1)</td>
<td>84 (23.9)</td>
<td>1.161 (1.080, 1.247)*</td>
<td>1.055 (0.990, 1.123)</td>
</tr>
<tr>
<td>Educational attainment</td>
<td></td>
<td></td>
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<tr>
<td>Elementary</td>
<td>16 (4.5)</td>
<td>9 (2.6)</td>
<td>7 (1.9)</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>High school</td>
<td>171 (48.6)</td>
<td>110 (31.3)</td>
<td>61 (17.3)</td>
<td>0.944 (0.791, 1.127)</td>
<td>0.917 (0.807, 1.043)</td>
</tr>
<tr>
<td>College</td>
<td>143 (40.6)</td>
<td>83 (23.6)</td>
<td>60 (17.0)</td>
<td>0.988 (0.826, 1.180)</td>
<td>0.927 (0.809, 1.063)</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>19 (5.4)</td>
<td>16 (4.5)</td>
<td>3 (0.9)</td>
<td>0.805 (0.646, 1.004)</td>
<td>0.787 (0.649, 0.954)*</td>
</tr>
<tr>
<td>Vocational†</td>
<td>3 (0.9)</td>
<td>2 (0.6)</td>
<td>1 (0.3)</td>
<td>0.928 (0.601, 1.432)</td>
<td>0.798 (0.62, 1.027)</td>
</tr>
<tr>
<td>Type of occupation‡</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Unemployed/unstable</td>
<td>243 (69.0)</td>
<td>160 (45.5)</td>
<td>83 (23.6)</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Blue-collar job</td>
<td>25 (7.1)</td>
<td>14 (3.9)</td>
<td>11 (3.1)</td>
<td>1.073 (0.931, 1.237)</td>
<td>1.02 (0.889, 1.169)</td>
</tr>
<tr>
<td>White-collar job</td>
<td>84 (23.9)</td>
<td>46 (13.1)</td>
<td>38 (10.8)</td>
<td>1.083 (0.994, 1.179)</td>
<td>1.123 (1.02, 1.235)*</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Single</td>
<td>207 (58.8)</td>
<td>133 (37.8)</td>
<td>74 (21.0)</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Married</td>
<td>126 (35.8)</td>
<td>73 (20.7)</td>
<td>53 (15.1)</td>
<td>1.047 (0.969, 1.131)</td>
<td>1.057 (0.979, 1.142)</td>
</tr>
<tr>
<td>Cohabiting</td>
<td>15 (4.3)</td>
<td>12 (3.4)</td>
<td>12 (0.9)</td>
<td>0.884 (0.742, 1.053)</td>
<td>0.906 (0.759, 1.082)</td>
</tr>
<tr>
<td>Widowed</td>
<td>4 (1.1)</td>
<td>2 (0.6)</td>
<td>2 (0.6)</td>
<td>1.105 (0.794, 1.537)</td>
<td>0.990 (0.610, 1.606)</td>
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<tr>
<td>Religion</td>
<td></td>
<td></td>
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<tr>
<td>Catholic</td>
<td>324 (92.0)</td>
<td>202 (57.4)</td>
<td>122 (34.7)</td>
<td>1.000</td>
<td>1.000</td>
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<tr>
<td>Protestant</td>
<td>5 (1.4)</td>
<td>2 (0.6)</td>
<td>3 (0.9)</td>
<td>1.162 (0.886, 1.524)</td>
<td>1.193 (0.913, 1.558)</td>
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<tr>
<td>Muslim</td>
<td>9 (2.6)</td>
<td>6 (1.7)</td>
<td>3 (0.9)</td>
<td>0.969 (0.766, 1.224)</td>
<td>1.056 (0.896, 1.244)</td>
</tr>
<tr>
<td>Others</td>
<td>14 (3.9)</td>
<td>10 (2.8)</td>
<td>4 (1.1)</td>
<td>0.934 (0.774, 1.127)</td>
<td>0.982 (0.841, 1.147)</td>
</tr>
<tr>
<td>Socioeconomic status</td>
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<tr>
<td>Less than US$90.91 (PHP5000)</td>
<td>198 (56.3)</td>
<td>136 (38.6)</td>
<td>62 (17.6)</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>US$90.91–US$363.62 (PHP5000–PHP20 000)</td>
<td>101 (28.7)</td>
<td>54 (15.3)</td>
<td>47 (13.4)</td>
<td>1.116 (1.027, 1.212)*</td>
<td>1.060 (0.985, 1.141)</td>
</tr>
<tr>
<td>Above US$363.62 (PHP20 000)</td>
<td>53 (15.1)</td>
<td>30 (8.5)</td>
<td>23 (6.5)</td>
<td>1.092 (0.983, 1.213)</td>
<td>1.048 (0.935, 1.174)</td>
</tr>
</tbody>
</table>

Continued
Pregnancy, as a risk factor, supports other studies’ findings which have variously been attributed to a more vulnerable immune constitution during gestation. COVID-19-positive women had higher rates of intensive care unit (ICU) admission, intubation, ICU hospitalisation and preterm birth than their non-pregnant counterparts, according to cohort studies conducted in the USA. Moreover, pregnant women with COVID-19 are more likely to be hospitalised and given moderate ventilation. On the other hand, white-collar workers being at higher risk may be explained by the general nature of their occupations in healthcare, essential bureaucracy as part of a skeleton workforce and similar jobs that result in increased interaction with suspect cases of the disease. Healthcare workers are at high risk of contracting COVID-19 due to contact with patients with the disease, with nurses and non-emergency wards personnel being the most commonly infected although mostly asymptomatic. For this reason, it is also rational, as other studies found to varying significance, to expect international travel as a risk factor for COVID-19 infection and its consequent spread. Returning travellers and pilgrims have been found to trigger COVID-19 outbreaks in various countries. Having a history of VPD infection as a risk is a novel finding that warrants further research. The researchers hypothesise that the social and environmental influences that led to a prior VPD infection may have been the same conditions that caused COVID-19 transmission, especially among the densely populated shanty towns of Manila City with poor sanitation systems and ventilation.

Characteristics | Total, n=352 | COVID-19 negative, n=220 | COVID-19 positive, n=132 | cPR (95% CI) | aPR (95% CI)
---|---|---|---|---|---
Using contraception
No | 282 (80.1) | 166 (47.2) | 116 (32.9) | 1.000 | 1.000
Yes | 70 (19.9) | 54 (15.3) | 16 (4.5) | 0.870 (0.796, 0.952)* | 0.889 (0.824, 0.960)*
Smoking history
Never smoker | 337 (95.7) | 209 (59.4) | 128 (36.4) | 1.000 | 1.000
Ever smoker | 15 (4.3) | 11 (3.1) | 4 (1.1) | 0.918 (0.766, 1.100) | 1.124 (0.955, 1.324)
Alcohol use
Never alcoholic | 301 (85.5) | 185 (52.6) | 116 (32.9) | 1.000 | 1.000
Ever alcoholic | 51 (14.5) | 35 (9.9) | 16 (4.5) | 0.948 (0.854, 1.053) | 1.002 (0.909, 1.104)
Immunised VPD>1
No | 219 (62.2) | 103 (29.3) | 116 (32.9) | 1.000 | 1.000
Yes | 133 (37.8) | 117 (33.2) | 16 (4.4) | 0.732 (0.686, 0.782)* | 0.795 (0.733, 0.862)*
History of VPD>1
No | 238 (67.6) | 181 (51.4) | 57 (16.2) | 1.000 | 1.000
Yes | 114 (32.4) | 39 (11.1) | 75 (21.3) | 1.338 (1.249, 1.432)* | 1.208 (1.113, 1.310)*
Blood type
A | 82 (23.3) | 58 (16.5) | 24 (6.8) | 1.000 | 1.000
B | 68 (19.3) | 42 (11.9) | 26 (7.4) | 1.069 (0.955, 1.197) | 1.047 (0.958, 1.146)
O | 181 (51.4) | 106 (30.1) | 75 (21.3) | 1.094 (0.998, 1.199) | 1.028 (0.958, 1.103)
AB | 21 (5.9) | 14 (3.9) | 7 (1.9) | 1.031 (0.871, 1.222) | 0.967 (0.837, 1.117)
Travel history
No | 349 (99.1) | 220 (62.5) | 129 (36.6) | 1.000 | 1.000
Yes | 3 (0.9) | 0 (0.0) | 3 (0.9) | 1.460 (1.407, 1.515)* | 1.369 (1.083, 1.173)*

*Significant at p<0.05.
†Vocational education refers to the short course for semiskilled or skilled technical-vocational programmes and certifications offered by the Technical Education and Skills Development Authority (TESDA).
‡As per the International Labour Organization, blue-collar workers are those whose jobs are mostly unskilled, semiskilled or skilled manual work in various trades, equipment operation and maintenance. White-collar workers are those whose jobs involve non-manual office, clerical, sales, semitechnical, professional or supervisory activities.
VPD, vaccine-preventable disease.
education in forming informed decisions among individuals. Higher educated people are more likely to follow protective measures against COVID-19 such as using disinfectants and wearing masks in contrast to lower educated people, who are less likely to adapt social distancing, increase hand washing and disinfection and avoid gatherings, meetings and personal contact.\textsuperscript{23} Subsequently, contraception also lowers the risk of COVID-19 presumably due to the positive health outcomes inherent in the behaviour that could have translated into COVID-19 safe practices. People who practise safe sex through contraceptives consider COVID-19 exposure as part of the risky sexual behaviour which they are conditioned to refrain from.\textsuperscript{24} Furthermore, some studies suggest that higher or physiological oestrogen levels, especially during consumption of combined hormonal contraceptives, confer a humoral immune-reactive response by inducing higher antibody levels.\textsuperscript{25,26}

While this study provides information about the risk and protective factors in women in the Philippines, the limitations of this study pose restrictions to the external validity of the results. First, since data collection was performed during the early pandemic, the population are yet to be vaccinated. Second, genomic surveillance is not routinely done by DOH and therefore unavailable for analysis. Because of this, this study only focuses on identifying predisposing factors of COVID-19 infection regardless of variants. Second, the longitudinal progression of the disease associated with the stage of pregnancy was not addressed since the study is time limited. Lastly, there is no baseline characterisation of the local population yet as of conducting this study. Because of this, the external validity of this study only includes unvaccinated women in the Philippines exposed to dominant variants at the time of data collection.

**CONCLUSION**

Pregnancy is a significant risk factor for COVID-19 infection among women, as is being a white-collar worker, being infected by at least one VPD and travelling outside the country during the pandemic. On the other hand, protective factors include graduate-level education, practising contraception and being immunised for at least one VPD.

Our findings are useful in providing baseline findings on the characteristics that exacerbate and relieve the susceptibility of unvaccinated Filipinas to COVID-19. This will inform the development of public health response and vaccination efforts with consideration to vulnerable populations, including pregnant women. Further investigations as to the clinical manifestations, maternal and neonatal outcomes and the possibility of vertical transmission of COVID-19 are recommended.

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**Acknowledgements** The authors thank the following: Research Institute of Tropical Medicine—Dr Celia Carlos; Manila City Officials headed by former Mayor Francisco “Isko Moreno” Domagoso; Office of the Mayor Honourable Honey Lacuna-Pangan; the Manila City Councilors headed by Counsellor Joel Chua; and Manila City Health Department Staff—Dr Arnold Pangan, Dr Gina Pardilla and Dr Rosalina R Tan, and other public health staff. Our gratitude to the administrators, resident physicians and medical officers in cooperating in the endeavour. Much appreciation to Ms Kyla Javier and the research staff, as well as the staff of the project site hospitals, and all participants who contributed to this multicentre COVID-19 and women study for the Philippines.

**Contributors** EL-C is the principal investigator, guarantor, and first author of this study who gave instrumental contributions to the concept, research design and methodology including the implementation and management of this study. EL-C is also responsible for the overall content, access to data, and decisions over the publication of this paper. FMH, ESB, METU-V, MSFC, MUL and PJBR-U assisted in specific components of the study. LCC-C, EV, CASC, LBHE, CUA, MLDA, CPDM, PNWS, JBB, VdDg, RBC, ARD and ALR implemented the research methodology and provided practical insights and discussion which were considered in the study. ESB, JFF and EL-C conducted statistical data analyses and interpretation. JFF and EL-C drafted the article and visualisation, and provided contextual interpretations into the study findings. All have critically revised and approved the final version of the manuscript.

**Funding** This study was made possible by grants from the Australian Awards and Alumni Engagement Program, Department of Science and Technology-Philippine Council for Health Research and Development (DOST-PCHRD) and the Philippine Obstetrical and Gynecological Society (POGS).

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Obtained.

**Ethics approval** This study involves human participants and was approved by the Department of Health Single Joint Research Ethics Board (DOH-SJREB) Protocol Code 2020-30) and the University of the Philippines Manila Research Ethics Board (UPMREB Code 2020-0320-01-SJREB). Participants gave informed consent to participate in the study before taking part.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available upon reasonable request.

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