# Prevailing divergent views regarding COVID-19 vaccine among Divine Word University students and implications for countering SARS-CoV-2 in Papua New Guinea

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## Abstract

Current exponential increase in COVID-19 cases signals an impending health catastrophe in Papua New Guinea (PNG). This study assessed views of students at Divine Word University (DWU) regarding COVID-19 vaccines and generated discussions that inform health policy and future vaccine roll-out program for the control of SARS-CoV-2 in PNG. An electronic survey was conducted using the Moodle online platform for teaching and learning. Data was exported to Microsoft Excel file and descriptive statistics and chi-square tests performed. Reasons for supporting or opposing vaccines were grouped under their respective headings.

Of the 90 participants, 62.2% (n=56) opposed vaccination, 60.0% (n=54) were unwilling to receive vaccine and 58.9% (n=53) refused recommending vaccine to others. Although observable difference in responses were seen between groups compared, those differences (except for 'signal of end times' between church groups, p=0.02) were not statistically significant. Fear of the unknown, including adverse effects, was common among those who opposed vaccines and protection from infection, was the most frequent response among those who supported.

Radically divergent views exist about COVID-19 vaccine among study participants. These views reflect the divide in opinions about COVID-19 vaccine in PNG. Combining scientific facts with doubt-based reasoning to correct and allay misleading information and uncertainties about COVID-19 vaccine may lead to greater acceptance of vaccination in the fight against SARS-CoV-2 in PNG.

**Keywords:** COVID-19, Vaccine acceptance, Vaccine hesitancy

## Introduction

In little over a year since its detection in Wuhan City (China) in December 2019, the novel corona virus (SARS-CoV-2) has infected nearly 123 million people and caused over 2.7 million deaths around the world (WHO, 2021). Not only did the virus infect and cause the demise of millions of people in a short space of time, it also caused nationwide lockdowns and brought families to the brink of poverty as businesses closed and jobs were lost (Whitehead et. al., 2021). Given that there is no cure, vaccines may be the best hope against this deadly respiratory virus (World Bank, 2021). However, there are concerns and doubts about possible adverse effects, and the efficacy of the vaccine that could hinder vaccination campaigns and impede the current efforts to counter SARS-CoV-2 or COVID-19 (Abbasi, 2021; Sallam, 2021; Yin et. al., 2021; Lazarus et. al., 2021; Chou et. al., 2020; Johnson et. al., 2020).

The Oxford-AstraZeneca vaccine roll out was suspended in sixteen countries of the European Union following reports of blood-clotting among those vaccinated (Mahase, 2021). Although 37 blood-clotting reports among 17 million vaccinations (estimated ratio 1: 459460) appear to be insignificant compared to the public health benefits of rolling out the vaccine, including that of preventing community transmissions of the virus and lifting travel restrictions (and all it entails), the suspension was still responsible for causing fear and refusal among the public and those who were to be inoculated with the AstraZeneca vaccine (Mahase, 2021; WHO, 2021). Fear of such adverse events and fear of the many unknowns around this new and rapidly evolving pandemic should be assessed and addressed amicably in the race against time to control COVID-19.

Vaccines are important for two main reasons: infection prevention among those vaccinated and 'herd immunity' in preventing infection among the unvaccinated; both of which contribute to controlling epidemics of vaccine-preventable diseases (Andre et. al., 2008). From the phenomenal effort of vaccine developers, SARS-CoV-2 vaccines have become available in record time, and with help from World Health Organization (WHO), countries around the world are increasing vaccination of the populace. Some 500 million shots of COVID-19 vaccine have so far been given and Israel and Saudi Arabia are leading in the number of people being vaccinated ("501 Million Shots," 2021; "COVID-19 vaccine," 2021). Signs of control of COVID-19 has started appearing in Israel and those other countries who have gone ahead with vaccination (Schraer, 2021; "Israel provides," 2021; "Israel," 2021).

Papua New Guinea (PNG), a low-middle income country north of Australia, has unique and often very difficult challenges that may frustrate any COVID-19 vaccination program ("About Papua New Guinea," 2021). There are over 800 different ethnic groups and some 85% of the population live in rural and often isolated remote villages with limited access to information including that about infectious diseases or pandemics ("About Papua New Guinea," 2021). In addition, some 40% of the adult population are unable to read, implying that the extend of reach of written health promotion messages would be limited ("About Papua New Guinea," 2021; UNESCO, 2020). Further, there are convincingly crafted theories about the world ending or human population control mechanisms that are circulating especially in social media, that invoke unrealistic perspectives (Ahearn, 2021). From these challenges, it is understandable that many citizens of the country will have misconceptions about COVID-19 and about the vaccines that authorities in PNG are eager to source and distribute in the country (Mola, 2021; "Kramer to take vaccine," 2021; Seymour, 2021).

Despite some improvements since political independence in 1975, the country's health system has generally been in decline (Grundy, et. al., 2019). There is a significant shortage of human resources for health in remote and rural communities that limit access to basic health services. In addition, drug and medical supplies and functioning equipment are severely limited (Grundy et. al., 2019). Although the testing rate in PNG is among the lowest in the world, 363 new cases were detected in a single day on 01 April 2021, indicating widespread community transmission (PNG Joint Agency Task Force, 2021). If left to its natural progression, COVID-19 appears to be a foe that may overwhelm and collapse the health system (Choudhury & Koulouris, 2021).

Working without adequate protective gear, a good proportion of the health workers at PNG's national referral hospital in Port Moresby have become infected and were self-isolating or seeking treatment themselves, while the sudden increase in COVID-19 patients stretches the already depleted capacity of the hospital ("Kramer to take vaccine," 2021; Choudhury & Koulouris, 2021; "PNG forced to wait," 2021). This is a typical scenario in the major health facilities across the country. It appears that as health workers become ill from COVID-19, the increasing number of COVID-19 patients will soon have nowhere to find help. Mass vaccination may be that ray of hope for this crisis unfolding in PNG and in order for this to be successful it is critical that any misconceptions regarding COVID-19 vaccines among the people are assessed and documented.

This research was therefore conducted to assess the prevailing views around COVID-19 vaccine, including some of the misconceptions that exist, in the lead-up to a COVID-19 vaccination program in PNG. Divine Word University students represent a class of citizens of PNG who, being university students, with access to internet and information and communication technology, are expected to be 'informed' about COVID-19, its modes of transmission and methods of prevention, including vaccines. They are also expected to be aware of the benefits of vaccination and any side effects that may be associated with particular vaccines. In this paper, we provide the study results showing divergent views regarding COVID-19 vaccine and offer policy guiding suggestions for countering the spread of SARS-CoV-2 in PNG.

## Methodology

### Setting

#### *Papua New Guinea*

PNG shares its southern and eastern border with Australia and Indonesia respectively. An estimated 8.776 million people were living in PNG in 2019 ("Population," 2021). There are four geographical regions (Southern, Highlands, Momase and New Guinea Islands) and twenty-two administrative provinces. Christianity is the main religion, although Christian and traditional religious beliefs are often held together (Trompf, 1991). Although the vast majority of people (some 85%) live in rural areas, the rate of migration to towns and cities is quite high, so that there is rise in urban population and increase in peri-urban and rural settlements (Kora, 2017). There are seven universities operating in the country: University of Papua New Guinea, University of Technology, Divine Word University, Pacific Adventist University, University of Goroka, University of National Resources and Environment and Western Pacific University ("Demand for higher education," 2021).

#### *Divine Word University*

Divine Word University main campus is located in Madang, an expanding town along the northern coastline of mainland PNG. Approximately 1800 students from all over PNG and the neighboring Solomon Islands attend classes at this campus of the Catholic church run university. Most students reside on campus in dormitories and have meals served at the student mess. Students vacate the campus at the end of academic year in December and new and continuing students return after the holiday period. There are four Faculties: Medicine and Health Sciences, Business and Informatics, Arts and Social Sciences and Education. Using high-speed internet and a dedicated team of specialists in Internet and Communication Technology, Divine Word University is one of the leading universities in online teaching and learning in PNG (DWU teaching staff, 2020).

### Study participants

Participants in this study were male and female students of Divine Word University enrolled into the 2021 Academic year. Successfully enrolled students of the university are expected to be of good physical and mental health given that they would have been screened medically before admission into the academic programs. Further, the participants having achieved university admission are expected to have reasonable or higher level of skills in the use of computer and online programs that enabled them to participate in this online study (DWU teaching staff, 2020).

### Research design

This cross-sectional study is designed to assess prevalence of views (including of misconceptions) on COVID 19 vaccines. An online survey was devised on Moodle (an online platform for teaching and learning) (Moodle, 2021). Link to the survey was placed in the Moodle page for Biostatistics and Research Methods, a subject in the Bachelor of Health Science (Rural Health) program. A notice about this study and where to access the study link was placed on notice boards around the university. Students willing to participate 'self-enrolled' into the Moodle page, clicked on the link provided and completed the survey. Only fully registered students of Divine Word University had access to the survey link and only one attempt was allowed per Moodle user, in other words, multiple attempts per user were disallowed.

From informal conversations heard outside of the classroom, there seemed a likelihood that many of the students held strong views against COVID-19 vaccination in PNG. Our online survey was an attempt to test that hypothesis.

### Sampling and sample size

Convenience non-probability sampling was applied. Although randomization was preferred, the circumstances around student movements into campus and commencement of academic activities at the beginning of the academic year made 'convenience' sampling the best method to assemble the required study sample. Using 50% estimated prevalence (of strong views against vaccine), 95% confidence interval, and 10 precisions, the minimum sample size for the study was 97 (Büttner & Muller, 2011).

### Data collection and management

A structured questionnaire containing 'closed-ended' and 'open-ended' questions was generated. The survey on Moodle was created using 'Add an activity or resource' and 'Feedback' functions, and information in the structured questionnaire was transferred onto this online survey system. The opening page provided information about the study, instructions on how to take the survey and ethical considerations, including students' consent to participate.

The first question in the survey was about 'consent to participate' with 'yes/no' options. The next questions were about demographic details including age, gender, region of origin and religion, and particulars of the student's position at the university such as course taken and year of study. This was followed by a question on 'main source of information' and questions about vaccines including views and beliefs around COVID-19 vaccine. At the end of the survey, space was provided for phone numbers and date. A K5 (US$1.00) phone credit was sent (using phone-to-phone transfer) to the phone numbers as a gesture of appreciation and good will.

Link to the survey was opened or made visible to DWU student Moodle users on 10 March 2021 and closed on 29 March 2021. Survey data in Moodle was exported and saved as Microsoft Excel Workbook file. This file was saved on multiple password-protected devices and uploaded to the lead author's outlook and Gmail accounts. The 'sort and filter' function on Microsoft Excel program was used to check and clean the data for analysis.

### Data analysis

Frequencies were calculated for categorical variables. Mean and standard deviation were calculated for the age variable. Chi-square tests were applied (using 'R' statistical software) in testing for association between categorical variables. A p value less than 0.05 was taken as significant. Explanations provided to 'open-ended' questions were grouped under their respective headings and labelled as 'box 1', 'box 2', 'box 3'and 'box 4'. In this paper, we will show 'box 1' as 'Box 1'.

### Ethics

This study was granted ethical clearance (number FRC/MHS/08-21) by the Faculty Research Committee of the Faculty of Medicine and Health Sciences, Divine Word University. Ethical considerations were also strictly followed. Participants were provided with information about the study and given the option to participate at their own free will and at their own space and time, using their university-issued laptops or personal touch-screen phones. Gate-keeper permission was also granted by the President of Divine Word University.

## Results

### Demographic characteristics

A total of 90 young-adult students participated in this study. All participants were single and 53.3% (n=48) were females. Average age was 22.1 (+-2 SD) years (min = 19 years, max =28 years). Most (56.7%, n=51) students were in year three of their study. From the four regions of PNG there were more

participants from Highlands (40.0%, n=36) and Momase (35.6%, n=32) compared to New Guinea Islands (NGI) (14.4%, n=13) and Southern (10.0%, n=9) regions. Students from rural and urban areas constituted 45.6% (n=41) and 54.4% (n=49) respectively. Catholic church membership was indicated by 26.7%(n=24), while 21.1%(n=19) were of Seventh Day Adventist faith and 52.2%(47) indicated other Christian denominations including Lutheran, Baptist, Assemblies of God, Evangelical Brotherhood, South Seas Evangelical and Revival Centers International. Most (76.7%, n=69) students were using social media as their main source of information (See Table 1).

**Responses to questions on COVID-19 and its vaccine**

Figure 1 shows the responses to questions on COVID-19 and its vaccine. Majority (62.2%) of the study participants opposed (n=38) or were uncertain (n=18) about whether COVID-19 vaccine was good for PNG. Similarly, most (60.0%) were unwilling (n=41) and uncertain (n=13) about receiving the vaccine. In addition, over half (53.3%) were not in agreement (n=35) and were unsure (n=13) about recommending the vaccine to others. Of interest, a little over half (n=47) of those sampled supported the view that COVID-19 disease was signaling the end of times and that some two-fifths indicated that the virus was made purposely to harm humanity (n=39), although a good number of respondents were uncertain (signaling end times n=30, harm humanity n=32). (See Figure 1).

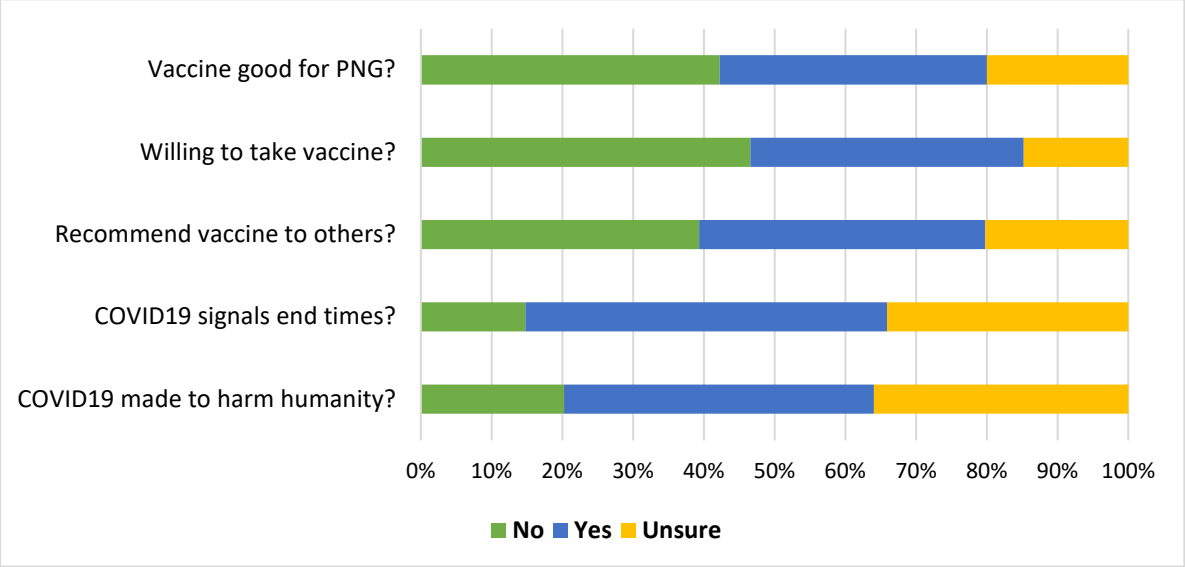


***Figure 1 Responses to questions COVID-19 disease and vaccine***

Table 1 compares differences between groups in the responses provided. There was little difference between males and females in the frequency of responses except for responses to 'COVID-19 signals end of times' question. More males (61.9%) were in agreement with this statement compared to females (43.8%). However, that difference was not statistically significant, $p$=0.09. Another observable but statistically insignificant difference was in the 'Region of origin' variable. Southern (33.3%) and NGI (30.8%) respondents were less supportive regarding whether COVID-19 disease was signaling end of times, compared to Highlands (66.7%) and Momase (50.0%), although this difference was also not statistically significant. The only statistically significant difference was observed between Church groups and 'COVID-19 signals End times' variable. It showed that more SDA respondents were positive about COVID-19 signaling End Times compared to respondents from Catholic and other Christian denominations (p=0.02). Interestingly, there was not much difference in the responses provided between those who indicated 'social media' and 'mainstream media' as their main source of information (See Table 1).

| | | Vaccine good for PNG? | | | Willing to take vaccine? | | | Recommend vaccine to others? | | | COVID-19 signals End Times? | | | COVID-19 made to harm humanity? | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Total** | **Yes** % (n) | **No** %(n) | ***p*** | **Yes** % (n) | **No** %(n) | ***p*** | **Yes** %(n) | **No** %(n) | ***p*** | **Yes** %(n) | **No** % (n) | ***p*** | **Yes** %(n) | **No** %(n) | ***p*** |
| **Gender** | | | | | | | | | | | | | | | | |
| Female | **48** | 35.4(17) | 64.6(31) | 0.62 | 37.5(18) | 62.5(30) | 0.60 | 41.7(20) | 58.3(28) | 0.91 | 43.8(21) | 56.2(27) | 0.08 | 39.6(19) | 60.4(29) | 0.32 |
| Male | **42** | 40.5(17) | 59.5(25) | | 42.9(18) | 57.1(24) | | 40.5(17) | 59.5(25) | | 61.9(26) | 38.1(16) | | 50.0(21) | 50.0(21) | |
| **Year level** | | | | | | | | | | | | | | | | |
| One | **9** | 33.3(3) | 66.7(6) | 0.73 | 33.3(3) | 66.7(6) | 0.70 | 44.4(4) | 55.6(5) | 0.91 | 55.6(5) | 44.4(4) | 0.67 | 33.3(3) | 66.7(6) | 0.32 |
| Two | **23** | 43.5(10) | 56.5(13) | | 52.2(12) | 47.8(11) | | 43.5(10) | 56.5(13) | | 52.2 (12) | 47.8(11) | | 34.8(8) | 65.2(15) | |
| Three | **51** | 37.3(19) | 62.7(32) | | 39.2(20) | 60.8(31) | | 41.2(21) | 58.8(30) | | 47.1(24) | 52.9 (27) | | 47.1(24) | 52.9(27) | |
| Four | **7** | 57.1(4) | 42.9(3) | | 42.9(3) | 57.1(4) | | 28.6(2) | 71.4(5) | | 71.4(5) | 28.6 (2) | | 71.4(5) | 28.6(2) | |
| **Region of Origin** | | | | | | | | | | | | | | | | |
| Southern | **9** | 44.4(4) | 55.6(5) | 0.77 | 55.6(5) | 44.4(4) | 0.79 | 55.6(5) | 44.4(4) | 0.27 | 33.3(3) | 66.7(6) | 0.08 | 22.2(2) | 77.8(7) | 0.27 |
| NGI | **13** | 46.2(6) | 53.8(7) | | 38.5(5) | 61.5(8) | | 53.8(7) | 46.2(6) | | 30.8(4) | 69.2(9) | | 38.5(5) | 61.5(8) | |
| Highlands | **36** | 36.1(13) | 63.9(23) | | 38.9(14) | 61.1(22) | | 61.1(22) | 38.9(14) | | 66.7(24) | 33.3(12) | | 41.7(15) | 58.3(21) | |
| Momase | **32** | 31.3(10) | 68.7(22) | | 37.5(12) | 62.5(20) | | 37.5(12) | 62.5(20) | | 50.0(16) | 50.0(16) | | 56.3(18) | 43.8(14) | |
| **Residing location** | | | | | | | | | | | | | | | | |
| Urban | **49** | 40.8(20) | 59.2(29) | 0.51 | 40.8(20) | 59.2(29) | 0.86 | 44.9(22) | 55.1 (27) | 0.42 | 53.1(26) | 6.9(23) | 0.86 | 44.9(22) | 55.1(27) | 0.92 |
| Rural | **41** | 34.1(14) | 65.9(27) | | 39.0(16) | 61.0(25) | | 36.6(15) | 63.4(26) | | 51.2(21) | 48.8(20) | | 43.9(18) | 56.1(23) | |
| **Church group** | | | | | | | | | | | | | | | | |
| Catholic | **24** | 33.3(8) | 66.7(16) | 0.84 | 41.7(10) | 58.3(14) | 0.70 | 45.8(11) | 54.2(13) | 0.61 | 37.5(9) | 62.5(15) | 0.02 | 41.7(10) | 58.3(14) | 0.93 |
| SDA | **19** | 42.1(8) | 57.9(11) | | 31.6(6) | 68.4(13) | | 31.6(6) | 68.4(13) | | 78.9(15) | 21.1(4) | | 47.4(9) | 52.6(10) | |
| Others | **47** | 38.3(18) | 61.7(29) | | 72.5(20) | 57.4(27) | | 42.5(20) | 57.5(27) | | 48.9(23) | 51.1(24) | | 44.7(21) | 55.3(26) | |
| **Main information Source** | | | | | | | | | | | | | | | | |
| Social media | **69** | 39.1(27) | 60.9(42) | 0.63 | 43.5(30) | 56.5(39) | 0.22 | 42.0(29) | 58.0(40) | 0.75 | 50.7(35) | 42.3(34) | 0.61 | 42.0(29) | 58.0(40) | 0.40 |
| MStream media | **21** | 33.3 (7) | 66.7(14) | | 28.6(6) | 71.4(15) | | 38.1(8) | 61.9(13) | | 57.1(12) | 42.9(9) | | 52.4(11) | 47.6(10) | |

***Table 1 Views on COVID-19 vs Demographic characteristic***

**Reasons provided for choices on COVID-19 Vaccine**

Box 1 shows the reasons provided for the choices participants made regarding COVID-19 vaccine. Dominant themes among the reasons against COVID-19 vaccine comprised 'fear' of the unknown including of side effects, 'suspicions', especially in the way the vaccines were developed (in record time), and 'confidence' in the body and immune system or natural remedies fighting off the infection. Themes that stood out among reasons supporting vaccination included 'protection' from the virus, including reducing risk of developing severe disease, 'boosting' of the immune system to deal with the infectious virus and prevention of spread of the virus (See Box 1).

***Response to why participants will not receive vaccine***

- *No, because all over social media I hear and see that people who were tested positive for COVID- 19 seems to recover themselves. They say it is our immune system that does that. But I think it might be something else and not our immune system.*
- *From my understanding any drug that is to be used as treatment to treat sickness has to undergo several lab testing and must be approved by the recognized authorities before it is released for use, and it takes much longer time. Unlike the other drugs COVID-19 vaccine was created within the period of pandemic which I think will still have some side effect sooner or later.*
- *I would not be vaccinated as this is a new vaccine. I do not know what kind of reactions my body will have to it.*
- *I need to see the proof and evidence that the vaccine will protect me from COVID-19, sometimes the virus contained in the vaccination was not completely disarmed and instead of it acting like a seal, it causes the actual infection.*
- *Being unsure makes me scared, how am I supposed to just go and present myself to a vaccine I have no idea about.*
- *I will not be vaccinated until and unless I know the facts of the vaccine itself.*

- *I would get good information about the vaccine before going to the clinic.*
- *No, because I don't trust the vaccine and don't know what it will do to my body.*
- *Because I think if I take this vaccine, it may have some negative impact to my body system.*
- *I would not go for vaccination because I haven't heard of or shown any laboratory reports on the matter. Test results should be published nationwide to accommodate acceptance of the drug through public awareness.*
- *No because as individual I have to make a critical decision and say no because there are lots of viral going on the social media regarding the vaccination that it is really a trap. So again I would say no and wait and see and study the effects that would be brought by it.*
- *Because due to what I have said earlier, I would not want to just get vaccinated unless I was tested positive.*
- *Because other countries have not tested the vaccine and they want us the Papua New Guineans to be the first to be tested we are not sure if it is really going to work and protect us from COVID-19 and it might have its side effects too.*
- *Seeing other Nations present disadvantages about the vaccination is enough reason to not want to get vaccinated.*
- *Because COVID-19 (is) a disease with 90% recovery rate. I'm healthy I do not need a vaccine.*
- *Because there are no proper documents for the vaccine provided and I don't know what side effects the vaccine might produce.*
- *No, because I cannot get vaccinated if I am not tested positive of the virus and also there will be some side effects when getting the vaccine. In order to (be) on the safe side if someone tested positive (he/she) should/must get vaccinated.*
- *No, I wouldn't present myself to be vaccinated unless it was approved by the World Health Organization and Papua New Guinea Institute of Medical Research.*
- *Because I don't know the side effect of the vaccine. Every vaccine and drugs have advantages and disadvantages of side effect that we have to consider before taking. And vaccine and drugs normally takes some years to be approved by seeing their side effects and the trials. But for this vaccine, it's just like a blink of an eye meaning it took just few months to be approved which I don't know if they test and do some trial or not. Therefore, I will not present myself to be vaccinated.*
- *Because I believe that this vaccine will harm my body according to the movies that I watched.*
- *My answer would be No for this as an individual. Since this vaccine was made so fast and now it is approved and given to many people, but as to what I think is not right and it will take time for me to believe this unless I see there is no adverse effects of it.*
- *No, I will not because there have been no research done on testing this COVID-19 vaccines. I personally do not know the side effects of taking the vaccines too as this COVID-19 vaccine is like overnight vaccines.*
- *Like I have stated above, I read that the vaccine is fake so I wouldn't risk my own life with it until I saw proof that it does actually works.*

***Responses to why participants will receive vaccine***

- *Yes, because I wouldn't know if I was infected or not. So, it is best to be vaccinated if the vaccine is available.*
- *I would get vaccinated because by doing so the vaccine stimulates an immune response therefore preparing me if I am ever infected with COVID-19.*
- *I will still go to the clinic to get the COVID-19 vaccine because my life is important. It is through life, and I can have my education, see my friends, be with my family member.*
- *Yes, because we all know that prevention is better than cure. Help yourself to protect others.*
- *I will definitely present myself to be vaccinated because I feel that it is very important action to take (vaccine) in order to eliminate the spread of the virus.*
- *I agreed to be vaccinated because I don't want to get the disease.*

- *I would get myself vaccinated to prevent or protect myself from COVID-19.*
- *Since Australian is our mother country, I believe all vaccines given by Australia have passed tests to prove they are safe and work well therefore the COVID-19 vaccine is safe and effective and will protect me.*
- *It is just a matter of time before everyone starts showing the symptoms, it is already among us. Most of us are being ignorant not to get tested and isolated, this puts everyone at risk. Either I have it or not, it is better to be vaccinated than going around getting everyone sick.*
- *Definitely yes, because it will help my immune system to stay fit and strong to be protected myself from the Pandemic disease.*
- *Yes, I would definitely present myself to be vaccinated. At first, I thought COVID-19 was just here for a short while, but it is real and here to stay. So, I need to protect myself from getting this virus which may cost me my life, because it may have certain implications on societies views towards me, if I were to get the virus. Better to be safe than sorry or end up regretting later.*
- *I think its effective and will help prevent me from getting COVID-19.*
- *Yes. How can one die from COVID-19 when the vaccine is made available at the doorstep (nearest clinic)? Therefore, people having probable cases or confirmed cases make themselves available at the nearest clinic.*
- *If I were tested positive and knowing there's a vaccine, yes, I will present myself to be vaccinated rather than spreading the virus and infecting more people.*
- *I am willing to be vaccinated if the vaccine is available. As the saying goes, prevention is better than cure, it is best for me to take the vaccine rather than me being infected and spreading the virus among the people in my community.*
- *I say yes because I have to be vaccinated by COVID-19 vaccine in advance, to be free from the pandemic disease. If I am not, then I would be in a bad position to easily get infected with the COVID-19.*
- *I said yes because as an educated person I know that the only way I can save my life is through taking medicine or vaccinate myself in the clinic so that I will avoid the danger of COVID19.*
- *Because I can boost my immune system and it can guard itself from the virus.*

***Box 1 Participants' explanations about their choice on whether to vaccinate***

## Discussion

The findings in this study are vital to planning the best course of action in controlling what is considered a looming COVID-19 catastrophe in PNG. It was found in this study that radically diverging views exist regarding COVID-19 vaccine among young-adult Papua New Guinean students at Divine Word University (DWU). The diverging views and uncertainties around COVID-19 vaccine are expected given that not only are participants exposed to a variety of opinions about COVID-19 vaccines circulating, especially in social media, but also their ethnic, cultural and religious backgrounds may have influenced their choice of whether to accept or refuse COVID-19 vaccines (Ahearn, 2021; Trompf, 1991).

These divergent views around COVID-19 vaccine suggests that the success of any COVID-19 roll-out program in PNG may depend on clearing misconceptions that exist and to get people willing and ready to be vaccinated. It may mean providing factual information about vaccines, how they work and any side effects that are associated with them. It also may mean comparing the different COVID-19 vaccines and providing unambiguous explanations on why certain vaccines were chosen over others and how risks associated with vaccines can be minimized. Dominant themes among those surveyed in this study were 'fear' of the unknown including side-effects, 'suspicions' in the way the vaccines were developed, and 'confidence' in the body's natural ability to protect itself from infection. However, in the setting of diverse sociocultural practices and beliefs, low literacy rates and rural-placed, hard-to-reach populations, it is clear that factual information will not reach everyone and 'fear of the unknown' will

always exist. Hence, if that fear and beliefs persist, a sizeable proportion of the population will refuse vaccination.

On the other hand, the findings reveal a socio-cultural based theorizing surrounding SARS-CoV-2 and its vaccine. These lay theories are important to illustrate how socio-cultural contexts influence choices and attitudes related to COVID-19 prevention measures (Milburn, 1996). Context-specific approaches are therefore important in the fight against SARS-CoV-2 in PNG. Drawing on key findings from collaborative research project on sorcery accusation related violence (SARV), the authors point out that health messaging should not be based on scientific or biomedical explanations alone (Hukula et. al., 2020; Schuele et. al., 2020; Forsyth & Gibbs, 2021). In PNG, where stories are enhanced and shared, messages about sickness and death based on science alone are not sufficient to quell doubts (Schuele et. al., 2020; Forsyth & Gibbs, 2021). The SARV study found that there is value in designing initiatives seeking to tap into doubt and uncertainty, in order to move people to a more scientific form of causal reasoning. Rather than relying solely on bio-medical explanations, initiatives should combine these explanations with religious or cultural principles. This study finds that religious affiliation is a significant factor (p=.02) in beliefs about 'end times' that may influence views on SARS-CoV-2 vaccine, hence the responsibility of religious leaders to recognize their place in promoting a desired outcome for COVID-19 prevention in PNG.

Confronting doubts rather than simply arguing with scientific logic may be more effective in bringing people to be more accepting of vaccination. Moreover, the most effective way to persuade others to change their views is best communicated by people who have been themselves in a position of ambivalence and are able to establish trust. This suggests an important role for insider advocates rather than so-called experts' knowledge. The SARV study found that personal experience with regard to previous causal stories is a compelling factor influencing an individual's position in holding to certain causal narratives (Forsyth & Gibbs, 2021). This can be particularly relevant in the case of vaccination as students hear of the experience of Papua New Guineans who have actually been vaccinated, particularly their peers. Newspaper and blogs currently spend considerable space to accounts of recipients talking about any after-effects of vaccination (Ahearn, 2021). Interventions that provide people with direct experience of the source of fear are more likely to be persuasive.

Conspiracy theories and stories creating fear are circulating widely in PNG, particularly in social media (Ahearn, 2021). Their complexity requires interventions that are multi-factored and go beyond mere provision of bio-medical knowledge about a virus (Forsyth & Gibbs, 2021). Forsyth and Gibbs conclude: *"In anxious times, positions that previously seemed stable and solid are loosened. People start to probe and question, trying different explanatory avenues, looking for evidence, weighing and assessing. These are the moments when individuals, groups, populations become more likely to move from one explanatory framework to another. Today, many are finding that those who believe in what some consider conspiracy theories are no longer a fringe group, but family and friends.... Our research suggests that in such situations a doubt based advocacy strategy is advisable. Rather than seeking to convince others to reject a particular explanatory framework or to adopt a contrary one, this strategy seeks to create or extenuate doubt and uncertainty, and to highlight potential negative consequences of proceeding without further interrogation or consideration of other alternatives."*

Findings in this study are crucial in shaping a path through the uncertainties around the fight against SARS-CoV-2 in PNG. From diverging views (about COVID-19 vaccine) documented in this study, the PNG COVID-19 response team can use this information to plan strategies alternative to or in combination with vaccine roll-out program in PNG. It is clear from these findings that despite availability of a suitable COVID-19 vaccine, a substantial proportion of the population may reject it. In addition, the discussions provided about COVID-19 and the importance of vaccines in controlling infection and spread of SARS-CoV-2 may also assist readers to make an informed choice to accept and receive vaccines for greater public health benefit, including preventing possible collapse of the health system in PNG (Sukbat, 2021).

Although the sample size is small, the data gives an invaluable snapshot of the prevailing views regarding COVID-19 in PNG given that the sample had nearly equal number of participants coming from rural and urban areas and although majority were from Highlands and Momase regions, New

Guinea Islands and Southern regions were also represented in the sample. The sampled students brought with them views that may have been influenced by their contacts around their respective homes and communities. These students would also be expected to be in frequent communication with their relatives and friends, hearing their opinions (and forming their own thoughts) through phone conversations and internet communications including social media (DWU teaching staff, 2020). It is not unreasonable therefore to think that the views captured in this study may be representative of opinions that exist currently regarding COVID-19 vaccine in PNG.

Non-probability sampling is another limitation in this study. Application of convenience sampling, although giving a useful snapshot of the prevailing views, it is not representative of the views of the student body at Divine Word University, which ideally would have come from simple random sampling. It is acknowledged also that sampling is biased towards students in the Faculty of Medicine and Health Sciences given that the survey link was placed on Bachelor of Health Science (Rural Health) Program Moodle page, although the link was accessible to 'all' students of DWU and notice of the study was placed at locations all students had access to including the university library. Further, the question asked in this survey was about 'COVID-19 vaccine' in general and was not specific to Oxford-AstraZeneca vaccine that was associated with blood-clotting side effects, and which is the vaccine that is becoming available to the population in PNG. The next study should ask specifically about Oxford-AstraZeneca vaccine. In addition, the prevalence of views reflects level of knowledge around DWU university students who are expected to have fair idea of COVID-19 and the vaccines against the disease. Future research should be directed at rural areas where majority of the people live, and who may have less level of acceptance to vaccine given that they might not be exposed to as much information as university students.

## Conclusion

This study provides evidence vital in controlling SARS-CoV-2 in PNG. Radically divergent views exist about COVID-19 vaccine among young adult Papua New Guinean students at DWU. Majority of those surveyed expressed views opposed to vaccination in PNG and were unwilling to be vaccinated. A national COVID-19 vaccination rolls out program should first allay concerns around COVID-19 vaccine and dispel misconceptions that exist. It is evident, however, that despite best efforts, divergent views will always exist and alternatives to vaccination roll-out strategy, including combination approaches and advocacy that confronts doubts rather than persuasion with scientific facts, should be considered and devised urgently in the fight against SARS-CoV-2 in PNG.

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