



THE NATIONAL
RESEARCH INSTITUTE
PAPUA NEW GUINEA

DISCUSSION PAPER

COVID-19 VACCINE HESITANCY
AMONG WHOLESALE AND RETAIL
SERVICE EMPLOYEES WITH PRE-
EXISTING MEDICAL CONDITIONS:
EVIDENCE FROM PAPUA NEW
GUINEA

Edwin Machine
Francis Odhuno

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Authors' Contributions

Francis Odongo Odhuno conceived and designed the project, supervised data collection, and wrote first draft of the introduction/background sections of the paper.

Edwin Masese Machine analysed the data and provided the statistical estimates and wrote the first draft of methods, results and discussion sections of the paper. Both co-authors contributed equally to revising all parts of the paper, including interpretation of the results.

Abbreviations and Acronyms

COVID-19	Coronavirus Disease 2019
ERACODA	European Renal Association COVID-19 Database
ERA-EDTA	European Renal Association-European Dialysis and Transplant Association
NCD	National Capital District
NDoH	National Department of Health
NRI	National Research Institute
PNG	Papua New Guinea
PPE	Personal Protective Equipment
SARS-Cov-2	Severe Acute Respiratory Syndrome Coronavirus 2
WHO	World Health Organisation

Abstract

Vaccination is one of the proven ways to reduce both the likelihood and severity of COVID-19 infection. Yet, at the peak of COVID-19 pandemic in 2020-2021, the delay in acceptance or outright refusal to vaccinate against the coronavirus disease (vaccine hesitancy) became a significant area of public health concern in Papua New Guinea. The government was particularly worried that a large number of unvaccinated people, if infected, was likely to contribute more to overall rates of community transmission of COVID-19. In 2021, some private sector employers began to demand proof of vaccination at workplaces in order to expand the effort to prevent the spread of COVID-19 in the country, regardless of the risk the vaccine may pose to an employee. Using data from a survey of wholesale and retail sector workers in the country's National Capital District, we first assessed the incidence of COVID-19 vaccine hesitancy of a sample of wholesale and retail service sector workers who considered themselves vulnerable because of underlying medical conditions or believed that their immune systems were compromised. We found that a sizable majority (n=129, 57.9%) of them considered the threat of COVID-19 as high, yet most of them (n=216, 75%) had not received any dose of COVID-19 vaccine. We then characterised their willingness to get a COVID-19 vaccine and found that 66 percent (n=144) were not willing to get vaccinated, perhaps because a good number of them (n=127, 58.5%) did not have enough information to make a decision about the vaccines against COVID-19. We then described their socio-demographic characteristics and found that lower education standard was associated with vaccine hesitancy, regardless of whether they had received at least one dose of COVID-19 vaccine (n=107, 81.7%) or not (n=102, 74.5%). Since regulatory clinical trials with COVID-19 vaccines have largely excluded those with immunocompromising and underlying medical conditions, consideration should be given to increasing the quality and access to information on the vaccines targeting medically vulnerable people with lower levels of education.

Key words: COVID-19, vaccine hesitancy, Port Moresby, PNG, retail sector.

Background

The outbreak of SARS-CoV-2 infection (commonly known as COVID-19) first identified in the city of Wuhan, People's Republic of China, in December 2019, was declared a public health emergency of international concern on 30 January 2020 (World Health Organization, 2021b). On 20 March 2020, the Prime Minister of Papua New Guinea (PNG) announced the first positive COVID-19 case in the country. By 7 March 2021, there were more than 1,670 confirmed cases and 17 deaths from COVID-19 in the country, with an average of 15 new cases reported daily (World Health Organization & National Department of Health (NDoH), 2021a). Majority of these cases were reported in the National Capital District (NCD), but as a control measure, movement restrictions within the NCD and country were implemented, given that there was low compliance in wearing masks, social distancing and frequent hand sanitation, factors in the continuing rise in cases (World Health Organization & National Department of Health (NDoH), 2021a). It was presumed that PNG had widespread community transmission of COVID-19 but many of the cases were unreported due to low testing rates in all provinces. The low numbers may also be seen through the prism of under-reporting of influenza-like illnesses and severe acute respiratory illness, health conditions that compromise the immune systems, and that were considered the most at risk of severe COVID-19 disease (Tsai et al., 2021).

While there was broad agreement among public health experts that widespread vaccination coverage is the best way to end the pandemic, regulatory clinical trials with COVID-19 vaccines had largely excluded those immunosuppressed and having underlying medical conditions (Tsai et al., 2021). Underlying medical conditions such as diabetes, hypertension, cardiovascular disease (Huang et al., 2020) and chronic kidney disease are known risk factors for severe COVID-19 disease (ERA-EDTA Council and the ERACODA Working Group, 2021). Since vaccines can potentially control the global COVID-19 pandemic if a large segment of the population is vaccinated, there has been concerted efforts to boost COVID-19 vaccine uptake worldwide. Vaccine hesitancy, which refers to the delay in acceptance or outright refusal of vaccines despite availability of vaccine services (Macdonald, 2015), has been an important challenge that requires more effort in the response to combat the COVID-19 pandemic, including in PNG.

Surges in COVID-19 cases in 2020-2021 prompted the Government and businesses to actively encourage vaccine rollout in the workplace, especially in the National Capital District (NCD) – with an estimated population of about 500,000 people – where community transmission was believed to be widespread (World Health Organization & National Department of Health (NDoH), 2021b). The PNG Government and business community therefore began to play an important role in spreading the global message that 'No one is safe from COVID-19 until everyone is safe' (World Health Organization, 2021a). In addition, businesses were promoting "no jab, no job" policy that was proving controversial (Loop PNG, 2021) as it seemingly requires workers to choose between either getting vaccinated to continue with work or lose their jobs if they are not vaccinated. Vaccine mandates, for all their good intentions, can also increase public distrust on the vaccine (Opel et al., 2021). In the absence of mandates, however, concerns were that, one, voluntary COVID-19 vaccination rates will be insufficient to stem transmission (Largent et al., 2020). Secondly, herd immunity – an epidemiologic term that states that only a proportion of a population needs to be immune through overcoming natural infection or through vaccination to an infectious agent for it to stop generating large outbreaks (Fontanet & Cauchemez, 2020) – acquired through community spread, can have a devastating impact on a susceptible population (Randolph & Barreiro, 2020).

In environments with limited or at least competing COVID-19 vaccine safety information available to the masses, vulnerable populations such as workers with underlying health conditions may have conflicted attitudes towards COVID-19 vaccine (Tsai et al., 2021). It is therefore important to understand if there are patterns to the hesitance to vaccinate against COVID-19 among vulnerable workers with comorbidities in PNG. Understanding these patterns would inform policy interventions towards targeted responses as well as mass campaigns of COVID-19 vaccination, thereby, protecting the population and ultimately ending the pandemic.

Objectives

The purpose of this study was to analyse data collected from a recent survey of wholesale and retail service sector workers based in the NCD that elicited information about COVID-19 vaccine hesitancy together with socio-economic and socio-demographic characteristics of respondents. For the present study, we wished to describe characteristics of the wholesale and retail service sector's sub-population considered vulnerable workers because of underlying medical conditions and characterise their willingness to get a COVID-19 vaccine as well as describe the patterns of their COVID-19 vaccine uptake.

The **specific objectives** were therefore to:

- Assess the incidence of COVID-19 vaccine hesitancy among wholesale and retail service workers with underlying medical conditions.
- Explore and highlight the correlates of COVID-19 vaccine hesitancy and vaccination patterns among wholesale and retail service sector workers with pre-existing medical conditions.
- Prescribe policy options for combating vaccine hesitancy among wholesale and retail service sector employees with pre-existing medical conditions.

Methodology

The present study analysed data obtained from a survey on wholesale and retail service workers which has been documented in Odhuno et al. (2022a) and Odhuno et al. (2022b). Briefly, the primary sample-based survey's aim was to better understand the willingness to take COVID-19 vaccine among wholesale and retail service workers; to estimate perceived impact of COVID-19, including lockdowns on current and future employment outcomes. The survey questionnaire was adapted from Kelly et al. (2021) and Alekseev et al. (2020). The primary survey was a cross-sectional data collected by an independently contracted firm between 18 to 31 October 2021 and that recruited 1,265 respondents among wholesale and retail service sector workers in Port Moresby. The survey involved administering a paper-based questionnaire targeting employees of wholesale and retail outlets in Port Moresby. The list of question relevant for this study are provided in Table A1 in the Appendix.

In our present study therefore, we were guided by our specific objectives in summarising and describing the distribution of the survey respondents' characteristics around the core issues of their vaccination status or their willingness to vaccinate whenever the vaccines become available to them. Our sub-sample of interest were the respondents who had underlying medical conditions. We therefore extracted from the initial dataset of 1,265 those who had responded in the affirmative to the question of having any of the underlying medical conditions that were listed as: compromised immune system/ immunosuppression; a serious heart disease; chronic kidney disease that required dialysis or chronic liver disease; chronic lung disease; diabetes; moderate to severe asthma.

Vaccine hesitancy, as our primary outcome of interest, was viewed as a continuum between full acceptance of all recommended vaccines and outright refusal of all recommended vaccines. For this analysis purposes, we categorised the primary outcome of interest into a dichotomised Yes-No the likelihood of taking a COVID-19 vaccination when made available. Lumping together strong likelihood and more likelihood is a reflection of a binary intent more than necessarily the subsequent uptake of vaccine by the participant. It has been noted in literature that some people will still accept vaccines even when they are uncertain or refuse vaccines when they are uncertain (Moore et al., 2021). Our secondary outcome of interest was whether participants had taken first or both first and second doses of the COVID-19 vaccine. We categorised this outcome as Yes for those who had taken one or both vaccines, and a No for those who had not taken any COVID-19 vaccination shots.

Statistical analysis

We assessed differences in participant socio-demographic characteristics between vaccine hesitancy groups using chi-squared tests of the categorical variables. To determine the strength of the association between the vaccine hesitancy groups with participant characteristics, we performed dichotomous (binary) logistic regression analysis and reported odds ratios and their associated 95 percent confidence intervals. The choice of logistic regression over competing methods was largely based on disciplinary tradition (see Kelly et al., 2021 and Reno et al., 2021 for example). The regression analyses were conducted with vaccine hesitancy as the primary outcome of interest while the secondary outcome of interest was whether they had been vaccinated by taking one or both COVID-19 shots. The predictor variables (see Table A1 in the Appendix) for both analyses included socio-demographic characteristics of the participants as well as the sources and knowledge and perceptions of COVID-19 threats. Statistical significance was set at alpha of $p < 0.05$ for a two-tailed analysis. Sporadic missing data was treated as random non-response to questions and therefore no further imputation was considered in the final dataset analysed.

Results

Of the 1,265 participants in the primary survey, 224 (17.7%) self-reported they had underlying medical conditions and were therefore included in this analysis. Table 1 summarises the socio-demographic characteristics of the 224 participants with underlying medical conditions. Participants were mostly male, in the 20 to 35-year-old category, with almost equal distribution between those married and single. About 25 percent had received at least one or both shots of COVID-19 vaccine. Majority of them (over 99%) worked in environments where the employer provided Personal Protective Equipment (PPEs) such as hand sanitisers, masks and alcohol wipes as protection against the spread of COVID-19. Importantly, less than half (about 43%) felt they had access to enough information to make decisions about the vaccine against COVID-19. Their sources of information on COVID-19 vaccine comprised many sources, but mostly a mix of government health authorities and social media. About 66 percent (n=147) of respondents expressed unwillingness to take COVID-19 vaccine, whenever available and accessible to them.

Table 1: Population based survey among workers with underlying medical conditions

Description	Total	n	%
Gender	224		
Female		73	32.6
Male		151	67.4
Age (in years)	222		
15 – 19		7	3.1
20 – 35		168	75.7
36 – 50		40	18.1
51 – 65		7	3.1
Marital status	222		
Divorced/ Separated		7	3.2
Married		109	49.1
Single/ Never married		104	46.8
Widowed		2	0.9
Highest level of education completed	221		
Year/Grade 10 or below		73	33.0
Year/Grade 12		65	29.4
Certificate/ TVET		41	18.6
Advanced Diploma/ Diploma		24	10.9
Bachelor's Degree		11	4.9
Post-graduate Degree		7	3.2
Occupational group	222		
Clerical/Sales/Cashier/ Customer Service		101	45.5
Driver/ Transport		12	5.4
Labourer/ Shelf stocker/ Bagger		14	6.3
Manager/ Assistant Manager		11	4.9
Other		36	16.2
Production/ Warehouse/ Store		15	6.8
Professional/ Technical		18	8.1
Tradesperson/ Maintenance		15	6.8
Which section of the company/ business do you normally work in?	223		

Cafes and food service	16	7.2
Construction and facilities management	21	9.4
Finance and accounts	9	4.0
Human resources	1	0.4
Information and Communication	11	4.9
Other	38	17.0
Retail	75	33.6
Transport and logistics	14	6.3
Wholesale and merchandise	38	17.0
Gross income per fortnight	221	
Less than K400	119	53.8
K400 – K700	73	33.0
K700 – K1300	20	9.1
K1300 – K2700	6	2.7
K2700 – K9600	1	0.4
More than K9600	2	0.9
If lower than normal, what was the main reason there has been a lower-than-normal workloads?	121	
Employee-related reasons (we are too many in this department/ section)	11	9.0
Government order/ lockdown	63	52.1
Logistics/ supplies (delayed deliveries)	37	30.6
Other reasons	10	8.3
Were you or any of your work colleagues in the department laid off or furloughed?	175	
All were furloughed	14	8.0
All were laid off	1	0.6
Some were furloughed	141	80.6
Some were laid off	2	1.1
Some were laid off/ some were furloughed	17	9.7
Which of the following best describes your current employment status?	224	
Full time employee	192	85.7
Part time employee	12	5.4
Temporary/ casual	20	8.9
Have you received the first dose or both first and second doses of COVID-19 vaccines?	216	
No	162	75.0
Yes	54	25.0
How would you rate the potential for exposure of the employees/ workers in your section to COVID-19 infection?	222	
High	62	27.9
Low	45	20.3
Medium	80	36.0
None	35	15.8
Does your employer currently provide employees with any of the following equipment to reduce exposure to COVID-19?	221	

Alcohol/ disinfectant wipes	10	4.6
Hand sanitisers	193	88.1
Other (please specify)	2	0.9
Protective masks	14	6.4
Did you feel that you had access to enough information to make decisions about the vaccine against COVID-19?	222	
No	127	57.5
Yes	94	42.5
Where did you receive information about vaccination against the COVID-19 (check all that apply)?	223	
Business in-house memo, newsletters	1	0.4
Friends and families	11	4.9
Government/ health authority	64	28.7
Internet news	8	3.6
Other (please specify)	3	1.4
Printed news/ Newspapers	19	8.5
Radio	15	6.7
Social Media	72	32.3
TV News	18	8.1
When a vaccine for COVID-19 becomes available, will you be willing to get vaccinated?	222	
No	147	66.2
Yes	75	33.8
What are your top three concerns during this COVID-19 challenging times?	221	
Access to COVID-19 vaccine	1	0.4
Access to health care	4	1.8
Being stuck at home for a long time	2	0.9
Having access to correct information	27	12.2
Having enough money to sustain my house	119	53.9
Losing my job	68	30.8
How do you feel about your future employment?	223	
Neither optimistic nor pessimistic	64	28.7
Optimistic	87	39.0
Pessimistic	72	32.3
Ethnicity	222	
Asian Origin	1	0.4
Australian Origin	1	0.4
PNG National	222	99.2
How many other people live in your household?	223	
Live alone	3	1.3
1 Person	12	5.4
2 to 5 people	101	45.5
6 to 10 people	88	39.6
11 people or more	18	8.1

What is the challenge you are facing when it comes to supporting members of your household during the COVID-19?	222		
Afraid of bringing virus home because I need to be out		108	48.7
Burn-out taking care of both employment		78	35.1
Cannot find someone to take care of dependents		25	11.3
Other (specify)		11	4.9
What level of threat do you think COVID-19 poses to you and/ or your family?	223		
Don't know		15	6.7
High threat		129	57.9
Low threat		38	17.0
Moderate threat		41	18.4
Medical conditions	222		
Compromised immune system (immunosuppression)		88	39.6
A serious heart disease		18	8.1
Chronic kidney disease (dialysis) or Chronic liver disease		30	13.5
Chronic lung disease		10	4.5
Diabetes		31	14.0
Moderate to severe asthma		45	20.3
How much did your household responsibilities affect your ability to focus on your work?	221		
A little		71	32.1
A moderate amount		28	12.7
A lot		90	40.7
I have no household responsibilities		10	4.5
Not at all		22	10.0
Can you manage/ do your employment work responsibilities remotely?	223		
No		82	36.8
Yes		141	63.2
Does your employer allow you take equipment home with you to work?	221		
No		177	80.1
Yes		44	19.0
Which of these places best describe where you live and work?	223		
Big City		84	37.7
Rural/Remote		13	5.8
Suburban/ Small Town		76	34.1
Urban/ Big Town		50	22.4

Table 2 summarises the univariate analyses of the COVID-19 vaccine hesitancy (referring to whether or not they were willing to take the COVID-19 vaccine when available to them) based on various demographic characteristics. The top three concerns during the pandemic consists of having enough money to sustain their households, losing their job and having access to correct information on the COVID-19 pandemic. Over 47 percent of the respondents came from households with over six people and a similar proportion of respondents was afraid of bringing COVID-19 virus home from work. Over 75 percent thought COVID-19 poses a moderate to high threat to their family.

Table 2: Socio-demographic characteristics, vaccination status and vaccine hesitancy among those with underlying conditions

Description	Vaccinated for COVID-19				COVID-19 vaccine hesitancy			
	N	No n (%)	Yes n (%)	p-value	N	No n (%)	Yes n (%)	p-value
Gender	215				222			
Female		52 (76.5)	16 (23.5)	0.80		53 (73.6)	19 (26.4)	0.11
Male		110 (74.8)	37 (25.2)			94 (62.7)	56 (37.3)	
Age in years	215				222			
15 – 19		3 (42.9)	4 (57.1)	0.20		3 (42.9)	4 (57.1)	0.40
20 – 35		125 (76.7)	38 (23.3)			112 (66.7)	56 (33.3)	
36 – 50		28 (73.7)	10 (26.3)			26 (65.0)	14 (35.0)	
51 – 65		6 (85.7)	1 (14.3)			6 (85.7)	1 (14.3)	
Marital status	215				222			
Divorced/ Separated		4 (57.1)	3 (42.9)	0.36		2 (28.6)	5 (71.4)	0.06
Married		83 (79.0)	22 (21.0)			79 (72.5)	30 (27.5)	
Single/ never married		73 (72.3)	28 (27.7)			65 (62.5)	39 (37.5)	
Widowed		2 (100.0)	0 (0.0)			1 (50.0)	1 (50.0)	
Highest level of education (a)	214				222			
Year/Grade 10 or below		54 (79.4)	14 (20.6)	0.136		54 (74.0)	19 (26.0)	0.03
Year/Grade 12		53 (82.8)	11 (17.2)			48 (73.9)	17 (26.1)	
Certificate /TVET		30 (75.0)	10 (25.0)			26 (63.4)	15 (36.6)	
Advanced Diploma/ Diploma		14 (58.3)	10 (41.7)			12 (50.0)	12 (50.0)	
Bachelor's Degree		7 (63.6)	4 (36.4)			4 (36.4)	7 (63.6)	
Post-graduate Degree		4 (57.1)	3 (42.9)			3 (42.9)	4 (57.1)	
Highest level of education (b)	214							
Grade 12 and below		107 (81.7)	24 (18.3)	0.01		102 (74.5)	35 (25.5)	0.00
Above Grade 12		55 (66.3)	28 (33.7)			45 (54.2)	38 (45.8)	
Occupational group	215				222			
Clerical/Sales/Cashier/ Customer Service		71 (73.2)	26 (26.8)	0.28		64 (63.4)	37 (36.6)	0.42
Driver/ Transport		7 (58.3)	5 (41.7)			8 (66.7)	4 (33.3)	
Labourer/ Shelf stocker/ Bagger		14 (100.0)	0 (0.0)			10 (71.4)	4 (28.6)	
Manager/ Assistant Manager		9 (81.8)	2 (18.2)			8 (72.7)	3 (37.3)	
Other (Specify)		27 (77.1)	8 (22.9)			27 (75.0)	9 (25.0)	

Production/ Warehouse/Store	12 (85.7)	2 (14.3)		10 (66.7)	5 (33.3)	
Professional/ Technical	12 (66.7)	6 (33.3)		8 (44.4)	10 (55.6)	
Tradesperson/ Maintenance	10 (71.4)	4 (28.6)		12 (80.0)	3 (20.0)	
Which of these places best describe where you live and work?	214			221		
Big City	60 (77.9)	17 (22.1)	0.77	59 (70.2)	25 (29.8)	0.41
Rural/Remote	11 (84.6)	2 (15.4)		10 (76.9)	3 (23.1)	
Suburban/ Small Town	54 (73.0)	20 (27.0)		44 (59.5)	30 (40.5)	
Urban/ Big Town	37 (74.0)	13 (26.0)		34 (68.0)	16 (32.0)	
Which section of the company do you normally work in?	214			221		
Cafes and food service	13 (86.7)	2 (13.3)	0.44	11 (68.8)	5 (31.2)	0.52
Construction and facilities management	13 (68.4)	6 (31.6)		11 (55.0)	9 (45.0)	
Finance and accounts	6 (66.7)	3 (33.3)		5 (55.6)	4 (44.4)	
Human resources	0 (0.0)	1 (100.0)		0 (0.0)	1 (100.0)	
Information and Communication	7 (63.6)	4 (36.4)		6 (54.6)	5 (45.4)	
Other	29 (80.6)	7 (19.4)		24 (64.9)	13 (35.1)	
Retail	56 (77.8)	16 (22.2)		51 (68.0)	24 (32.0)	
Transport and logistics	12 (85.7)	2 (14.3)		12 (85.7)	2 (14.3)	
Wholesale and merchandise	26 (70.3)	11 (29.7)		27 (71.0)	11 (29.0)	
Regularly, what is the distribution of employees at your workplace by gender? (self-reported)	215			221		
Equal number of men and women	71 (72.4)	27 (27.6)	0.65	68 (68.0)	32 (32.0)	0.90
More men than women	47 (77.1)	14 (22.9)		40 (64.5)	22 (35.5)	
More women than men	44 (78.6)	12 (21.4)		39 (66.1)	20 (33.9)	
Since start of COVID-19 pandemic, which of the following reflects your employment workload?	215			221		
Higher than normal	25 (62.5)	15 (37.5)	0.11	21 (51.2)	20 (48.8)	0.03
Lower than normal	69 (79.3)	18 (20.7)		65 (74.7)	22 (25.3)	
Same as normal	68 (77.3)	20 (22.7)		61 (65.7)	32 (34.4)	
If lower than normal, what was the main reason there has been a lower-than-normal workloads?	121			121		
Employee-related reasons	8 (72.7)	3 (27.3)	0.73	7 (63.6)	4 (36.4)	0.66
Government order/ lockdown	50 (79.4)	13 (20.6)		44 (69.8)	19 (30.2)	
Logistics/ supplies (delayed deliveries)	31 (83.8)	6 (16.2)		29 (78.4)	8 (21.6)	
Other reasons	9 (90.0)	1 (10.0)		8 (80.0)	2 (20.0)	
If higher than normal, what did this business do to accommodate higher than normal workload?	101			102		
Deferred delivery of products/ stock	10 (62.5)	6 (37.5)	0.76	9 (56.3)	7(43.7)	0.24
Extended operating hours	16 (80.0)	4 (20.0)		11 (57.9)	8 (42.1)	
Hired more employees/ workers	9 (64.3)	5 (35.7)		7 (46.7)	8 (53.3)	

Increased supplies of goods/ stock	10 (76.9)	3 (23.1)		11 (78.6)	3 (21.4)	
Limited number of items per customers	27 (71.0)	11 (29.0)		28 (73.7)	10 (26.3)	
What was the change in the employee numbers where you work as a result of COVID-19?	215			221		
Increased	12 (70.6)	5 (29.4)	0.88	9 (52.9)	8 (47.1)	0.46
Reduced	80 (76.2)	25 (23.8)		73 (68.2)	34 (31.8)	
Remained the same/ no change	70 (75.3)	23 (24.7)		65 (67.0)	32 (33.0)	
Were you or any of your work colleagues in the department laid off or furloughed?	169			172		
All were furloughed	13 (92.9)	1 (7.1)	0.16	12 (85.7)	2 (14.3)	0.02
All were laid off	1 (100.0)	0(0.0)		1 (100.0)	0 (0.0)	
Some were furloughed	99 (71.2)	40 (28.8)		83 (59.7)	56 (40.3)	
Some were laid off	2 (100.0)	0 (0.0)		2 (100.0)	0 (0.0)	
Some were laid off/ some were furloughed	12 (92.3)	1 (7.7)		15 (93.7)	1 (6.3)	
Which of the following best describes your current employment status?	215			221		
Full time employee	137 (74.9)	46 (25.1)	0.36	123 (65.1)	66 (34.9)	0.17
Part time employee	11 (91.7)	1 (8.3)		11 (91.7)	1 (8.3)	
Temporary/ casual	14 (70.0)	6 (30.0)		13 (65.0)	7 (35.0)	
How many days a week did you work during the times that the govt imposed lockdown to contain spread of COVID-19?	213			219		
1 day	7 (100.0)	0 (0.0)	0.36	7 (100.0)	0 (0.0)	0.13
2 to 3 days	16 (80.0)	4 (20.0)		19 (76.0)	6 (24.0)	
4 to 5 days	39 (78.0)	11 (22.0)		35 (70.0)	15 (30.0)	
6 to 7 days	99 (72.8)	37 (27.2)		86 (62.8)	51 (37.2)	
How much have your household responsibilities affected your ability to focus on your work during COVID-19 pandemic?	214			220		
A little	50 (69.4)	22 (30.6)	0.04	39 (54.9)	32(45.1)	0.00
A moderate amount	14 (66.7)	7 (33.3)		13 (46.4)	15 (53.6)	
A lot	65 (87.8)	9 (12.2)		70 (77.8)	20 (22.2)	
Not at all	29 (67.4)	14 (32.6)		15 (71.4)	6 (28.6)	
Not Applicable	3 (75.0)	1 (25.0)		9 (90.0)	1 (10.0)	
How would you rate the potential for exposure of the employees/ workers in your section to COVID-19 infection?	213			220		
High	46 (76.7)	14 (23.3)	0.48	42 (67.7)	20 (32.3)	0.21
Low	34 (91.0)	8 (19.0)		31 (70.4)	13 (29.6)	
Medium	53 (69.7)	23 (30.3)		46 (58.2)	33 (41.8)	
None	28 (80.0)	7 (20.0)		27 (77.1)	8 (22.9)	

Does your employer currently provide employees/ workers with any of the following equipment to reduce exposure to COVID-19?	215			222		
Alcohol/ disinfectant wipes	7 (70.0)	3 (30.0)	0.67	4 (40.0)	6 (60.0)	0.02
Hand sanitisers	139 (74.3)	48 (25.7)		126 (65.0)	68 (35.0)	
Not Applicable	2 (100.0)	0 (0.0)		-	-	
Other	2 (100.0)	0 (0.0)		-	-	
Protective masks	12 (85.7)	2 (14.3)		13 (92.9)	1 (7.1)	
Did you feel that you had access to enough information to make decisions about the vaccine against COVID-19?	213			219		
No	100 (80.0)	25 (20.0)	0.09	87 (69.6)	38 (30.4)	0.37
Yes	62 (70.4)	26 (29.6)		60 (63.8)	34 (36.2)	
What are your top three concerns during COVID-19?	215			222		
Access to COVID-19 vaccine	1 (100.0)	0 (0.0)	0.00	0 (0.0)	1 (100.0)	0.00
Access to health care	1 (25.0)	3 (75.0)		1 (25.0)	3 (75.0)	
Being stuck at home for a long time	1 (50.0)	1 (50.0)		1 (50.0)	1 (50.0)	
Having access to correct information	15 (53.6)	13 (46.4)		12 (42.9)	16 (57.1)	
Having enough money to sustain my house	84 (71.8)	33 (28.2)		71 (59.7)	48 (40.3)	
Losing my job	60 (95.2)	3 (4.8)		62 (91.2)	6 (8.8)	
Where did you receive information about vaccination against the COVID-19?	212			219		
Business in-house memo/ Newsletters	1 (100.0)	0 (0.0)	0.42	1 (100.0)	0 (0.0)	0.01
Friends and families	8 (72.7)	3 (27.3)		8 (72.7)	3 (27.3)	
Government/ health authority	50 (71.4)	20 (28.6)		47 (65.3)	25 (34.7)	
Internet news	9 (75.0)	3 (25.0)		8 (66.7)	4 (33.3)	
Printed news/ Newspapers	15 (79.0)	4 (21.0)		7 (36.8)	12 (63.2)	
Radio	11 (73.3)	4 (26.7)		12 (80.0)	3 (20.0)	
Social Media	55 (83.3)	11 (16.7)		54 (76.1)	17 (23.9)	
TV News	10 (55.6)	8 (44.4)		7 (38.9)	11 (61.1)	
Ethnicity	215			221		
Asian Origin	0 (0.0)	1 (100.0)	0.18	0 (0.0)	1 (100.0)	0.29
Australian Origin	1 (100.0)	0 (0.0)		1 (100.0)	0 (0.0)	
PNG National	161 (75.6)	52 (24.4)		146 (66.7)	73 (33.3)	
How do you feel about your future employment?	214			220		
Neither optimistic nor pessimistic	51 (79.7)	13 (20.3)	0.03	47 (73.4)	17 (26.6)	0.03
Optimistic	55 (65.5)	29 (34.5)		47 (56.0)	37 (44.0)	
Pessimistic	55 (83.3)	11 (16.7)		53 (73.6)	19 (26.4)	

How many other people live in your household?	214			220		
I live alone	2 (66.7)	1 (33.3)	0.99	2 (66.7)	1 (33.3)	0.99
1 person	9 (75.0)	3 (25.0)		8 (66.7)	4 (33.3)	
2 to 5 people	14 (77.8)	4 (22.2)		68 (66.7)	34 (33.3)	
6 to 10 people	73 (76.8)	22 (23.2)		56 (65.1)	30 (34.9)	
11 people or more	64 (74.4)	22 (25.6)		13 (72.2)	5 (27.8)	
Challenges faced supporting household members	213			220		
Afraid of bringing virus home because I need to be out	79 (79.0)	21 (21.0)	0.35	74 (69.2)	33 (30.8)	0.37
Burn-out taking care of both employment	54 (70.1)	23 (29.9)		46 (59.7)	31 (40.3)	
Cannot find someone to take care of dependents	19 (76.0)	6 (24.0)		19 (76.0)	6 (24.0)	
Other (specify)	10 (90.9)	1 (9.1)		8 (72.7)	3 (27.3)	
Level of threat COVID-19 poses to you/ your family	214			221		
Don't know	11 (73.3)	4 (26.7)	0.53	11 (73.3)	4 (26.7)	0.23
High threat	89 (72.4)	34 (27.6)		79 (61.7)	49 (38.3)	
Low threat	31 (81.6)	7 (18.4)		30 (79.0)	8 (21.0)	
Moderate threat	31 (81.6)	7 (18.4)		27 (67.5)	13 (32.5)	
Any of the following underlying medical conditions?	215			222		
A compromised immune system	64 (72.7)	24 (27.3)	0.21	53 (60.2)	35 (39.8)	0.11
A serious heart disease	14 (93.3)	1 (6.7)		17 (94.4)	1 (5.6)	
Chronic kidney disease	24 (80.0)	2 (20.0)		19 (63.3)	11 (36.7)	
Chronic lung disease	8 (80.0)	2 (20.0)		8 (80.0)	2 (20.0)	
Diabetes	25 (83.3)	5 (16.7)		21 (67.7)	10 (32.3)	
Moderate to severe asthma	27 (64.3)	15 (35.7)		29 (64.4)	16 (35.6)	
How much do your household responsibilities affect your ability to focus on your work?	214			220		
A little	47 (67.1)	23 (32.9)	0.02	39 (54.9)	32 (45.1)	0.00
A moderate amount	16 (61.5)	10 (38.5)		13 (46.4)	15 (53.6)	
A lot	75 (87.2)	11 (12.8)		70 (77.8)	20 (22.2)	
I have no household responsibilities	8 (80.0)	2 (0.0)		9 (90.0)	1 (10.0)	
Not at all	15 (68.2)	7 (31.8)		15 (71.4)	6 (28.6)	
Can you do your employment work responsibilities remotely?	214			221		
No	61 (82.4)	13 (17.6)	0.09	57 (70.4)	24 (29.6)	0.36
Yes	101 (72.1)	39 (27.9)		90 (64.3)	50 (35.7)	
Does your employer allow you to take resources/ equipment home with you to support working from home?	212			219		
No	133 (79.2)	35 (20.8)	0.02	122 (69.7)	53 (30.3)	0.06
Yes	27 (61.4)	17 (38.6)		24 (54.5)	20 (45.5)	

Table 2 also presents a column with respondents' COVID-19 vaccination status and assessing their demographic characteristics. When we compared those who have vaccinated against those who have not, there was no statistically significant differences between the genders, age groups, marital status, highest level of education in general, occupational group, place of living and working, employment status, perceived potential for exposure at work, or provision of PPEs by employer. When education level is stratified into above and below grade 12 however, the difference in the vaccination rates was statistically significant ($p=0.01$). We also observed statistically significant differences between those who responded yes or no to the question of whether they felt they had access to enough information to make decisions about the vaccine; their top three concerns during COVID-19 pandemic, their sense of optimism regarding future employment; their flexibility to work remotely and the support from the employer to work remotely.

When we compared vaccine hesitancy, there was no statistically significant differences between the genders, age groups, occupational groups, place of living and working, current employment status, perceived potential for exposure at work, whether they felt they had access to enough information to make decisions about the vaccine, the nature of their medical condition, and their flexibility to work remotely. Vaccine hesitancy was strongly associated with education level, how much responsibilities they have in their households, provision of PPEs at their workplace, their source of information about vaccination, and their top three concerns during COVID-19 pandemic.

Table 3 presents the multivariate analysis on vaccination. We found that younger age-groups were significantly less likely to vaccinate. Those who had more than a Grade 12 education were more than twice as likely to vaccinate as compared to those who had up to Grade 12 education. Those who got supported by their employer to work from home were more than twice as likely to be vaccinated as compared to those who do not get support from their employer to work from home.

Table 3: Behavioural model of COVID-19 vaccination hesitancy among those with underlying conditions

Description	Vaccinated for COVID-19		COVID-19 vaccine hesitancy	
	OR (95% CI)	p-value	OR (95%CI)	p-value
Gender				
Female	Ref		Ref	
Male	1.09 (0.56 – 2.14)	0.80	1.66 (0.89 – 3.09)	0.11
Age in years				
15 – 19	Ref		Ref	
20 – 35	0.23 (0.05 – 1.06)	0.06	0.37 (0.08 – 1.70)	0.20
36 – 50	0.27 (0.05 – 1.41)	0.05	0.40 (0.08 – 2.06)	0.28
51 – 65	0.12 (0.01 – 1.67)	0.12	0.12 (0.00 – 1.67)	0.12
Marital status				
Married	Ref		Ref	
Divorced/ Separated	2.83 (0.59 – 13.59)	0.19	6.60 (1.21 – 35.78)	0.03
Single/ Never married	1.44 (0.76 – 2.75)	0.26	1.60 (0.80 – 2.82)	0.12
Widowed	-	-	2.60 (0.16 – 43.45)	0.50
Highest level of education				
Year/Grade 10 or below	Ref		Ref	
Year/Grade 12	0.80 (0.33 – 1.92)	0.62	1.00 (0.47 – 2.15)	0.98
Certificate /TVET	1.28 (0.51 – 3.25)	0.60	1.64 (0.72 – 3.73)	0.24
Advanced Diploma/ Diploma	2.76 (1.01 – 7.50)	0.04	2.84 (1.09 – 7.39)	0.03
Bachelor's Degree	2.20 (0.56 – 8.60)	0.25	4.97 (1.30 – 18.90)	0.02
Post-graduate Degree	2.89 (0.58 – 14.45)	0.19	3.79 (0.77 – 18.50)	0.10
Highest level of education				

Grade 12 and below	Ref		Ref	
Above Grade 12	2.10 (1.11 – 3.96)	0.02	2.46 (1.38 – 4.39)	0.00
Which of these places best describe where you live and work?				
Big City	Ref		Ref	
Rural/Remote	0.64 (0.13 – 3.18)	0.59	0.71 (0.18 – 2.79)	0.62
Suburban/ Small Town	1.31 (0.62 – 2.75)	0.48	1.61 (0.83 – 3.11)	0.16
Urban/ Big Town	1.24 (0.54 – 2.84)	0.61	1.11 (0.52 – 2.37)	0.79
Which section of the company do you normally work in?				
Cafes and food service	Ref		Ref	
Construction and facilities management	3.0 (0.51 – 17.71)	0.23	1.80 (0.45 – 7.13)	0.40
Finance and accounts	3.25 (0.43 – 24.84)	0.26	1.80 (0.32 – 9.51)	0.51
Human resources	-	-	-	
Information and Communication	3.71 (0.54 – 25.60)	0.18	1.80 (0.37 – 8.98)	0.46
Other	1.57 (0.28 – 8.60)	0.60	1.19 (0.34 – 4.18)	0.78
Retail	1.86 (0.38 – 9.10)	0.45	1.03 (0.32 – 3.31)	0.95
Transport and logistics	1.08 (0.13 – 8.95)	0.94	0.36 (0.05 – 2.30)	0.28
Wholesale and merchandise	2.75 (0.53 – 14.30)	0.23	0.89 (0.25 – 3.18)	0.86
How would you rate the potential for exposure of the employees/ workers in your section to COVID-19 infection?				
None	Ref		Ref	
High	1.22 (0.44 – 3.40)	0.71	1.60 (0.62 – 4.16)	0.32
Low	0.94 (0.30 – 2.91)	0.92	1.41 (0.51 – 3.93)	0.50
Medium	1.73 (0.66 – 4.54)	0.26	2.42 (0.98 – 5.99)	0.06
Does your employer currently provide employees/ workers with any of the following equipment to reduce exposure to COVID-19?				
Hand sanitisers	Ref		Ref	
Alcohol/ disinfectant wipes	1.24 (0.31 – 4.99)	0.76	2.78 (0.76 – 10.19)	0.12
Not Applicable	-	-	-	-
Other	-	-	-	-
Protective masks	0.48 (0.10 – 2.23)	0.35	0.14 (0.02 – 1.11)	0.06
Did you feel that you had access to enough information to make decisions about the vaccine against COVID-19?				
No	Ref		Ref	
Yes	1.68 (0.89 – 3.16)	0.11	1.34 (0.76 – 2.35)	0.32
What are your top three concerns during this challenging time?				
Access to COVID-19 vaccine	-	-	-	-
Access to health care	Ref		Ref	
Being stuck at home for a long time	0.33 (0.01 – 11.94)	0.55	0.33 (0.00 – 11.94)	0.55
Having access to correct information	0.29 (0.03 – 3.13)	0.31	0.44 (0.04 – 4.82)	0.51
Having enough money to sustain my house	0.13 (0.01 – 1.30)	0.08	0.22 (0.02 – 2.22)	0.20
Losing my job	0.02 (0.00 – 0.21)	0.00	0.03 (0.00 – 0.36)	0.00
Occupation				
Clerical/Sales/Cashier/ Customer Service	Ref		Ref	
Driver/ Transport	1.95 (0.57 – 6.69)	0.29	0.86 (0.24 – 3.07)	0.82
Labourer/ Shelf stocker/ Bagger	-	-	0.69 (0.20 – 2.36)	0.56

Manager/ Assistant Manager	0.61 (0.12 – 2.99)	0.54	0.65 (0.16 – 2.60)	0.54
Other (Specify)	0.81 (0.33 – 2.00)	0.65	0.57 (0.24 – 1.35)	0.21
Production/ Warehouse/Store	0.45 (0.09 – 2.17)	0.32	0.86 (0.27 – 2.72)	0.80
Professional/ Technical	1.36 (0.46 – 4.01)	0.57	2.16 (0.78 – 5.96)	0.14
Tradesperson/ Maintenance	1.09 (0.31 – 3.79)	0.89	0.43 (0.11 – 1.63)	0.22
Where did you receive information about vaccination against the COVID-19?				
Business in-house memo/ Newsletters	Ref		Ref	
Friends and families	0.47 (0.09 – 2.37)	0.36	0.24 (0.05 – 1.22)	0.08
Government/ health authority	0.50 (0.17 – 1.45)	0.20	0.34 (0.12 – 0.98)	0.04
Internet news	0.42 (0.08 – 2.07)	0.28	0.32 (0.07 – 1.47)	0.14
Printed news/ Newspapers	0.33 (0.08 – 1.41)	0.14	1.09 (0.29 – 4.12)	0.90
Radio	0.45 (0.10 – 1.98)	0.29	0.16 (0.03 – 0.77)	0.02
Social Media	0.25 (0.08 – 0.77)	0.01	0.20 (0.07 – 0.60)	0.00
How many other people live in your household?				
I live alone	Ref		Ref	
1 person	0.67 (0.04 – 10.25)	0.77	1 (0.07 – 14.64)	1.00
2 to 5 people	0.57 (0.04 – 8.05)	0.68	0.77 (0.06 – 10.50)	0.84
6 to 10 people	0.60 (0.05 – 6.97)	0.68	0.97 (0.08 – 11.09)	0.98
11 people or more	0.69 (0.06 – 7.96)	0.76	1.07 (0.09 – 12.30)	0.96
How do you feel about your future employment?				
Neither optimistic nor pessimistic	Ref		Ref	
Optimistic	2.07 (0.97 – 4.41)	0.06	2.17 (1.07 – 4.39)	0.03
Pessimistic	0.78 (0.32 – 1.91)	0.59	0.99 (0.462 – 2.12)	0.98
What is the challenge you are facing when it comes to supporting members of your household during the COVID-19?				
Afraid of bringing virus home because I need to be out	Ref		Ref	
Burn-out taking care of both employment	1.60 (0.81 – 3.18)	0.18	1.51 (0.82 – 2.79)	0.19
Cannot find someone to take care of dependents	1.19 (0.42 – 3.35)	0.75	0.70 (0.26 – 1.94)	0.50
Other (specify)	0.37 (0.04 – 3.10)	0.36	0.84 (0.21 – 3.37)	0.81
What level of threat do you think COVID-19 poses to you and/ or your family?				
Don't know	Ref		Ref	
High threat	1.05 (0.31 – 3.52)	0.94	1.70 (0.51 – 5.65)	0.38
Low threat	0.62 (0.15 – 2.54)	0.51	0.73 (0.18 – 2.92)	0.66
Moderate threat	0.62 (0.15 – 2.54)	0.51	1.32 (0.35 – 4.96)	0.67
Can you manage or do your employment work responsibilities remotely?				
No	Ref		Ref	
Yes	1.81 (0.90 – 3.66)	0.09	1.32 (0.83 – 2.38)	0.36
Does your employer allow you to take resources/ equipment home with you to support working from home?				
No	Ref		Ref	
Yes	2.39 (1.17 – 4.88)	0.01	1.92 (0.98 – 3.77)	0.06

When we conducted multivariate analysis on vaccine hesitancy (Table 3), we found that those who are divorced or separated were six times more likely to get vaccinated given the opportunity as compared to those who are married (OR 6.60 [95%CI 1.21 – 35.78], $p < 0.03$); those with education above Grade 12 were more than two and a half times as likely to get vaccinated given the opportunity as compared to those with up to a Grade 12 education (OR 2.39 [95%CI 1.35 – 4.25], $p = 0.003$). Getting information about vaccination for COVID-19 from government or health authority, radio and social media each significantly reduced the likelihood of taking the vaccine given the opportunity as compared to those who sourced it from the workplace. Those who were optimistic about the future of their employment were more than twice likely to take the vaccine given the opportunity as compared to those who were neither optimistic nor pessimistic of their future employment (OR 2.17 [95%CI 1.07 – 4.39], $p = 0.03$).

Discussion

The aim of this study was to assess the incidence of COVID-19 vaccine hesitancy among wholesale and retail service workers with underlying health conditions. We found that vaccine hesitancy was high at 66 percent (n=147) of participants with underlying medical conditions. Vaccine acceptance in our study population was not so different from what was found by Hoy et al. 2021, in PNG, but is much lower than studies have shown in general populations in other countries, such as South Africa where acceptance reported in surveys were high in the 52 percent to 82 percent rates (Cooper et al., 2021). Many factors could explain these differences. Firstly, the vaccine hesitancy has varied greatly over the time of the pandemic globally depending on the availability of vaccines, perceptions of safety and effectiveness, and information available to the masses (Nossier, 2021).

Secondly, global vaccine rollout has had significant disparities particularly in the less developed countries. With a slow rollout, it can be difficult to ascertain vaccine hesitancy, since vaccine acceptance is a factor of, among others, its availability. The presence of documented evidence to show that vaccination uptake reduces transmission will go a long way to promote vaccination campaigns (Verger & Peretti-Watel, 2021). This is even stronger when the evidence is local figures, or even better household or community testimonials that act as role models for propagating the right message. In the US and UK, hesitancy was very high on the onset of the vaccine rollout, but over time, the hesitancy rates have dropped (Nossier, 2021). There is hope therefore, that with more availability of vaccines in PNG, the hesitancy would drop.

Vaccine hesitancy was also strongly associated with education level. Those with higher than Grade 12 education were more than twice likely to take the vaccine given the opportunity as compared to those with Grade 12 and lower education levels. They were also more than twice likely to be vaccinated compared to those Grade 12 and lower. These findings corroborate other studies' findings on correlates of lower educational level and COVID-19 vaccine hesitancy (Lin et al., 2020; Rhodes et al., 2020; Schwarzingler et al., 2021). This finding suggests that consideration should be given to increase the quality and access to information on COVID-19 vaccine targeting those with lower levels of education, if we are to minimise hesitancy or increase vaccination rates. Studies have also shown that with time, the hesitancy rates shift and depending on the content of the news sources, may shift away from hesitancy and towards wanting to vaccinate (Freeman et al., 2021). In their study, Freeman et al. observed that highlighting personal benefit was more effective than emphasising collective benefit especially for those who were strongly hesitant to take up available vaccine.

In our study population, there was no systematic pattern observed on the distribution of sources of COVID-19 vaccine information. As a result, the population was at the mercies of whatever source and quality of information they encountered and also, what has their greatest influence on their decision-making. There was, therefore, an important opportunity for sustained educational campaigns using all available media to increase positive messaging of COVID-19 vaccines and hopefully this increases the acceptability among the vulnerable. Studies have shown for example that the Middle East has some of the lowest COVID-19 vaccination acceptance rates as a result of widespread beliefs in conspiracy theories in the region (Nossier, 2021).

Sources of information that build a lack of trust or misinformation can contribute significantly to low rates of acceptance (Lucia et al., 2021). In our study, the significant sources of information on vaccination that influenced vaccine hesitancy included government ministry sources, social media and radio. This highlighted the unlimited nature, quality and adequacy of the information available to the public or maybe even competing information. These influential sources of information call for better strategies to reach the masses with information in PNG, as is the case worldwide, to counter whatever negative messaging is causing the hesitation, including conspiracy theories, myths about the vaccine and anti-vaccine beliefs (Khan et al., 2020; Ullah et al., 2021). It's a herculean task, given that societies generally have a distrust of government, research institutions and pharmaceutical industries, hence in the incidence of a pandemic, there is the need to have a consistent, clear and transparent information on the pandemic (Hakim, 2021). Some 12 percent of our study's respondents expressed the desire to access correct information as one of their top three concerns during the pandemic. Having active messaging handles on social

media, radio and other government outlets would go a long way in addressing the desire to having access to correct information about COVID-19. From our study, workers who access information on COVID-19 at their workplace were more likely to accept COVID-19 vaccine. Thus, if highly respected people in the society such as religious leaders and community heads would be engaged to lead the campaign for COVID-19 vaccination in PNG, it may reduce the hesitancy rates.

We found that about a quarter of respondents with pre-existing medical conditions had received one or both shots of the COVID-19 vaccine, which was much higher than the general PNG population at the time of the study at less than 2 percent (Ritchie et al., 2020). It is important that these vulnerable populations are protected at all ages, as they were at much greater risk of severe disease after SARS-CoV-2 infection (Delgoffe, 2022). As already mentioned, the low coverage in PNG was also a result of the global disparities in making vaccine distribution available to the global South.

Vaccine hesitancy was also strongly associated with how much responsibilities one had in their households, provision of personal protective equipment at their workplace, their level of optimism about future employment, and how they felt their household responsibilities affected their ability to focus at work. Studies have shown that there have been dramatic shifts in the routines of family life during the COVID-19 pandemic including children staying home from school, alongside parents who were either laid off/ furloughed or working from home or the disruptions that come as a result of a loss and grief in the family as a result of COVID-19 infection (Prime et al., 2020). This shift in the routines, work situation and together with the availability of PPEs influenced either positively or negatively their perceptions of the risks of COVID-19 infection.

Other studies have found that the characteristics that influenced vaccine acceptance included age, employment status, urbanicity, and geographical location (Cooper et al., 2021). In our present study, the factors such as education level stood out, which goes to show that the characteristics are dynamic and not set in stone. Indeed, the factors that inform people's beliefs include culture, personal background, education, religion, economic status, and life experiences, not just the information available to them (NDoH, 2021). Suddenly, issues of vaccination that hitherto were confined largely to medical, vaccinologists, epidemiologists, and other interested scientific communities has now become a public forum discussion, which in itself presented a lot of challenges. Our intervention will still require that those responding to the pandemic remain focused on building the public trust. This trust can be built through transparent information on how vaccines were made, how they work, what they contain, how they were tested and introduced to masses, their effectiveness, possible risks and side effects (Khan et al., 2020).

Conclusion

In conclusion, vaccine hesitancy was high in our study population and was associated with the availability of information on the vaccine and the pandemic. Intervention will, therefore, need to target the perceptions people have on the safety and effectiveness of the vaccine in addition to making the vaccine widely available. There is need to engage respected members of community leadership who will help with the quality information dissemination on the vaccine and its uptake, thereby helping minimise vaccine hesitancy. Such influential role models could include religious leaders as well as community leaders. The slow rollout of vaccination programs especially in the global South presented an additional opportunity for renewed advocacy for equitable distribution of the vaccines, since no one is safe from COVID-19 until all of us are safe.

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Appendix

Table A 1: List of survey questions (and variables) relevant for this study

Variables Assessed:
Gender
Age-group (in years)
Marital Status
Ethnicity
How many other people live in your household?
Highest level of education completed
Which of these places best describe where you live and work?
Occupational group
Section of company you normally work in
Gross income per fortnight
Since start of pandemic, which one reflects your employment workload?
Reasons for lower-than-normal workload
If higher than normal, what did the business do to accommodate the higher-than-normal workload?
Were you or any of your work colleagues in the department laid off or furloughed?
Which of the following best describes your current employment status?
Have you received the first dose or both first and second doses of COVID-19 vaccine?
How would you rate the potential for exposure of the employees/workers in your section to COVID-19 infection?
Does your employer currently provide employees with any of the following equipment to reduce exposure to COVID-19?
Did you feel you had access to enough information to make decisions about the vaccine against COVID-19?
Your source of information about vaccination against the COVID-19
When a vaccine for COVID-19 becomes available, will you be willing to get vaccinated?
What are your top three concerns during this COVID-19 challenging times?
How do you feel about your future employment?
What is the challenge you are facing when it comes to supporting members of your household during the COVID-19 pandemic?
What level of threat do you think COVID-19 poses to you and/ or your family?
Do you have any of the following medical conditions?
How much do your household responsibilities affect your ability to focus on your work?
Can you manage/ do your employment work responsibilities remotely?
Does your employer allow you to take equipment home with you to work?





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