

Full Length Research Paper

Attitudes towards vaccines and intentions to vaccinate against COVID-19 among undergraduate students at the University of Zambia

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Negative attitudes regarding vaccines and unwillingness to accept vaccinations are major barriers to managing the COVID-19 pandemic. Therefore, this study assessed the attitudes towards vaccines and intentions to vaccinate against COVID-19 among undergraduate students at the University of Zambia. This cross-sectional study was conducted among undergraduate students from August to September 2021. Data were collected through a validated questionnaire using the Vaccination Attitudes Examination (VAX) scale, where higher scores denoted greater negative attitudes. Overall, 339 students responded to the questionnaire, of whom 78 (23%) had received the COVID-19 vaccine and 261 (77%) were not vaccinated. Overall, 185 (54.6%) of the respondents exhibited negative attitudes towards vaccines. 249 (73.5%) of the respondents expressed a highly negative attitude concerning worries about the unforeseen effects of vaccines, while 191 (56.3%) reported a moderately negative attitude about general mistrust of vaccine benefits. 135 (40%) of the respondents intended to receive the COVID-19 vaccine, 123 (36%) were unsure, and 81 (24%) were unwilling. Studying a health-related program (AOR: 1.8, CI:1.04-3.03), the third year of study (AOR: 3.4, CI:1.08-10.5), and having a low negative attitude towards vaccines (AOR: 3.6, CI:2.24-5.83) were significantly associated with the intention to vaccinate. In this study, more than half of the participants displayed a highly negative attitude towards vaccines and had a low intention to vaccinate against COVID-19. Since the majority of participants are future parents, there is a need to develop awareness that targets behaviour changes to address the negative attitude exhibited by the participants towards vaccines.

Key words: Vaccination, immunizations, attitudes, intentions, COVID-19, students, vaccine hesitancy.

INTRODUCTION

One of the most significant achievements of modern science is the prevention of infectious diseases by

vaccination (Greenwood, 2014; Sallam et al., 2022). However, the availability of vaccines and vaccination

programs does not guarantee that the desired effect of reducing the burden of infectious illnesses will be achieved unless many people use them (Sallam et al., 2022). High vaccine acceptability and uptake levels are required for any vaccination campaign to be successful (Rhodes et al., 2021). Furthermore, long-term management of vaccine-preventable diseases is hampered by negative attitudes about vaccines and hesitancy or unwillingness to get vaccinations (Al-Amer et al., 2022; Qiao et al., 2022). According to the Strategic Advisory Group of Experts on Immunization (SAGE) of the World Health Organization (WHO), vaccine hesitancy is defined as "a delay in accepting or refusing vaccination notwithstanding the availability of vaccination services" (MacDonald, 2015; Sallam, 2021).

Long-term control of the coronavirus disease pandemic 2019 (Covid-19) is dependent on vaccine uptake (Chou and Budenz, 2020). Covid-19 has been linked to over 500 million reported illnesses and over 6 million deaths worldwide, but as of April 2022, roughly 62% of the world's population had received at least one dose of the vaccine, with 54% having completed their primary vaccine (Hunter et al., 2022). The WHO African Region reported more than 3.9 million confirmed cases and 94,000 deaths as of the end of June 2021, which has risen to 8.7 million confirmed cases and over 170,000 deaths due to Covid-19 as of April 2022 (WHO). While several wealthier countries have reached 90% vaccine coverage, only around 11% of people in low-income countries have received at least one dose, and only 25% of the African population was fully vaccinated by November, just before the omicron wave (Hunter et al., 2022). Covid-19 affected all countries, including Zambia, a lower-middle-income country with an 18 million population.

According to the WHO, there were nearly 300,000 confirmed cases of Covid-19 in Zambia between January 2020 and January 2022, with nearly 4,000 deaths. The Covid-19 vaccines were first given out in Zambia in April 2021 (Carcelen et al., 2022). Over 1 million Covid-19 vaccine doses were administered by November 2021, with 3.7 million doses administered by April 2022 (WHO). In Zambia, 18% of the population has received at least one dose of the Covid-19 vaccine, and 13% have been fully vaccinated as of April 2022 (WHO).

Once Covid-19 vaccines became widely available to the global public, rallying demand for the vaccines became a significant challenge (Machingaidze and Wiysonge, 2021; Umakanthan et al., 2020). Some reported that up to 50% of the adult population in high-income nations was delaying or refusing the Covid-19 vaccination for themselves or their children (Fisher et al., 2020; Goldman et al., 2020). Globally, studies have been

conducted regarding the acceptability of the Covid-19 vaccination, with vaccine acceptance ranging from 55 to 89% in 19 nations, including 65% in Nigeria and 82% in South Africa (Lazarus et al., 2021). In Africa, studies have found individuals' intention to be vaccinated ranged from 15.4 to 55.9% among healthcare workers, medical students, and the general public (Ditekemena et al., 2021; Mudenda et al., 2022). This variation in intention could be due to past vaccination experiences and beliefs about the risks of Covid-19 disease and vaccine efficacy and safety (Carcelen et al., 2022). Fears regarding the vaccine's newness and potential adverse effects have been mentioned as reasons for intending not to receive the Covid-19 vaccine (Neumann-Böhme et al., 2020; Sherman et al., 2021). Several Covid-19 vaccines based on various technologies were authorized, and some individuals picked and chose their vaccines (Hasan et al., 2021; Heinz and Stiasny, 2021; Neumann-Böhme et al., 2020; Sherman et al., 2021). Currently, licenced Covid-19 vaccines have demonstrated outstanding safety and effectiveness records in various settings; however, sceptics still remain (Rossman et al., 2021). A good number of studies among university students in Romania, Italy, and Bangladesh have reported positive attitudes towards vaccination against Covid-19 (Bălan et al., 2021; Barello et al., 2020; Rahman et al., 2022). Studies suggest that very little research on attitudes towards vaccines and intentions to vaccinate against Covid-19 has been conducted in Africa (Bwire et al., 2022; Carcelen et al., 2022). Moreover, much research has not been conducted on the intention to vaccinate against Covid-19 among older adolescents and young adults in Africa (Afifi et al., 2021). This population is significant, as many will soon become parents and may be asked to immunize their children. In addition, a general negative attitude towards vaccines can impact parents' acceptance of childhood immunizations (Dubé et al., 2018; Napolitano et al., 2018). This study sought to assess attitudes towards vaccines in general and intentions to vaccinate against Covid-19 among undergraduate students at the University of Zambia.

METHODOLOGY

Study design, setting, and population

A cross-sectional study that assessed general vaccination attitudes and intentions to vaccinate against Covid-19 among undergraduate students was conducted. The paper-and-pencil survey was conducted at the University of Zambia in Lusaka, where previous studies reported that 24.5% of pharmacy students at the university would accept the vaccine should it be made available (Mudenda et al., 2022).

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Sample size

The sample size of 368 was determined using Slovin's formula, and the precision was set at 0.05 across the population of 4,500 registered students at the time of study. A complete list of students enrolled in each school was gathered, and each element of the list was allocated a random number using a table of random digits. The list was then sorted in ascending order, and the first n elements were chosen to participate in the survey, where n equals the sample size. The sample size was divided among all faculties using the proportion to size assumption. The survey was administered from August 1 to September 30, 2021.

Measure

The 12-item Vaccination Attitudes Examination (VAX) Scale questions were used to assess general negative attitudes towards vaccines (Thunström et al., 2020). Three items of the VAX scale were inverted, so the score was flipped as well in the results presentation in order to capture negative attitudes towards vaccines. Exhaustively, the items "I feel safe after being vaccinated", "I can rely on vaccines to stop serious infectious diseases," and "I feel protected after getting vaccinated" are envisioned to represent the aspect "mistrust of vaccine benefit" by adopting an inverse scoring. Participants were asked to answer questions about vaccines overall rather than about Covid-19 vaccines in particular. Responses were graded on a six-point scale (1 "strongly agree," 2 "agree," 3 "slightly agree," 4 "slightly disagree," 5 "disagree," and 6 "strongly disagree"). When reporting the results, we converted options 1, 2, and 3 to agree, while options 4, 5, and 6 were regarded as disagree. The 12-item VAX Scale questions had four subscales that had earlier been derived (Martin and Petrie, 2017; Paul et al., 2021). Questions 1 to 3 were about mistrust of vaccine benefits, 4 to 6 concerns about unforeseen future effects, 7 to 9 concerns about commercial profiteering, and 10 to 12 concerns about preference for natural immunity. The total VAX score ranged from 12 to 72, and the high VAX score revealed a high negative attitude towards the vaccines. We dichotomized the total VAX score into low and high negative attitudes towards vaccines using the mean score. The Cronbach's alpha for all four subscales was 0.73, and for the overall data collection instrument, it was 0.74, indicating that internal consistency in this sample was good. Each of the four subscales was divided into three ordinal variables based on levels of negative attitudes towards vaccines: high (a score of 5-6 on a scale of 1-6), intermediate (a score of 3-4), and low (a score of 1-2) negative attitude. The intention to get vaccinated against Covid-19 was based on one question: "How likely do you think you are going to get a Covid-19 vaccination since it is now available?" "1-very unlikely" to "6-very likely" were the response options. Vaccination intentions among unvaccinated students were categorized as follows: (0) to very likely to vaccinate (responses of 5-6), (1) unsure whether to vaccinate (responses of 3-4), and (2) unwilling to vaccinate (responses of 1-2). The survey also collected demographic characteristics of participants, including age, gender, year of study, religion, and whether they are studying in a health-related program.

Statistical analysis

STATA/BE version 15.1 (Stata Corporation, College Station, Texas, USA) was used to conduct the data analysis. We analyzed the data using descriptive (frequencies, percent, mean, and standard deviation) and inferential statistics. The Shapiro-Wilk test was used to test for normality, and continuous variables with a P-value of > 0.05 were considered to be normally distributed. We dichotomize vaccination intentions into intention (very likely) and unwillingness

(unsure and very unlikely) in order to determine the associated factors with the intention to vaccinate against Covid-19. We first performed univariable logistic regression analysis and independent variables with a P-value of < 0.2 were included in the multivariable logistic regression model to determine factors associated with the intention to vaccinate. The significance was set at a p-value of < 0.05 and the confidence interval at 95%.

Ethical clearance

Ethical clearance was obtained to carry out the research from the University of Zambia Health Sciences Research Ethics Committee (Ref: 202112030069). After hearing about the study's goals and projected benefits, participants signed a written and verbal agreement. Those who did not sign up did not take part in the study. Their participation was completely voluntary, and their privacy was assured prior to the study's completion. Participants were told that there were minimal risks involved in taking part in the study.

RESULTS

Demographic characteristics of the respondents

A total of 368 individuals received the questionnaire, and 339 responded (a response rate of 92%), of whom 78 (23% of respondents) had received the Covid-19 vaccine and 261 (77% of respondents) were not vaccinated (Table 1). The majority (221, or 65.2%) of the respondents were female, and most (269, or 79.4%) of them were in the age range of 18 to 24. One hundred and seventy-seven (52.2%) of the respondents were either in their 4th year or higher grade, and the majority (203, or 59.9%) were pursuing non-health-related programs. In this study, the majority of the respondents were Christians. A high proportion (133 (71.9%) of male respondents) displayed a high negative attitude towards vaccination [$P = 0.005$]. Additionally, the exhibition of a high negative attitude towards vaccines was high among students studying non-health-related courses [$P = 0.0001$]. Furthermore, 172 (93%) of the unvaccinated respondents showed a high negative attitude towards vaccines [$P = 0.0001$].

Proportion of responses to the 12-item negative vaccine attitude examination scale (n = 339)

When asked to respond to negative vaccine attitude statements (Table 2), more than half 187 (55.3%) of the respondents disagreed with the statement "I feel safe after being vaccinated" [mean score 3.5 (SD \pm 1.5)]. When the respondents were asked to respond to "I can rely on vaccines to stop serious infectious diseases", 189 (55.8%) agreed with the statement, and 3 (0.9%) of those who agreed with the statement were vaccinated students [mean score 2.9 (SD \pm 2.0)]. 209 (61.7%) of the respondents disagreed with the statement, "I feel protected after getting vaccinated," [mean score 3.6

Table 1. Sociodemographic characteristics of study participants: their negative attitude and intention to vaccinate (n=339).

Variable	Category	Total population	Intention to vaccinate (n=261)			Negative attitudes		
		n (%)	No, n (%)	Yes, n (%)	P-value	Low, n (%)	High, n (%)	P-value
Gender	Female	221 (65.2)	140 (69.0)	38 (65.5)	0.619	66 (42.9)	52 (28.1)	0.005
	Male	118 (34.8)	63 (31.0)	20 (34.5)		88 (57.1)	133 (71.9)	
Age	18-24	269 (79.4)	159 (78.3)	49 (84.5)	0.452	122 (79.2)	147 (79.5)	0.800
	25-30	65 (19.1)	41 (20.2)	9 (15.5)		29 (18.8)	36 (19.5)	
	>30	5 (1.5)	3 (1.5)	0(0.0)		3 (2.0)	2 (1.1)	
Year of study	1 st	25 (7.4)	19 (9.4)	4 (6.9)	0.73	8 (5.2)	17 (9.2)	0.230
	2 nd	82 (24.2)	46 (22.7)	17(29.3)		34 (22.1)	48 (26.0)	
	3 rd	55 (16.2)	29 (14.3)	15 (25.8)		23 (14.9)	32 (17.3)	
	>4 th	177(52.2)	109 (53.7)	22(37.9)		89 (57.8)	88 (57.6)	
Health related Courses	No	203 (59.9)	132 (65)	33 (56.9)	0.258	75 (48.7)	128(69.2)	0.0001
	Yes	135 (40.1)	71(35)	25 (43.1)		79 (51.3)	57 (30.8)	
Religion	Christians	332 (97.9)	201(99.0)	58 (100)	0.448	149 (96.8)	183 (98.9)	0.163
	Others	7 (2.1)	2(0.99)	0 (0.0)		5 (3.2)	2(1.1)	
Vaccinated	No	78 (23.0)	-	-	-	65 (42.2)	13 (7)	0.0001
	Yes	261(77)	203 (77.8)	58 (22.2)	-	89 (57.8)	172(93)	

Source: Authors

Table 2. Proportion of responses to 12-item negative vaccine attitude examination scale (n=339).

Statements†	STA (%)	A (%)	SA (%)	SD (%)	D (%)	STD (%)	Mean (SD)
1. I feel safe after being vaccinated ‡	43 (12.7)	70 (20.7)	39 (11.5)	88 (26.0)	70 (20.7)	29 (8.6)	3.5 (±1.5)
2. I can rely on vaccines to stop serious infectious diseases ‡	159 (46.9)	17 (5.0)	13 (3.8)	33 (9.7)	66 (19.5)	51(15.0)	2.9 (±2.0)
3. I feel protected after getting vaccinated ‡	34 (10.0)	61 (18.0)	35 (10.3)	96 (28.3)	94 (27.7)	195.6	3.6 (±1.4)
4. Although most vaccines appear to be safe, there may be problems that we have not yet discovered	135 (39.8)	150 (44.3)	35 (10.3)	4 (1.2)	6 (1.8)	9 (2.7)	5.1 (±1.1)
5. Vaccines can cause unforeseen problems in children	74 (21.8)	124 (36.6)	80 (23.6)	29 (8.6)	25 (7.4)	7 (2.1)	4.5 (±1.2)
6. I worry about the unknown effects of vaccines in the future	140 (41.3)	131 (38.6)	32 (9.4)	11 (3.2)	17 (5.0)	8 (2.4)	5.0 (±1.2)
7. Vaccines make a lot of money for pharmaceutical companies, but do not do much for regular people	68 (20.1)	92 (27.1)	70 (20.7)	39 (11.5)	50 (14.8)	20 (5.9)	4.1 (±1.5)
8. Authorities promote vaccination for financial gain, not for people's health	42 (12.4)	38 (11.2)	83 (24.5)	59 (17.4)	86 (25.4)	31 (9.1)	3.4 (±1.5)
9. Vaccination programs are a big con	32 (9.4)	71 (20.9)	42 (12.4)	46 (13.6)	119 (35.1)	29 (8.6)	3.3 (±1.6)

Table 2. Cont'd

10. Natural immunity lasts longer than a vaccination	76 (22.4)	115 (33.9)	50 (14.8)	41 (12.1)	48 (14.2)	9 (2.7)	4.3 (± 1.4)
11. Natural exposure to viruses and germs gives the safest protection	33 (9.7)	60 (17.7)	55 (16)	47 (13.9)	102 (30.1)	42 (12.4)	3.3 (± 1.6)
12. Being exposed to diseases naturally is safer for the immune system than being exposed through vaccination	48 (14.2)	76 (22.4)	49 (14.5)	64 (18.9)	81 (23.9)	21 (6.2)	3.7 (± 1.5)

STA=Strongly agree; A=Agree; SA= Slightly Agree; SD= Slightly disagree; D=Disagree; STD=Strongly disagree. [†]Responses were directionally flipped to capture negative attitudes towards vaccines.

Source: Authors

(SD \pm 1.4)] and 320 (94.4%) of the respondents also agreed to the statement "Although most vaccines appear to be safe, there may be problems that we have not yet discovered," including 13% (45) of students who had been vaccinated against COVID-19 [mean score 5.1 (SD \pm 1.1)]. Furthermore, 278 (82.0%) of the respondents agreed with the statement, "Vaccines can cause unforeseen problems in children" [mean score 4.5 (SD \pm 1.2)] and 303 (89.4%) agreed with the statement, "I worry about the unknown effects of vaccines in the future" [mean score 5.0 (SD \pm 1.2)]. The majority of students, 230 (67.8%), agreed that "Vaccines make a lot of money for pharmaceutical companies but do not do much for regular people," [mean score 4.1 (SD \pm 1.5)] while 176 (51.9%) disagreed with statements that "Authorities promote vaccination for financial gain, not for people's health" [mean score 3.4 (SD \pm 1.5)]. 194 (57.2%) of the respondents disagreed with the statement, "Vaccination programs are a big con", [mean score 3.3 (SD \pm 1.6)]. Moreover, 241 (71.1%) agreed that natural immunity lasts longer than a vaccination [mean score 4.3 (SD \pm 1.4)] while 191 (56.3%) of respondents disagreed with the statement "Natural exposure to viruses and germs gives the safest protection" [mean score 3.3 (SD \pm 1.6)]. Finally, 173 (51.0%) agreed with the statement "Being exposed to diseases naturally is safer for the immune system than being exposed

through vaccination" [mean score 3.7 (SD \pm 1.5)].

Overall negative attitude towards vaccines

Figure 1 shows the overall attitude of the respondents regarding their negative attitude towards vaccines. The total VAX scale score was 72, with a mean score of 47.6 (SD: ± 9). The respondent population was dichotomised into low negative attitudes towards vaccines with a mean score of < 47.6 and high negative attitudes towards vaccines with a mean score of \geq 47.6. Therefore, 185 (54.6%) and 154 (45.4%) of the students had an overall high and low negative attitude towards vaccines, respectively.

Proportion of the participants responding to the 4-item negative vaccine attitude examination subscale

Table 3 shows that 87 (25.7%) of the respondents expressed high and 191 (56.3%) reported moderate negative attitudes about general mistrust of vaccine benefits [mean score 3.4 (SD \pm 1.1)]. Concerning worries about unforeseen effects, 249 (73.5%) reported a high negative attitude, while 86 (25.4%) showed a moderate negative attitude [mean score 4.9 (SD \pm 0.9)]. Regarding concerns about commercial profiteering,

75 (22.1%) expressed a high negative attitude, while 203 (59.9%) expressed a moderate one [mean score 3.6 (SD \pm 1.2)]. Regarding preference about natural immunity, 81 (23.9%) reported a high negative attitude, while 214 (63.1%) expressed a moderately negative one [mean score 3.7 (SD \pm 1.1)].

Intent to vaccinate against COVID-19

This study showed that 135 (40%) of the respondents said they intended to receive the COVID-19 vaccine since it was available, compared with 123 (36%), who were unsure, and 81 (24%), who were unwilling (Figure 2).

Factors associated with the intention to vaccinate against Covid-19

In an unadjusted logistic regression model, pursuing health-related program (COR: 1.7, CI: 1.11-2.71) and having a low negative attitude towards vaccines (COR: 3.9, CI: 2.47-6.20) were significantly associated with the intention to vaccinate against COVID-19. When variables with p-value <0.2 were transferred into the adjusted logistic regression model, pursuing a health-related program (AOR: 1.8, CI: 1.04-3.03), the third year of study (AOR: 3.4, CI: 1.08-10.5), and

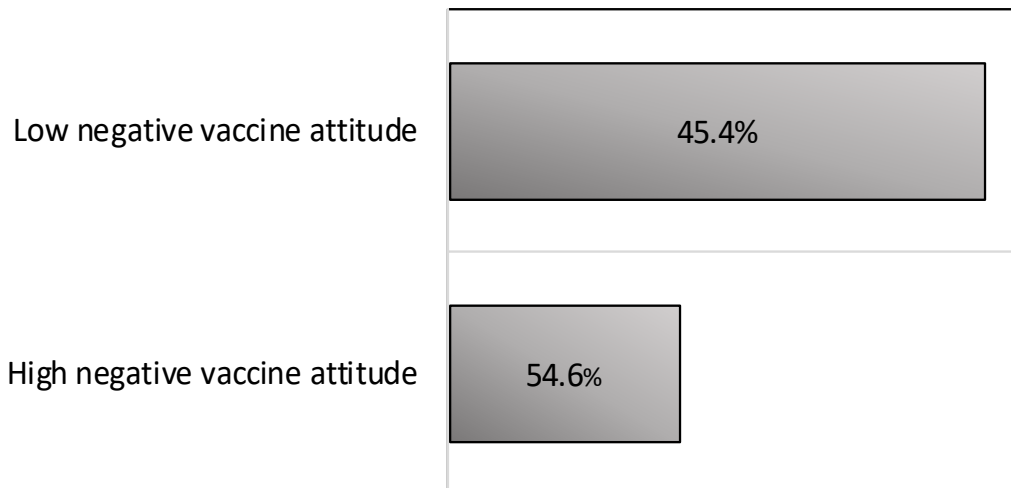


Figure 1. Overall negative attitude towards vaccine (n=339).
Source: Authors

Table 3. Proportion of the participants responding to 4-item negative vaccine attitude examination subscale (n=368).

Subscale	HNA (%)	INA (%)	LNA (%)	Mean (SD)
General mistrust of vaccine benefits	87 (25.7)	191 (56.3)	61 (18.0)	3.4 (±1.1)
Worries about unforeseen effects	249 (73.5)	86 (25.4)	4 (1.2)	4.9 (±0.9)
Concerns about commercial profiteering	75 (22.1)	203 (59.9)	61 (18.0)	3.6 (±1.2)
Preference about natural immunity	81 (23.9)	214 (63.1)	44 (13.0)	3.7 (1.1)

HNA: High negative attitude; INA: intermediary negative attitude; LNA: low negative attitude. *Responses were coded as (2) high (agree, strongly agree), (1) medium (slightly agree, slightly disagree), and (0) low (disagree, strongly disagree).
Source: Authors

How likely do you think you are to get a covid-19 vaccine since it is now approved?

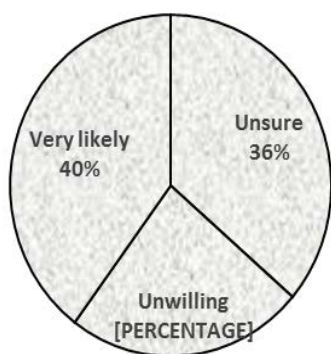


Figure 2. Intent to vaccinate against COVID-19 (n = 261).
Source: Authors

intention to vaccinate, shown in Table 4.

DISCUSSION

This study assessed the attitudes towards vaccines and intentions to vaccinate against Covid-19 among undergraduate students at the University of Zambia. Our findings illustrate the high prevalence of negative vaccine attitudes among undergraduate students at the University of Zambia. Most of our respondents had either a high or moderately negative attitude towards the statements. This finding is an important red flag for educational and public health authorities to better understand vaccine hesitancy in this population and improve student health education. The results are particularly concerning as we asked about vaccines in general, where such negative attitudes are likely to affect people's uptake of vaccines. Since most of these young adults will soon become parents and may be asked to immunize their children, it is essential to build vaccine confidence in this population.

In this study, 54.6% of the respondents expressed a

having a low negative attitude towards vaccines (AOR: 3.6, CI: 2.2-4.83) were significantly associated with the

Table 4. Factors associated with intention to vaccinate against covid-19.

Variable	Category	Unadjusted			Adjusted		
		COR	95% CI	P-value	AOR	95% CI	P-value
Gender	Male	1					
	Female	1.1	0.43-1.09	0.103	0.84	0.51-1.40	0.513
Age	18-24	1					
	25-30	0.9	0.49-1.50	0.595	-	-	-
	<30	1.0	0.16-5.95	0.981	-	-	-
Religion	Christians	1					
	Others	3.9	0.74-20.31	0.108	2.4	0.43-14.2	0.312
Health related program	No	1					
	Yes	1.7	1.11-2.71	0.014	1.8	1.04-3.03	0.037*
Year of Study	1 nd	1					
	2 rd	2.4	0.85-6.52	0.098	2.7	0.90-8.07	0.075
	3 th	2.8	0.98-8.20	0.054	3.4	1.08-10.5	0.035*
	>4 th	2.0	0.75-5.19	0.167	1.5	0.54-4.17	0.431
Negative attitude towards vaccine	High	1					
	Low	3.9	2.47-6.20	0.0001	3.6	2.24-5.83	0.0001*

Source: Authors

highly negative attitude towards vaccines overall. When we comparing our findings to those of studies conducted in Kuwait, we discovered that 57.2% had a strong negative attitude towards vaccines (Alibrahim and Awad, 2021). In the current study, 55.3% of the respondents disagreed that they would feel safe after being vaccinated, and 94.4% of the respondents agreed that "even though most vaccines appear to be safe, there may be problems that we have not yet discovered," including 13% of students who had been vaccinated against Covid-19. This indicates substantial concern about the safety of vaccines among students in Zambia. Other studies with similar findings revealed that participants' worries about safety were the primary factors influencing their decisions not to take the Covid-19 vaccine (Schwarzinger et al., 2021; Zaidi et al., 2021). In addition, 82.0 and 71.1% of respondents agreed that vaccines can cause unforeseen problems in children and that natural immunity lasts longer than a vaccination, respectively. The negative attitudes towards vaccines displayed in these two statements are high compared to other studies (Alibrahim and Awad, 2021; Martin and Petrie, 2017; Zaidi et al., 2021). These results highlight the need to institute health education programs at universities and other venues targeting young adults to build confidence in vaccine safety and efficacy. One study conducted among Egyptian medical students showed that 74.8% of students had insufficient information regarding the Covid-

19 vaccine (Saied et al., 2021). Schools, from elementary to university, need to do a better job of incorporating health and vaccination into the curriculum to build awareness and trust. In the current study, students studying non-health-related courses displayed a high negative attitude towards vaccines. This is supported by studies conducted in the USA and Ethiopia that revealed that health profession students showed greater positive attitudes about vaccination (Keckojevic et al., 2021; Aklil and Temesgan, 2022). Therefore, there is a need to enhance awareness about the importance of vaccination among students pursuing non-health-related programs. Some studies have found that males display more positive attitudes towards vaccine, and subsequently increasing the likelihood of intention to vaccinate against infection (Bell et al., 2020; Wang et al., 2020). Like in earlier studies, men in our study have higher positive attitudes towards vaccine.

Comparing the current results with a study conducted in Kuwait using the four subscales of the VAX scale, the study revealed that the proportion of respondents who expressed a high level of negative attitude towards vaccines was higher than in the Kuwait study (Alibrahim and Awad, 2021): mistrust of vaccine benefit (25.7% vs. 17.7%), worries over unforeseen future effects (73.5% vs. 40.9%), concerns about commercial profiteering (22.1% vs. 17.2%), and preference for natural immunity (23.9% vs. 22.0%). The aforementioned findings in our study

demonstrate the necessity of enhancing public perceptions of vaccines generally through efficient educational programs.

Specific to the Covid-19 vaccine, we found that only 23% of the students had taken the vaccine at the time of the study. This alarming result is supported by the study conducted in the USA among college students in New Jersey, in which 23% of the students had already received the Covid-19 vaccine (Kecojevic et al., 2021). In the current study, 40% of participants who were not vaccinated by September 30, 2021, intended to be vaccinated against Covid-19. This is significantly lower than the 52.8% reported in the USA (Kecojevic et al., 2021), the 57.8% reported in Palestine (Kateeb et al., 2021), the 58.0% reported in France (Tavolacci et al., 2021), the 79.6% reported in Canada (Mant et al., 2021), and the 94.7% reported in Italy (Pastorino et al., 2021) among students. Several studies have suggested that vaccination intentions may vary by geography and pandemic stage (Dodd et al., 2021; Reiter et al., 2020). This study also showed that 36 and 24% of unvaccinated students were unsure and unwilling to vaccinate against Covid-19, respectively. Other studies conducted in France, India, and Italy reported a lower proportion of vaccine hesitancy among university students than in our study (Barello et al., 2020; Jain et al., 2021; Tavolacci et al., 2021). Compared to students in upper-middle- and high-income countries, reports have revealed that students in low- and lower-middle-income countries, especially in Africa, reported much greater Covid-19 vaccine hesitancy (Riad et al., 2021a).

The present study identified some predictors of intention to vaccinate against the Covid-19 infection. The intention to vaccinate was found to be significantly high among third-year students. This finding is in line with what was reported by other studies, in which high vaccine acceptance tended to be in later school years (Riad et al., 2021a; Sovicova et al., 2021). Additionally, this study revealed that studying health-related programs was significantly associated with the intention to vaccinate. This agrees with studies conducted among Czech University and Chinese college students that showed that students in non-health-related programs had significantly higher levels of vaccine hesitancy (Riad et al., 2021b; Bai et al., 2021). Greater awareness of the significance of Covid-19 vaccinations in disease prevention may be the cause of the higher vaccine intention rate among UNZA students in health-related courses compared to those in other courses (Albaqawi et al., 2020). Additionally, a lot of students taking health-related classes sometimes have to go to hospitals and other medical facilities for primary care. Since they believe they are more likely to contract an infection than other students, they perceive a greater need for immunization to protect their health. However, a study that was conducted in Italy found no differences between healthcare and non-healthcare students (Barello et al., 2020). The current study also showed that an overall low negative attitude towards vaccines was

associated with a higher likelihood of receiving the vaccine. This is in line with other studies that found that positive attitudes towards vaccination are strongly associated with the intention to receive the Covid-19 vaccine (Kecojevic et al., 2021; DeRoo et al., 2020; Sagara et al., 2009). According to earlier studies, discussion with health providers is one of the major factors influencing vaccination behaviour. Therefore, strong advice from health professionals and educators may be necessary to encourage university students to get their vaccines. Although intentions and behavior are related (Arkes et al., 1991), it is crucial to remember that intentions do not always translate into vaccination uptake (Maurer, 2016; Ye et al., 2021). Monitoring temporal shifts in vaccine acceptance and uptake will therefore be crucial.

As with any study, this one had some limitations. First, our study was limited to university students, a group that may not be representative of Zambia's students or young adults in the same age group. We tried to minimize sampling bias among our university student population by recruiting respondents across school years and areas of study. Second, our sample was recruited exclusively from Lusaka, the capital, restricting generalizability across more rural areas.

Further studies comparing differences across the population may be warranted. Third, as with other surveys, the data was self-reported, which could have resulted in social desirability bias. The VAX scale questions were previously validated, and the survey was completed in private. Fourth, this study was conducted in the midst of the Covid-19 pandemic, from August 1 to September 30, 2021. As a cross-sectional study, we are not able to examine changes in vaccination attitudes and Covid-19 vaccination uptake over time. Despite these limitations, our results demonstrate a high level of negative attitude towards vaccines and low intention to vaccinate against Covid-19 in young adults in Zambia, which calls for further attention.

Conclusion

Findings of high levels of negative attitudes toward vaccines and low intentions to vaccinate against Covid-19 among undergraduate students are alarming and call for public health professionals and educators to work on building vaccine confidence in young adults in Zambia. There is a need to raise awareness that focuses on behavior change to address the participants' negative attitude towards vaccines and improve their intention to vaccinate against Covid-19 because the majority of participants are prospective parents.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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