

## COVID-19 Vaccine Hesitancy in Zambia: A Qualitative Study among Pharmacy Students at the University of Zambia

Steward Mudenda<sup>1\*</sup><sup>1</sup>University of Zambia, School of Health Sciences, Department of Pharmacy, P.O. Box 50110, Lusaka, ZambiaDOI: [10.36347/sajp.2022.v11i11.003](https://doi.org/10.36347/sajp.2022.v11i11.003)

| Received: 07.11.2022 | Accepted: 15.12.2022 | Published: 30.12.2022

\*Corresponding author: Steward Mudenda

University of Zambia, School of Health Sciences, Department of Pharmacy, P.O. Box 50110, Lusaka, Zambia

## Abstract

## Original Research Article

**Background:** The coronavirus disease 2019 (COVID-19) vaccines were introduced to contain the ongoing COVID-19 pandemic. However, there have been challenges regarding the acceptance and uptake of these vaccines in Zambia. The study aimed to explore the factors that contribute to COVID-19 vaccine hesitancy among pharmacy students in Zambia. **Materials and Methods:** This was a cross-sectional study that employed qualitative methods using a phenomenological approach. The study was conducted among 20 undergraduate pharmacy students schooling at the University of Zambia. The interviews were recorded in a semi-structured questionnaire and responses were analysed using Colaizzi's seven-step analysis method. The analysis was based on factors that influence COVID-19 vaccine hesitancy and the student's thoughts about the vaccines. The responses were divided into five themes: fear of potential adverse effects, the ineffectiveness of COVID-19 vaccines, fear of being used as experiments, preventive measures better than COVID-19 vaccines and the need for better education on the benefits and adverse effects of COVID-19 vaccines. **Results:** The findings indicate increased hesitancy against COVID-19 vaccines among pharmacy students in Zambia. Most participants were hesitant to receive the vaccine due to fear of experiencing adverse effects. Besides, there was also a concern about vaccine effectiveness in protecting individuals against COVID-19. Further, the students felt that the COVID-19 vaccines did not pass through all the necessary stages of vaccine development due to the short period they were introduced. Furthermore, the participants had fear of being used in experiments such as clinical trials. The students felt that adhering to the recommended COVID-19 prevention measures was better than being vaccinated. **Conclusion:** The hesitance against COVID-19 vaccines among pharmacy students was a result of many factors. The concern regarding potential adverse effects and effectiveness of vaccines needs to be addressed before vaccines are deployed and administered. Healthcare authorities must provide vaccine awareness campaigns in institutions of higher learning as this may improve the COVID-19 vaccine acceptance rate. **Keywords:** COVID-19 vaccines, pharmacy students, qualitative methods, vaccination, vaccine acceptance, vaccine hesitancy, Zambia.

Copyright © 2022 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

### BACKGROUND

Pandemics are a public health problem that causes deleterious effects across the globe [1–4]. The coronavirus disease 2019 (COVID-19) has led to negative effects, including increased morbidity and mortality across all populations [5–8]. Due to these effects, collaborations among countries emerged in the search for solutions to this problem [9,10]. Thus, there was a need to develop, deploy and administer COVID-19 vaccines across all countries as a strategy to address the pandemic was instituted [11, 12].

Vaccines are useful in promoting immunity against preventable infectious diseases [13]. Studies

have reported better patient outcomes in those who received the vaccine compared to the unvaccinated [14–17]. However, there has been variability in acceptance rates of COVID-19 vaccines [18–21]. Some previous studies have reported inconsistencies in vaccine acceptance rates and hesitancy among students [22–26]. Besides, COVID-19 vaccine hesitancy has been reported in the general population and it can hinder the goals of vaccination programmes [19–21, 27–33].

Vaccine hesitancy is a barrier to vaccine uptake that requires much attention [34, 35]. This is also true for healthcare students as they are future healthcare professionals [36, 37]. Additionally, it is critical to understand the factors that contribute to

vaccine hesitancy [38, 39]. This may be helpful in the development of strategies that can be employed to improve vaccine uptake [18]. Additionally, health education should be prioritised across populations addressing all socio-demographic factors that affect vaccine uptake [40, 41]. Therefore, there is a need to provide adequate information on the factors that have contributed to vaccine hesitance, such as concerns regarding side effects and the effectiveness of COVID-19 vaccines [42–44].

In Zambia, there is a lack of research that has been done using qualitative methods to assess the factors that contribute to vaccine hesitancy, more especially among pharmacy students who happen to be future custodians and experts in drug and vaccine development. Therefore, this study explored the factors that contributed to vaccine hesitancy among pharmacy students at the University of Zambia. The findings of this study may be used to formulate and implement intervention programmes that address vaccine hesitancy among students.

## MATERIALS AND METHODS

### Study Design, Site and Inclusion Criteria

This was a qualitative cross-sectional study that was conducted using a phenomenological approach among undergraduate pharmacy students at the University of Zambia. The study involved undergraduate pharmacy students who were not vaccinated from the time COVID-19 vaccination programmes were rolled-out in Zambia. Therefore, to be eligible, all participants were to be registered in the undergraduate program of Bachelor of Pharmacy at the University of Zambia.

### Sample Size and Selection of Participants

Participants were selected from a population of undergraduate pharmacy students. In qualitative research, a minimum of 10 participants is recommended [45]. A purposive sampling method was used to select the participants. The selection of participants was done continuously until the saturation point (redundancy) was reached. Therefore, this meant that at saturation point, further interviews led to similar answers obtained from other participants. Hence, sampling was stopped when the saturation point was reached.

### Data Collection

Data were collected using face-to-face interviews and recorded in data entry sheets. The participants were asked about their awareness of the COVID-19 vaccine and willingness to be vaccinated. Data collection was conducted by the principal researcher and two research assistants. The research assistants were trained on how to enter data in data collection sheets.

### Procedure of Interviews

This study utilised a semi-structured interview guide to collect data from the participants. The

interview guide was developed from previous literature and verified by experts in public health.

Some information that was collected included the participants' age, gender, marital status, employment status, residence, and the source of information on COVID-19 vaccines. In addition, the participants were asked “Would you accept to be vaccinated if the COVID-19 vaccine is made available to you?”, “Why would you refuse to be vaccinated?”, “Are the recommended COVID-19 prevention measures better than COVID-19 vaccines?”, and “Would you like to learn more about the importance of COVID-19 vaccinations? This study utilised two steps in the data collection process: firstly, the potential participants were identified using the inclusion criteria; secondly, the potential participants were invited to participate in the face-to-face interviews that lasted for 20 to 30 minutes. The principal researcher interviewed the participants while the assistant researcher took notes. The non-verbal behaviours of participants were also observed.

### Main Themes

The following themes were developed and used in this study: concerns regarding adverse effects, concerns regarding vaccine effectiveness, fear of being used in COVID-19 experiments, adherence to the prevention measures are more effective in preventing infections than the COVID-19 vaccines, and the needs observed by the principal researcher.

### Analysis Strategy

The principal researcher went through the responses and made corrections within 48 hours of the interviews. The researcher also checked for the uniformity of the texts. Data analysis was conducted using Colaizzi's seven-step descriptive phenomenological method [46]:

1. Familiarisation and transcribing of data based on the responses provided by the students.
2. Identification and extraction of significant statements. The transcripts were carefully read and re-read to ensure the researchers were familiar with all the content. The principal and assistant researcher separately analysed the transcribed text and selected meaningful statements from the data.
3. Creating formulated meanings. The principal and assistant researcher separately summarised and refined the meanings to develop common characteristics.
4. Aggregating formulated meanings into theme clusters. The principal and assistant researcher combined their results to develop themes.
5. Developing an exhaustive description. All themes were connected back to the interview data to obtain complete descriptions.
6. Identifying the fundamental structure of the phenomenon. We identified the two pathways

to describe the psychological experience of pharmacy students during the COVID-19 epidemic in Zambia: some of the difficulties they experienced and the psychological interventions they needed.

7. Returning to participants for validation. The obtained results from the analysis were returned to the participants for verification and revision.

## RESULTS

**Table 1: Socio-demographic characteristics of participants**

Number	Gender	Age	Marital	Employment	Residence	COVID-19 vaccine information
1	Female	27	Single	Unemployed	Urban	Internet
2	Male	20	Single	Unemployed	Urban	Internet
3	Female	40	Single	Employed	Urban	HCWs
4	Female	28	Married	Employed	Urban	Internet
5	Male	23	Single	Unemployed	Per-urban	Internet
6	Female	21	Single	Unemployed	Urban	Internet
7	Female	20	Single	Unemployed	Peri-urban	Internet
8	Female	25	Single	Unemployed	Urban	Internet
9	Male	28	Single	Unemployed	Rural	HCWs
10	Female	33	Married	Employed	Urban	Internet
11	Male	27	Single	Unemployed	Peri-urban	Internet
12	Female	22	Single	Unemployed	Rural	Internet
13	Female	26	Married	Employed	Urban	Internet
14	Female	23	Single	Employed	Urban	Internet
15	Male	22	Single	Unemployed	Rural	Television
16	Male	27	Single	Unemployed	Urban	Internet
17	Male	25	Single	Unemployed	Urban	Internet
18	Female	33	Married	Employed	Peri-urban	Television
19	Male	24	Single	Unemployed	Urban	Television
20	Male	20	Single	Unemployed	Urban	Internet

In total, 20 undergraduate pharmacy students from Zambia participated in this study after being told the purpose and benefits of the study. Redundancy was reached at 20.

The main factors that led to COVID-19 vaccine hesitancy among pharmacy students included being concerned about the safety and effectiveness of

COVID-19 vaccines, the short period of vaccine development, fear of being used as experiments and perceiving preventive measures to be more effective than COVID-19 vaccines. The increased vaccine hesitancy among pharmacy students requires interventions that will help increase COVID-19 vaccine acceptance and uptake.

**Table 2: The main categories and subcategories of factors that lead to vaccine hesitancy among pharmacy students**

Main categories	Subcategories
Concerns regarding adverse effects	Concerns about short-term adverse effects Concerns about long-term adverse effects
Concerns regarding vaccine effectiveness	Concerns about the proven effectiveness of vaccines Perception of vaccines as being ineffective
Fear of being used in COVID-19 experiments	The short period of vaccine development COVID-19 vaccines have not passed through all stages of clinical trials
Preventive measures are more effective than the COVID-19 vaccines	Adhering to preventive measures is more effective than COVID-19 vaccines
Needs observed by the principal investigator/researcher	High hesitancy against COVID-19 Lack of knowledge and confidence in COVID-19 vaccines Beliefs and misinformation from social media increase vaccine hesitancy Strategies are required to increase acceptance of COVID-19 vaccines

### **Concerns about the Adverse Effects of COVID-19 Vaccines**

#### **I am Worried about the Short and Long-Term Adverse Effects of COVID-19 Vaccines**

The pharmacy students were concerned about the possible adverse effects of COVID-19 vaccines. Many students were worried about the potential short-term and long-term adverse effects of vaccinations.

"I am concerned about the adverse effects of COVID-19 vaccines. I have seen some people who received the vaccine and became paralyzed" (Student 3).

"I do not think the vaccine is safe, I read on the internet how it has caused adverse effects on those who got vaccinated" (Student 5).

"Rumour has it the COVID-19 vaccine is not effective and causes adverse effects such as blood clots. I am hesitant to receive the vaccine due to the surfacing adverse effects recorded in some populations. I.e. blood coagulation." Therefore, I would rather continue wearing face masks than being vaccinated" (Student 7).

"I cannot receive the vaccine because the vaccine has not undergone proper new medicines trials in Zambia or locally for safety approval for use among the Zambian citizens. The use of vaccines is a great idea, however, but taking vaccines that have not undergone all clinical trial stages is dangerous" (Student 9).

"After all the conspiracy theories that have been raised concerning the COVID-19 vaccines, taking it would be considered a risk to oneself. And also the adverse effects of the vaccines on people who have been vaccinated have raised a lot of concerns on the internet and make vaccines seem like a bad thing. More awareness of the vaccine is needed" (Student 15).

"I refuse to be vaccinated because there is little information regarding the safety of the vaccines. The vaccines are said not to be 100% safe and can lead to other conditions" (Student 19).

#### **Concerns Regarding Vaccine Effectiveness COVID-19 are Said to be Ineffective**

"I cannot be vaccinated because the vaccines have come too soon and this makes me have concerns about their safety and effectiveness and whether the clinical trials were conducted efficiently. However, the COVID-19 vaccines are important to combat the spread of the disease but guaranteeing their safety for human use is equally important" (Student 13).

"There is less evidence on the safety and effectiveness of COVID-19 vaccines" (Student 18).

### **Fear of being used in Experiments Regarding COVID-19 Vaccines**

#### **COVID-19 Vaccines have not Passed Through all the Stages of Clinical Trials**

"I do not want to be a part of an experiment. Therefore, I refuse to be vaccinated" (Student 2).

"I am unwilling to be vaccinated because I feel the studies that were done on the vaccine are not sufficient for approval" (Student 6).

"I cannot be vaccinated because the COVID-19 vaccines have not undergone all the stages of clinical trials to ascertain their safety" (Student 10).

"I do not think the vaccines have met the full criteria to be given as vaccines due to the short period the vaccines were developed and approved" (Student 11).

"I am hesitant to receive the vaccine because the vaccines have not passed through all the necessary tests to ensure their safety and effectiveness and thus the adverse effects may not be known whether short or long term. The vaccine should be tested thoroughly especially adverse effects and effectiveness because we are looking at the health of people around the world which happens to be a very large scale" (Student 12).

"I am not willing to receive the COVID-19 vaccine because the vaccines were developed faster than usual, meaning that certain stages were accelerated" (Student 14).

"I doubt if I will be vaccinated because these vaccines were not studied for a long period to know their adverse effects with time. Instead, the use is based on just scientific predictions on the outcomes depending on what has been scientifically observed" (Student 17).

### **The Recommended Preventive Measures are More Effective than the COVID-19 Vaccines**

#### **Adhering to Preventive Measures is better than Receiving COVID-19 Vaccines**

"There are too many theories about the COVID-19 vaccines, it is hard to judge which one is reliable. Hence, I cannot accept to be vaccinated. I feel preventive measures are safer than the vaccine" (Student 1).

"I do not trust the source of the COVID-19 vaccine; this makes me unwilling to be vaccinated. I will continue following the recommended preventive measures" (Student 4).

"I am concerned for safety reasons because I am not sure about the source of the COVID-19 vaccines. The recommended COVID-19 preventive measures are enough for now; there is a need for further

research on COVID-19 vaccines and medicines" (Student 16).

"I am hesitant to be vaccinated because I do not think the vaccines were properly processed, thus, I am concerned about their safety. Therefore, I do rather continue wearing masks and adhering to other preventive measures" (Student 20).

### Needs Observed by the Researcher

Since the students were aware of the COVID-19 vaccines but scared to be vaccinated due to various reasons, it would be important that governments and healthcare authorities provide educational and sensitisation programmes in institutions of higher learning on the importance of vaccination against COVID-19. Further, there is a need to strengthen the curricula regarding containing disease outbreaks using vaccines.

## DISCUSSION

This study explored the factors that contributed to COVID-19 vaccine hesitancy among pharmacy students in Zambia. More than half, 75% (n=15) of the participants accessed information regarding COVID-19 vaccines through the internet. The findings showed that concerns about the adverse effects and effectiveness of vaccines, as well as fear of being used in experiments, were the main factors that caused the students to be hesitant to receive the COVID-19 vaccine.

This study found that most participants accessed information about COVID-19 through the internet. Currently, the internet happens to be the main source of information regarding COVID-19 vaccines for students and healthcare workers [19]. Some channels of information such as the internet have been used by many individuals to spread misinformation about COVID-19 vaccines [19, 47]. A study in Kenya among youths found that social media was the most source of information about COVID-19 vaccines but promoted vaccine hesitancy [48]. These findings were also reported in the United Arab Emirates (UAE) [24] and Ethiopia [49] in which university students accessed misinformation about COVID-19 vaccines on social media, leading most of them to be vaccine-hesitant. This shows that social media is very critical in the spread of both correct and wrong information about COVID-19 [24, 48].

The fear of experiencing side effects was among the major causes of vaccine hesitancy among the pharmacy students who participated in this study. These findings corroborate reports from other studies in which the students were hesitant to receive the COVID-19 vaccine due to concerns about their risk of causing side effects [22, 50–54]. In China, a study reported similar findings in which the students who were hesitant to be vaccinated felt that the vaccines had serious side effects [55]. The belief that COVID-19 vaccines are associated

with side effects was a driver of hesitancy among students in South Africa [56]. In Spain, despite higher cases and deaths due to COVID-19, the fear of unknown side effects associated with COVID-19 vaccines contributed to hesitancy among health sciences students [57]. The fears of side effects have been worsened by the lack of information regarding the safety of COVID-19 vaccines [58, 59]. The concerns regarding the side effects of vaccines should be addressed to help address vaccine hesitancy [51].

The concern about COVID-19 vaccine effectiveness was also a major cause of hesitancy among the participants. The fact that the development of COVID-19 vaccines was accelerated caused the students to doubt their effectiveness. This is similar to findings from other studies that reported that most students were hesitant to receive the vaccine immediately after its approval by the FDA [22, 49, 52, 56]. Additionally, the participants thought that there was less information about the effectiveness of COVID-19 vaccines. Other studies have also reported that the lack of information about the COVID-19 vaccine effectiveness has contributed to hesitancy across populations [58–60]. Therefore, there is a need to provide adequate information about the COVID-19 vaccine that may help promote vaccine acceptance and uptake.

Some participants believed that since vaccines were developed so fast, they did not pass through all the stages of production. These findings have also been reported in other studies in which individuals were hesitant to receive the vaccine due to its rapid development [24, 35, 60, 61]. This made participants feel fear that vaccine administration was commenced to test their effectiveness in humans. However, a study in India reported that most students were aware of the rapid development of COVID-19 vaccines and the majority accepted to be vaccinated. This shows that there is a need to implement educational activities that increase awareness of COVID-19 vaccines across populations [62].

Most participants in the current study felt that adhering to the prevention measures offered more protection than being vaccinated against COVID-19. This was because they did not trust the source, process of manufacturing, safety, and effectiveness of vaccines. Additionally, the students thought that since there were too many theories about vaccines, they would prefer to adhere to the preventive measures than being vaccinated. A study among medical and healthcare students in Slovenia reported that most students highly adhered to the recommended preventive measures and preferred to receive a vaccine at a later stage [63]. Conversely, a study at a Caribbean medical school in the United States of America (USA) reported that most students who were willing to be vaccinated were equally practising good prevention measures [64].

This study highlights the causes of vaccine hesitancy among students in a low-income country. The researcher observed the need for more sensitisation and educational programmes regarding the COVID-19 vaccine among pharmacy students. These programmes should also be rolled-out to other students in different study programmes.

## CONCLUSION

This study demonstrated that vaccine hesitancy was highly prevalent among undergraduate pharmacy students at the University of Zambia. Based on the current findings, there is a need for urgent strategies to address COVID-19 vaccine hesitancy across university populations. Alongside this, there is a need for health authorities to provide adequate information on the safety and effectiveness of COVID-19 vaccines. Additionally, programmes that dispel rumours, myths, and misinformation about COVID-19 vaccines must be strengthened across populations using various channels such as mass and social media while prioritising healthcare workers as key individuals in promoting vaccine acceptance and uptake.

## ACKNOWLEDGEMENTS

I am grateful to all the pharmacy students that participated in this study. I am also grateful to the University of Zambia e-library for providing access to most of the articles used in this publication. I pass my gratitude to Ms Christabel Nang'andu Hikaambo for her help in data collection.

## Ethical Approval

This study was approved by the University of Zambia Health Sciences Research Ethics Committee (UNZAHSREC) with an approval ID of 20190217024. Participation was voluntary and all the participants provided consent to participate in the study.

## CONFLICT OF INTEREST

I declare no conflict of interest regarding this publication.

## Funding

The study received no external funding.

## REFERENCES

1. Quinn, S. C., & Kumar, S. (2014). Health Inequalities and Infectious Disease Epidemics: A Challenge for Global Health Security. *Biosecurity and Bioterrorism*, *12*, 263–273, doi:10.1089/bsp.2014.0032.
2. Dawood, B., Tomita, A., & Ramlall, S. (2022). 'Unheard,' 'Uncared for' and 'Unsupported': The Mental Health Impact of Covid -19 on Healthcare Workers in KwaZulu-Natal Province, South Africa. *PLoS One*, *17*, e0266008, doi:10.1371/JOURNAL.PONE.0266008.
3. Lufungulo, E. S., Mwila, K., Mudenda, S., Kampamba, M., Chulu, M., & Hikaambo, C. N. (2021). Online Teaching during COVID-19 Pandemic in Zambian Universities: Unpacking Lecturers' Experiences and the Implications for Incorporating Online Teaching in the University Pedagogy. *Creat. Educ.*, *12*, 2886–2904, doi:10.4236/ce.2021.1212216.
4. Mudenda, S. (2021). The Second Wave of COVID-19 and Risk of the Third Wave: Factors Affecting the Continuous Transmission, Spread of, and Increased Mortality Associated With Coronavirus Disease 2019 (COVID-19). *Eur. J. Environ. Public Heal.*, *5*, em0081, doi:10.21601/ejeph/11056.
5. Helle, K. B., Sadiku, A., Zelleke, G. M., Ibrahim, T. B., Bouba, A., Obama, H. C. T., Appiah, V., Ngwa, G. A., Teboh-Ewungkem, M. I., & Schneider, K. A. (2021). Is Increased Mortality by Multiple Exposures to COVID-19 an Overseen Factor When Aiming for Herd Immunity? *PLoS One*, *16*, e0253758, doi:10.1371/journal.pone.0253758.
6. Abayomi, A., Osibogun, A., Kanma-Okafor, O., Idris, J., Bowale, A., Wright, O., ... & Akinroye, K. (2021). Morbidity and mortality outcomes of COVID-19 patients with and without hypertension in Lagos, Nigeria: a retrospective cohort study. *Global health research and policy*, *6*(1), 1-8. doi:10.1186/s41256-021-00210-6.
7. Mudenda, S., Mainza, P, R. L., Mufwambi, W., Hangoma, J., Kampamba, R. M., Muungo, T. L., ... & Daka, V. (2022). Psychological Impact of COVID-19 on Community Pharmacists: A Cross-Sectional Study in Lusaka District, Zambia. *Fortune Journal of Health Sciences*, *5*(4), 579-587.
8. Chileshe, M., Mulenga, D., Mfuno, R. L., Nyirenda, T. H., Mwanza, J., Mukanga, B., Mudenda, S., & Daka, V. (2020). Increased Number of Brought-in-Dead Cases with COVID-19: Is It Due to Poor Health-Seeking Behaviour among the Zambian Population? *Pan Afr. Med. J.*, *37*, 136, doi:10.11604/pamj.2020.37.136.25967.
9. Duff, J. H., Liu, A., Saavedra, J., Batycki, J. N., Morancy, K., Stocking, B., ... & Szapocznik, J. (2021). A global public health convention for the 21st century. *The Lancet Public Health*, *6*(6), e428-e433.
10. Assefa, Y., Gilks, C. F., Reid, S., van de Pas, R., Gete, D. G., & Van Damme, W. (2022). Analysis of the COVID-19 Pandemic: Lessons towards a More Effective Response to Public Health Emergencies. *Global Health*, *18*, 1–13, doi:10.1186/s12992-022-00805-9.
11. Tregoning, J. S., Brown, E. S., Cheeseman, H. M., Flight, K. E., Higham, S. L., Lemm, N. M., Pierce, B. F., Stirling, D. C., Wang, Z., & Pollock, K. M. (2020). Vaccines for COVID-19. *Clin. Exp. Immunol.*, *202*, 162–192.
12. Li, M., Wang, H., Tian, L., Pang, Z., Yang, Q., Huang, T., Fan, J., Song, L., Tong, Y., & Fan, H.

- (2022). COVID-19 Vaccine Development: Milestones, Lessons and Prospects. *Signal Transduct. Target. Ther.*, 7, 1–32.
13. Storlie, C. B., Pollock, B. D., Rojas, R. L., Demuth, G. O., Johnson, P. W., Wilson, P. M., ... & Dowdy, S. C. (2021, July). Quantifying the importance of COVID-19 vaccination to our future outlook. In *Mayo Clinic Proceedings* (Vol. 96, No. 7, pp. 1890-1895). Elsevier. doi:10.1016/j.mayocp.2021.04.012.
  14. Fatima, S., Zafar, A., Afzal, H., Ejaz, T., Shamim, S., Saleemi, S., & Butt, A. S. (2022). COVID-19 Infection among Vaccinated and Unvaccinated: Does It Make Any Difference? *PLoS One*, 17, e0270485, doi:10.1371/journal.pone.0270485.
  15. Hany, M., & Torensma, B. (2022). Incidence and Presentation of COVID-19 in the Vaccinated and Unvaccinated Patients Undergoing Bariatric Surgery. *Obes. Pillars*, 2, 100019, doi:10.1016/j.obpill.2022.100019.
  16. Johnson, A. G., Amin, A. B., Ali, A. R., Hoots, B., Cadwell, B. L., Arora, S., Avoundjian, T., Awofeso, A. O., Barnes, J., & Bayoumi, N. S. (2022). COVID-19 Incidence and Death Rates Among Unvaccinated and Fully Vaccinated Adults with and Without Booster Doses During Periods of Delta and Omicron Variant Emergence — 25 U.S. Jurisdictions, April 4–December 25, 2021. *MMWR. Morb. Mortal. Wkly. Rep.*, 71, 132–138, doi:10.15585/mmwr.mm7104e2.
  17. Dyer, O. (2021). Covid-19: Unvaccinated Face 11 Times Risk of Death from Delta Variant, CDC Data Show. *BMJ*, 374, n2282, doi:10.1136/bmj.n2282.
  18. Ogunleye, O. O., Godman, B., Fadare, J. O., Mudenda, S., Adeoti, A. O., Yinka-Ogunleye, A. F., ... & Meyer, J. C. (2022). Coronavirus disease 2019 (COVID-19) pandemic across Africa: current status of vaccinations and implications for the future. *Vaccines*, 10(9), 1553. doi:10.3390/VACCINES10091553.
  19. Sallam, M., Dababseh, D., Eid, H., Hasan, H., Taim, D., Al-Mahzoum, K., ... & Mahafzah, A. (2021). Low COVID-19 vaccine acceptance is correlated with conspiracy beliefs among university students in Jordan. *International journal of environmental research and public health*, 18(5), 2407. doi:10.3390/ijerph18052407.
  20. Sallam, M. (2021). COVID-19 Vaccine Hesitancy Worldwide: A Concise Systematic Review of Vaccine Acceptance Rates. *Vaccines*, 9, 1–15, doi:10.3390/VACCINES9020160.
  21. Mudenda, S., Hikaambo, C. N., Daka, V., Chileshe, M., Mfuno, R. L., Kampamba, M., ... & Mukosha, M. (2022). Prevalence and factors associated with COVID-19 vaccine acceptance in Zambia: a web-based cross-sectional study. *The Pan African Medical Journal*, 41, 112. doi:10.11604/PAMJ.2022.41.112.31219.
  22. Lucia, V. C., Kelekar, A., & Afonso, N. M. (2020). COVID-19 Vaccine Hesitancy among Medical Students. *J. Public Health (Bangkok)*, 1–5, doi:10.1093/pubmed/fdaa230.
  23. Kelekar, A. K., Lucia, V. C., Afonso, N. M., & Mascarenhas, A. K. (2021). COVID-19 Vaccine Acceptance and Hesitancy among Dental and Medical Students. *J. Am. Dent. Assoc.*, 152, 596–603, doi:10.1016/j.adaj.2021.03.006.
  24. Nizam, A., Iqbal, T., Mashood, H., & El Nebrisi, E. (2022). Analyzing COVID-19 Vaccine Hesitancy among University Students in UAE: A Cross-Sectional Study. *Dubai Med. J.*, 5, 182–193, doi:10.1159/000523993.
  25. Bou Hamdan, M., Singh, S., Polavarapu, M., Jordan, T. R., & Melhem, N. M. (2021). COVID-19 Vaccine Hesitancy among University Students in Lebanon. *Epidemiol. Infect.*, 149, e242, doi:10.1017/S0950268821002314.
  26. Mudenda, S., Mukosha, M., Meyer, J. C., Fadare, J., Godman, B., Kampamba, M., ... & Hikaambo, C. N. (2021). Awareness and Acceptance of COVID-19 Vaccines among Pharmacy Students in Zambia: The Implications for Addressing Vaccine Hesitancy. *Res. Sq.*, doi:10.21203/rs.3.rs-651501/v1.
  27. Utami, A., Margawati, A., Pramono, D., Nugraheni, A., & Pramudo, S. G. (2022). Determinant Factors of COVID-19 Vaccine Hesitancy Among Adult and Elderly Population in Central Java, Indonesia. *Patient Prefer. Adherence*, 16, 1559–1570, doi:10.2147/PPA.S365663.
  28. Carcelen, A. C., Prosperi, C., Mutembo, S., Chongwe, G., Mwansa, F. D., Ndubani, P., ... & Truelove, S. A. (2022). COVID-19 vaccine hesitancy in Zambia: A glimpse at the possible challenges ahead for COVID-19 vaccination rollout in sub-Saharan Africa. *Human vaccines & immunotherapeutics*, 18(1), 1–6. doi:10.1080/21645515.2021.1948784.
  29. Mudenda, S., Chileshe, M., Mukosha, M., Hikaambo, C. N., Banda, M., Kampamba, M., Mwila, K., Banda, D. C., Mufwambi, W., & Daka, V. (2022). Zambia's Response to the COVID-19 Pandemic: Exploring Lessons, Challenges and Implications for Future Policies and Strategies. *Pharmacol. Pharm.*, 13, 11–33, doi:10.4236/pp.2022.131002.
  30. Solís Arce, J. S., Warren, S. S., Meriggi, N. F., Scacco, A., McMurry, N., Voors, M., ... & Omer, S. B. (2021). COVID-19 vaccine acceptance and hesitancy in low-and middle-income countries. *Nature medicine*, 27(8), 1385-1394. doi:10.1038/s41591-021-01454-y.
  31. Syed Alwi, S. A. R., Rafidah, E., Zurraini, A., Juslina, O., Brohi, I. B., & Lukas, S. (2021). A Survey on COVID-19 Vaccine Acceptance and Concern among Malaysians. *BMC Public Heal.* 2021 211, 21, 1–12, doi:10.1186/S12889-021-11071-6.
  32. Edwards, B., Biddle, N., Gray, M., & Sollis, K.

- (2021). COVID-19 Vaccine Hesitancy and Resistance: Correlates in a Nationally Representative Longitudinal Survey of the Australian Population. *PLoS One*, *16*, e0248892, doi:10.1371/JOURNAL.PONE.0248892.
33. Schwarzinger, M., Watson, V., Arwidson, P., Alla, F., & Luchini, S. (2021). COVID-19 Vaccine Hesitancy in a Representative Working-Age Population in France: A Survey Experiment Based on Vaccine Characteristics. *Lancet Public Heal.*, *6*, e210–e221, doi:10.1016/S2468-2667(21)00012-8.
  34. Ackah, B. B. B., Woo, M., Fazal, Z. A., Stallwood, L., Okpani, A., & Adu, P. A. (2022). COVID-19 Vaccine Hesitancy in Africa: A Scoping Review. *Glob. Heal. Res. Policy*, *7*, 21, doi:10.21203/RS.3.RS-759005/V1.
  35. Aw, J., Seng, J. J. B., Seah, S. S. Y., & Low, L. L. (2021). Covid-19 Vaccine Hesitancy—a Scoping Review of Literature in High-Income Countries. *Vaccines*, *9*, 900.
  36. Baldolli, A., Michon, J., Verdon, R., & Fournier, A. (2020). Vaccination Perception and Coverage among Healthcare Students in France in 2019. *BMC Med. Educ.*, *20*, 1–10, doi:10.1186/s12909-020-02426-5.
  37. Ashok, N., Krishnamurthy, K., Singh, K., Rahman, S., & Majumder, M. A. A. (2021). High COVID-19 Vaccine Hesitancy Among Healthcare Workers: Should Such a Trend Require Closer Attention by Policymakers? *Cureus*, *13*, e17990, doi:10.7759/cureus.17990.
  38. Bonnema, C. E., Van Woerden, I., Steinberg, J. R., Nguyen, E., Oliphant, C. M., Cleveland, K. W., & Robinson, R. F. (2021). Understanding Covid-19 Vaccine Hesitancy among Students in Health Professions a Cross-Sectional Analysis. *J. Allied Health*, *50*, 314–320.
  39. Matenga, T. F. L., Zulu, J. M., Moonzwe Davis, L., & Chavula, M. P. (2022). Motivating Factors for and Barriers to the COVID-19 Vaccine Uptake: A Review of Social Media Data in Zambia. *Cogent Public Heal.*, *9*, 2059201, doi:10.1080/27707571.2022.2059201.
  40. Shahwan, M., Suliman, A., Jairoun, A. A., Alkhoujah, S., Al-Hemyari, S. S., Al-Tamimi, S. K., Godman, B., & Mothana, R. A. (2022). Prevalence, Knowledge and Potential Determinants of COVID-19 Vaccine Acceptability Among University Students in the United Arab Emirates: Findings and Implications. *J. Multidiscip. Healthc.*, *15*, 81–92, doi:10.2147/JMDH.S341700.
  41. Mudenda, S., Ngalande, N., Mukosha, M., Hikaambo, C. N., Daka, V., Matafwali, S. K., Banda, M., Mfunne, R. L., Mayoka, G., & Witika, B. A. (2022). Knowledge and Practices toward COVID-19 among Healthcare Students: A Cross-Sectional Study at the University of Zambia. *Front. Public Heal.*, *10*, 1028312, doi:10.3389/FPUBH.2022.1028312.
  42. Mundagowa, P. T., Tozivepi, S. N., Chiyaka, E. T., Mukora-Mutseyekwa, F., & Makurumidze, R. (2022). Assessment of COVID-19 Vaccine Hesitancy among Zimbabweans: A Rapid National Survey. *PLoS One*, *17*, e0266724, doi:10.1371/journal.pone.0266724.
  43. Joshi, A., Kaur, M., Kaur, R., Grover, A., Nash, D., & El-Mohandes, A. (2021). Predictors of COVID-19 Vaccine Acceptance, Intention, and Hesitancy: A Scoping Review. *Front. Public Heal.*, *9*, 698111.
  44. Sirikalyanpaiboon, M., Ousirimaneechai, K., Phannajit, J., Pitisuttithum, P., Jantarabenjakul, W., Chaiteerakij, R., & Paitoonpong, L. (2021). COVID-19 Vaccine Acceptance, Hesitancy, and Determinants among Physicians in a University-Based Teaching Hospital in Thailand. *BMC Infect. Dis.*, *21*, 1174, doi:10.1186/s12879-021-06863-5.
  45. Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education*.
  46. Morrow, R., Rodriguez, A., & King, N. (2015). Colaizzi's Descriptive Phenomenological Method. *Psychologist*, *28*, 643–644.
  47. Piltch-Loeb, R., Savoia, E., Goldberg, B., Hughes, B., Verhey, T., Kayyem, J., Miller-Idriss, C., & Testa, M. (2021). Examining the Effect of Information Channel on COVID-19 Vaccine Acceptance. *PLoS One*, *16*, e0251095, doi:10.1371/JOURNAL.PONE.0251095.
  48. Osur, J. O., Chengo, R., Muinga, E., Kemboi, J., Sidibe, M., & Rarieya, M. (2022). Determinants of COVID-19 Vaccine Behaviour Intentions among the Youth in Kenya: A Cross-Sectional Study. *Arch. Public Heal.*, *80*, 159, doi:10.1186/s13690-022-00904-4.
  49. Mose, A., Haile, K., & Timerga, A. (2022). COVID-19 Vaccine Hesitancy among Medical and Health Science Students Attending Wolkite University in Ethiopia. *PLoS One*, *17*, e0263081, doi:10.1371/journal.pone.0263081.
  50. Doyle-Campbell, C., Mattison, M. J., Amedeo, V., Gaffney, S., & Achadinha, H. (2022). COVID-19 Vaccine Status and Hesitancy in Pharmacy Students. *Curr. Pharm. Teach. Learn.*, *3*, doi:10.1016/j.cptl.2022.03.011.
  51. Saied, S. M., Saied, E. M., Kabbash, I. A., & Abdo, S. A. E. F. (2021). Vaccine Hesitancy: Beliefs and Barriers Associated with COVID-19 Vaccination among Egyptian Medical Students. *J. Med. Virol.*, *93*, 4280–4291, doi:10.1002/jmv.26910.
  52. Mascarenhas, A. K., Lucia, V. C., Kelekar, A., & Afonso, N. M. (2021). Dental Students' Attitudes and Hesitancy toward COVID-19 Vaccine. *J. Dent. Educ.*, *85*, 1504–1510, doi:10.1002/jdd.12632.
  53. Yassin, E. O. M., Faroug, H. A. A., Ishaq, Z. B. Y., Mustafa, M. M. A., Idris, M. M. A., Widatallah, S. E. K., Abd El-Raheem, G. O. H., & Suliman, M. Y. (2022). COVID-19 Vaccination Acceptance among Healthcare Staff in Sudan, 2021. *J. Immunol. Res.*, *2022*, 3392667, doi:10.1155/2022/3392667.
  54. Gao, X., Li, H., He, W., & Zeng, W. (2021). COVID-19 Vaccine Hesitancy among Medical



- Students: The Next COVID-19 Challenge in Wuhan, China. *Disaster Med. Public Health Prep.*, 1–6.
55. Zhang, J., Dean, J., Yin, Y., Wang, D., Sun, Y., Zhao, Z., & Wang, J. (2022). Determinants of COVID-19 Vaccine Acceptance and Hesitancy: A Health Care Student-Based Online Survey in Northwest China. *Front. Public Heal.*, 9, 777565, doi:10.3389/fpubh.2021.777565.
  56. Potgieter, N., Kimmie-Dhansay, F., Meyer, A., Marais, S., Mansoor, I., Mkololo, Y., Maakana, M., Mhlongo, S., Makhoba, S., & Mhlanga, S. (2022). COVID-19 Vaccine Hesitancy and Its Drivers among Dental Students at University of the Western Cape, South Africa. *Heal. SA Gesondheid*, 27, 1950, doi:10.4102/hsag.v27i0.1950.
  57. Rodríguez-Blanco, N., Vicente-Alcalde, N., Cubero-Plazas, L., Sánchez-Más, J., Montagud, E., Moragues, R., Gabaldón-Bravo, E., Hurtado-Sanchez, J. A., & Tuells, J. (2022). Acceptability of the Vaccine against COVID-19 in Spanish Health Sciences Students: A Cross-Sectional Study. *Int. J. Environ. Res. Public Health*, 19, 12244, doi:10.3390/ijerph191912244.
  58. Shiferie, F., Sada, O., Fenta, T., Kaba, M., & Fentie, A. M. (2021). Exploring Reasons for COVID-19 Vaccine Hesitancy among Healthcare Providers in Ethiopia. *Pan Afr. Med. J.*, 40, doi:10.11604/pamj.2021.40.213.30699.
  59. Guljaš, S., Bosnić, Z., Salha, T., Berecki, M., Krivdić Dupan, Z., Rudan, S., & Majnarić Trtica, L. (2021). Lack of Informations about COVID-19 Vaccine: From Implications to Intervention for Supporting Public Health Communications in COVID-19 Pandemic. *Int. J. Environ. Res. Public Health*, 18, 6141, doi:10.3390/ijerph18116141.
  60. Asres, F., & Umeta, B. (2022). COVID-19 Vaccines: Awareness, Attitude and Acceptance among Undergraduate University Students. *J. Pharm. Policy Pract.*, 15, 32, doi:10.1186/s40545-021-00397-6.
  61. Leigh, J. P., Moss, S. J., White, T. M., Picchio, C. A., Rabin, K. H., Ratzan, S. C., Wyka, K., El-Mohandes, A., & Lazarus, J. V. (2022). Factors Affecting COVID-19 Vaccine Hesitancy among Healthcare Providers in 23 Countries. *Vaccine*, 40, 4081–4089, doi:10.1016/j.vaccine.2022.04.097.
  62. Jain, L., Vij, J., Satapathy, P., Chakrapani, V., Patro, B., Kar, S. S., Singh, R., Pala, S., Sankhe, L., ... & Modi, B. (2021). Factors Influencing COVID-19 Vaccination Intentions Among College Students: A Cross-Sectional Study in India. *Front. Public Heal.*, 9, 735902, doi:10.3389/fpubh.2021.735902.
  63. Gabrovec, B., Selak, Š., Crnkovič, N., Šorgo, A., Cesar, K., Fafangel, M., Vrdelja, M., & Trop Skaza, A. (2022). Compliance with Preventive Measures and COVID-19 Vaccination Intention among Medical and Other Healthcare Students. *Int. J. Environ. Res. Public Health*, 19, 11656, doi:10.3390/ijerph191811656.
  64. Gala, D., Parrill, A., Patel, K., Rafi, I., Nader, G., Zhao, R., Shoaib, A., Swaminath, G., Jahoda, J., ... & Hassan, R. (2022). Factors Impacting COVID-19 Vaccination Intention among Medical Students. *Hum. Vaccines Immunother.*, 18, 2025733, doi:10.1080/21645515.2022.2025733.