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*Original article*

# Assessment of COVID-19 Vaccine Coverage and Acceptance Determinants in Western Libya

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**Abstract**
COVID-19 vaccination is crucial to controlling the pandemic, yet disparities in uptake exist globally. Libya, affected by political instability and fragile healthcare systems, presents unique challenges in vaccine coverage. This study aimed to assess COVID-19 vaccination coverage and identify the factors influencing vaccine acceptance in certain areas of western Libya, namely Zawiya, Sabratha, and Sorman. A cross-sectional study was conducted between January and June 2024, enrolling 400 adult participants through stratified random sampling. Data were collected using a structured questionnaire covering sociodemographic characteristics, vaccination status, awareness, and attitudes toward COVID-19 vaccination. Statistical analysis included descriptive statistics, chi-square tests, and logistic regression (SPSS v26). Vaccination coverage was 56.3% overall, with slight variation between cities (Zawiya 58.5%, Sabratha 55.5%, Sorman 54.6%). The primary reasons for vaccination were personal health protection (64%) and protecting family members (52%). Hesitancy was mainly due to fear of side effects (49%), mistrust in effectiveness (38%), and misinformation (32%). Significant predictors of vaccine uptake included higher education (AOR = 2.31), presence of chronic disease (AOR = 1.89), good awareness (AOR = 2.75), and trust in health authorities (AOR = 2.08). COVID-19 vaccination coverage in western Libya is moderate, with significant barriers including hesitancy and access challenges. Targeted public health interventions focusing on education, risk communication, and improved vaccine accessibility are essential to enhance uptake and protect population health.
**Keywords.** COVID-19 Vaccine, Vaccination Coverage, Health Awareness, Chronic Diseases, Libya.

## Introduction

The Coronavirus Disease 2019 (COVID-19) pandemic has significantly affected global health systems, economies, and social structures since its emergence, resulting in hundreds of millions of confirmed cases and millions of deaths worldwide [1]. The rapid development of vaccines such as Pfizer-BioNTech, Moderna, AstraZeneca, Sputnik V, and Sinovac represented a major advancement in reducing severe illness and mortality [2,3]. Despite these scientific achievements, global disparities in vaccine distribution and acceptance remain substantial, particularly in low- and middle-income settings, where misinformation, logistical challenges, and weakened health systems continue to hinder vaccination efforts [4,5].

Although billions of vaccine doses have been administered globally, high-income countries achieved coverage levels exceeding 80%, while many low-income nations remained below 20% [6]. Global initiatives such as COVAX have attempted to reduce these inequalities, yet countries experiencing conflict and political instability—including Libya—continue to face significant obstacles related to inconsistent vaccine supply, inadequate healthcare access, and limitations in public health communication [7].

Across the Middle East and North Africa (MENA) region, marked differences in vaccination uptake and awareness have been observed, with conflict-affected countries reporting notably lower coverage rates [8]. In Libya, the pandemic placed additional pressure on an already fragile healthcare system. Despite the launch of a national vaccination campaign supported by international organizations, overall uptake remained limited, and regional disparities became evident, particularly in western cities such as Libya, Zawiya, Sabratha, and Sorman [9]. Barriers such as misinformation, fear of side effects, limited access to services, and logistical constraints among vulnerable groups further contributed to vaccine hesitancy [10].

Local evidence from western Libya has highlighted variations in public knowledge, heavy reliance on social media for health information, and differences in vaccination behavior when compared to Libyan expatriates living in countries with stronger healthcare systems, where awareness and uptake were significantly higher [11,12]. These findings demonstrate the influence of contextual and structural factors on vaccine acceptance and underline the need for region-specific assessments.

Given the demographic diversity, population density, and mobility patterns within western Libya, understanding vaccination coverage and the factor's influencing acceptance is essential for guiding public health interventions**.** Accordingly, this study aimed to assess COVID-19 vaccination coverage and identify the key factors affecting vaccine acceptance and hesitancy to receive it in the western Libyan namely Zawiya, Sabratha, and Surman, to support targeted strategies that promote vaccination uptake and strengthen public health preparedness.


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## Methods

### *Study Design and Settings*

This research employed a cross-sectional descriptive study design and was conducted between January and June 2024 in three major cities located in the western region of Libya (Zawiya, Sabratha, and Sorman). These cities were selected because they represent densely populated urban areas with documented variations in vaccination uptake and contain multiple vaccination centers supervised by the National Center for Disease Control (NCDC).

### *Study Population*

The study population consisted of adults (≥18 years) residing in the selected cities, including males and females, Libyan nationals, and Migrant and displaced populations living in the region. Eligible participants included individuals who had received at least one COVID-19 vaccine dose as well as those who remained unvaccinated.

### *Sample Size*

The calculated sample size was 350 participants. To increase accuracy and account for non-response, the sample size was increased to 400 participants. Participants were selected using stratified random sampling, ensuring equal representation from each city (Zawiya: ~135 participants, Sabratha: ~135 participants, and Sorman: ~130 participants).

### *Data Collection Tools*

Data were collected using a structured questionnaire adapted from previously validated vaccine hesitancy tools (WHO SAGE Vaccine Hesitancy Model).

### *Data Collection Procedure*

Trained field researchers distributed the questionnaire in (Primary healthcare centers, public markets, educational institutions, Vaccination clinics). Participants were briefed about the purpose of the study before responding. Responses were collected anonymously to ensure confidentiality.

### *Ethical Considerations*

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and received approval from the relevant local health authorities in the study areas. Informed consent was obtained from all participants, who completed the study questionnaire voluntarily, with assurances that their responses would be used solely for research purposes.

### *Statistical Analysis*

Data were entered and analyzed using SPSS version 26. The following statistical methods were applied: descriptive statistics (frequencies, percentages, mean ± SD), Chi-square test to assess associations between demographic variables and vaccination status, and logistic regression to identify predictors of vaccine acceptance. A p-value < 0.05 was considered statistically significant.

## Results

A total of 400 participants were included from the three selected cities in western Libya: Zawiya (n = 135), Sabratha (n = 135), and Sorman (n = 130). The sample represented a wide range of ages, genders, educational backgrounds, and health statuses (Table 1). Most participants were middle-aged (46%) and had at least a university-level education (47%), while 29% reported having a chronic condition such as diabetes or hypertension.

***Table 1. Sociodemographic Profile of Participants (N = 400)***

| Characteristic | Frequency (n) | Percentage (%) |
|---|---|---|
| Gender | | |
| Male | 218 | 54.5 |
| Female | 182 | 45.5 |
| Age | | |
| 18–29 | 128 | 32 |
| 30–49 | 184 | 46 |
| ≥50 | 88 | 22 |
| Education | | |
| Secondary or less | 152 | 38 |
| University | 188 | 47 |
| Postgraduate | 60 | 15 |
| Chronic disease | 116 | 29 |


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Overall, 56.3% of participants (n = 225) had received at least one dose of a COVID-19 vaccine, whereas 43.7% (n = 175) were unvaccinated. Vaccination coverage showed slight variation across cities—Zawiya (58.5%), Sabratha (55.5%), and Sorman (54.6%)—but these differences were not statistically significant ($x^2$ = 0.41, p = 0.813). Among vaccinated participants, the most commonly received vaccines were AstraZeneca (38%), Sinovac (26%), Sputnik V (22%), and Pfizer-BioNTech (14%). A total of 72% of vaccinated individuals completed the two-dose regimen (Table 2).

***Table 2. COVID-19 Vaccination Coverage and Distribution of Vaccine Types Among Participants***

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| Vaccinated | 225 | 56.3 |
| Unvaccinated | 175 | 43.7 |
| Vaccine type | | |
| AstraZeneca | 86 | 38 |
| Sinovac | 59 | 26 |
| Sputnik V | 50 | 22 |
| Pfizer-BioNTech | 30 | 14 |
| Two-dose completion | 162 | 72 |

Reasons for Vaccination, among vaccinated participants (n = 225), the main reasons for receiving the vaccine included protection of personal health (64%) and protection of family members (52%). Additionally, one-third (33%) reported that vaccination was required for work or travel, and 28% were motivated by trust in national health recommendations (Table 3).

***Table 3. Reasons for Receiving the COVID-19 Vaccine Among Vaccinated Participants (n = 225)***

| Reason for Vaccination | Percentage (%) |
|---|---|
| Protecting personal health | 64 |
| Protecting family members | 52 |
| Required for work or travel | 33 |
| Trust in national health recommendations | 28 |

Of the 175 unvaccinated participants, the leading reasons for non-vaccination were fear of side effects (49%) and mistrust in vaccine effectiveness (38%). Misinformation—such as beliefs related to infertility or genetic alteration—was reported by 32%. Limited access to vaccination centers (21%) and a previous COVID-19 infection (17%) also contributed to vaccine hesitancy (Table 4).

***Table4. Reasons for COVID-19 Vaccine Hesitancy Among Unvaccinated Participants (n = 175)***

| Reason for Hesitancy | Percentage (%) |
|---|---|
| Fear of side effects | 49 |
| Mistrust in vaccine effectiveness | 38 |
| Belief in misinformation (e.g., infertility, DNA alteration) | 32 |
| Limited access to vaccination centers | 21 |
| Previous COVID-19 infection | 17 |

The study assessed participants' knowledge and awareness regarding the COVID-19 vaccine. Overall, 40% of participants demonstrated good awareness, 37% showed moderate awareness, and 23% had poor awareness. A significant association was found between awareness levels and educational attainment, with participants holding higher education levels demonstrating substantially greater awareness compared to those with lower education levels (p < 0.001) (Figure 1).

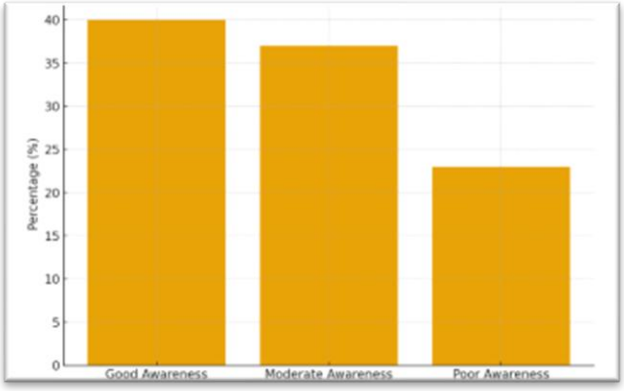


***Figure 1. Levels of Knowledge and Awareness of the COVID-19 Vaccine Among Participants***


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Regarding attitudes toward vaccination, 60% of participants believed that COVID-19 vaccines play a critical role in reducing severe complications associated with the infection. Trust in official health sources was moderate; 44% of participants expressed confidence in information issued by the Libyan Ministry of Health. Conversely, only 28% reported trusting information disseminated through social media platforms, although 62% identified social media as their primary source of COVID-19–related information (Figure 2).

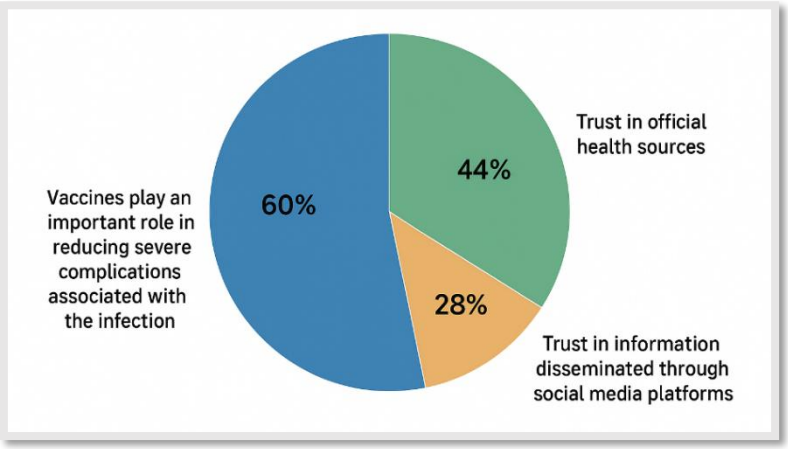


***Figure 2. Attitudes toward COVID-19 vaccination***

The logistic regression analysis identified several significant predictors of COVID-19 vaccine acceptance. Individuals with higher education levels were more likely to accept the vaccine (AOR = 2.31; 95% CI: 1.45–3.68). Participants with chronic diseases had increased odds of acceptance (AOR = 1.89; 95% CI: 1.12–2.73). A good level of awareness about the vaccine was also a strong predictor (AOR = 2.75; 95% CI: 1.66–4.21), as was trust in health authorities (AOR = 2.08; 95% CI: 1.21–3.14). In contrast, age and gender were not significantly associated with vaccination status ($p > 0.05$) (Figure 3).

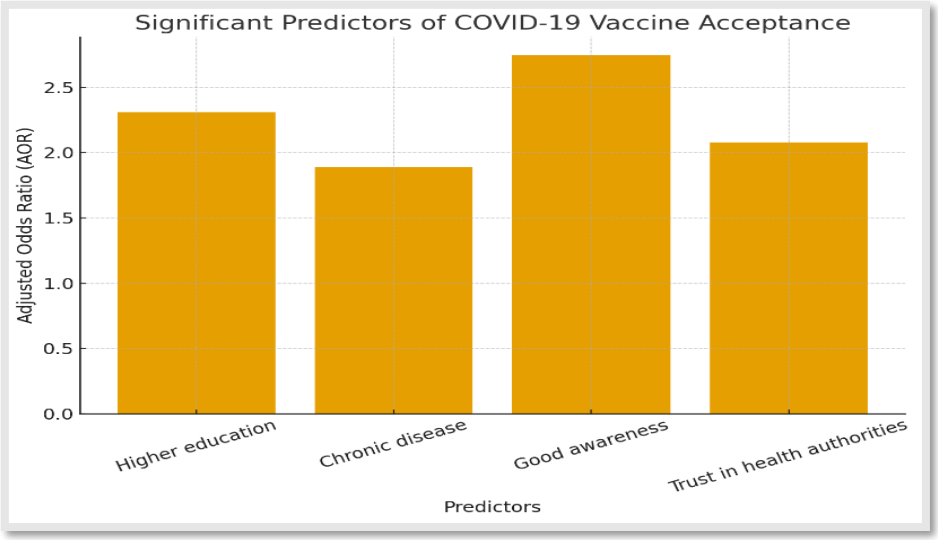


***Figure 3. Adjusted Odds Ratios (AORs) for Significant Predictors of COVID-19 Vaccine Acceptance***

## Discussion

The present study assessed COVID-19 vaccination coverage and the determinants of vaccine acceptance among residents of western Libya, including those in Zawiya, Sabratha, and Sorman. The overall vaccination rate of 56.3% observed in this study indicates moderate coverage, reflecting both progress and persistent challenges in Libya's national immunization efforts. While this figure is higher than previous estimates from early 2023, it remains below the global average and underscores the ongoing need to address barriers to vaccine uptake.

A comparison with prior studies shows a similar pattern of moderate acceptance coupled with low actual coverage. Earlier findings in Libya indicated an acceptance rate of approximately 57%, yet only about one-third of the population had received at least one vaccine dose. This gap between acceptance and actual vaccination suggests that hesitancy is not the only barrier; logistical constraints, limited vaccine availability, and inequities in access also play crucial roles. In our study, vaccination coverage varied slightly across cities—Zawiya (58.5%), Sabratha (55.5%), and Sorman (54.6%)—but these differences were not statistically


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significant, suggesting that broader structural factors may exert greater influence than local socio-demographic variations.

Motivations for receiving the vaccine in this study included personal health protection, protecting family members, and compliance with work or travel requirements. These findings align with previous Libyan research showing that perceived personal and familial benefits strongly impact acceptance. Conversely, among unvaccinated participants, fear of side effects, mistrust in vaccine effectiveness, misinformation, and limited access to vaccination centers were the primary reasons for hesitancy. These barriers mirror global trends in low- and middle-income contexts, where misinformation and safety concerns frequently undermine vaccination campaigns.

Knowledge and awareness levels emerged as strong predictors of vaccine uptake. Participants with higher education levels, better understanding of vaccine benefits, and greater trust in health authorities were more likely to be vaccinated. Logistic regression analysis further confirmed that higher education (AOR = 2.31), presence of chronic disease (AOR = 1.89), good awareness (AOR = 2.75), and trust in health authorities (AOR = 2.08) were significant determinants of acceptance. These findings underscore the importance of targeted educational interventions and public awareness campaigns to improve uptake. The role of social and informational factors was also evident. Although 62% of participants relied on social media as their primary source of COVID-19 vaccine information, only 28% considered it trustworthy. This reliance increases vulnerability to misinformation, which can amplify hesitancy. Strengthening official communication channels, providing culturally appropriate information, and engaging communities directly are essential to counter misleading narratives and build public trust.

Certain vulnerable groups require particular attention. Previous Libyan studies identified moderate acceptance but notable hesitancy among healthcare workers due to concerns about safety and efficacy. Given their influence on community health behaviors, ensuring that healthcare workers are well-informed and confident in vaccination is essential. Similarly, migrants and displaced populations face unique barriers—including limited information access, language challenges, and mistrust in authorities—that may reduce their participation in immunization programs. Overall, the findings indicate that improving vaccination coverage in western Libya requires a multi-dimensional approach. Public health strategies should integrate clear risk communication, community engagement, and educational programs with structural measures such as expanding access through mass vaccination centers, mobile clinics, and outreach services. Consideration of innovative strategies, such as co-administering COVID-19 vaccines alongside routine immunizations, may also enhance acceptance among hesitant individuals.

## Conclusion

This study provides a focused assessment of COVID-19 vaccination coverage and the main determinants of hesitancy in the western region of Libya, including Zawiya, Sabratha, and Sorman. Although moderate acceptance levels were observed, a considerable proportion of the population remains unvaccinated due to fear of adverse effects, mistrust in health authorities, and challenges in accessing vaccination services. The findings indicate that education level, awareness, the presence of chronic diseases, and trust in official health sources are the strongest predictors of vaccine uptake. These results highlight the persistent gap between willingness to vaccinate and actual vaccination behavior, emphasizing the need for more effective public health approaches. Understanding these factors is essential for strengthening the national vaccination strategy and improving resilience against future public health threats.

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***Conflict of interest.*** Nil

## References

1. World Health Organization. Coronavirus (COVID-19) Dashboard. WHO; 2024.
2. Polack FP, Thomas SJ, Kitchin N, et al. Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine. N Engl J Med. 2020;383:2603-2615.
3. Voysey M, Clemens SAC, Madhi SA, et al. Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222). Lancet. 2021;397:99-111.
4. Mathieu E, Ritchie H, Ortiz-Ospina E, et al. A global database of COVID-19 vaccinations. Nat Hum Behav. 2021;5:947-953.
5. World Health Organization. COVID-19 global risk communication and community engagement. WHO; 2023.
6. Our World in Data. COVID-19 Vaccinations Statistics. 2023.
7. UNICEF. COVAX Global Supply Update. UNICEF; 2022.
8. World Health Organization Regional Office for the Eastern Mediterranean (WHO-EMRO). COVID-19 Vaccination Updates in EMR. WHO-EMRO; 2023.


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9. International Organization for Migration (IOM). Libya COVID-19 Vaccination Progress Report. IOM; 2022.
10. Ismail A, Shembesh M. COVID-19 vaccine hesitancy and access challenges in Libyan communities. Libyan Med J. 2024;9(2):45-52.
11. Amer A. Assessment of COVID-19 awareness in western Libyan cities. Sebha Univ J Med Sci. 2022;4(1):12-20.
12. Amer A. Comparative study of COVID-19 awareness and vaccination uptake among Libyans in western Libya and expatriates in the UAE. Derna Acad J Appl Sci. 2024;3(2):55-65.


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