Original Article

A systemic evaluation of COVID-19 vaccination drives in LICs, LMICs, UMICs, and HICs: Preparedness for future pandemics

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Abstract

Introduction: The COVID-19 pandemic has significantly impacted global healthcare systems. Vaccination is an effective strategy to battle the disease. Policies and distribution frameworks have varied widely across countries. The paper aims to highlight the global vaccination trends in these nations, based on their economic classification, which will illuminate key takeaways that will allow for better pandemic management policies. **Methods:** A list of the most populated countries across each income slab was drawn up, and information on their vaccination campaigns was collected from national government portals and official health department websites of these countries in a structured manner. Data collected for the attributes was qualitatively described and converted into binary responses for quantitative analysis. ANOVA test, Chi-square test, and regression models were employed. **Results:** A consistent decreasing trend was noted in the

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Received: 09-04-2024 **Revised:** 27-05-2024
Accepted: 27-06-2024 **Published:** 09-12-2024

Access this article online

Quick Response Code:

Website: http://journals.lww.com/JFMPC

DOI: 10.4103/jfmpc.jfmpc_594_24

How to cite this article: Kumar P, Sarkar M, Unnithan VB, Martínez DJ, Arlettaz ME, Gnanaraj R, *et al*. A systemic evaluation of COVID-19 vaccination drives in LICs, LMICs, UMICs and HICs: Preparedness for future pandemics. J Family Med Prim Care 2024;13:5680-8.

percentage of the population vaccinated as the spectrum from higher-income countries to lower-income countries was traversed for all dose statuses. Fewer types of vaccines were available in the lower-income countries. Though compliance with the CDC vaccination strategies guide was largely noted, a linear regression univariate analysis of vaccination drive parameters carried out for single-dose vaccination yielded statistically significant results for medical provider vaccine standardization (*P*-value = 0.002), vaccination requirements (*P*-values <0.001), and provider recommendation. (*P*-values <0.001) Vaccine hesitancy was not dependent on economic status. **Conclusion:** Concerted global initiatives like vaccine donation would assist efforts in mitigating disease spread. Prompt busting of baseless anti-vaccine narratives and strengthening healthcare infrastructure to meet national requirements should be given due importance.

Keywords: COVID-19, LMIC, LIC, pandemic, vaccination

Introduction

As of November 2022, over 630 million people have been affected by the SARS-CoV pandemic, responsible for 6 million deaths globally.[1] Despite preventive initiatives like social distancing, border restrictions, and quarantines, which helped in controlling the pandemic to an extent, the global death toll was seemingly high. Due to the volume of cases reported, primary care internationally was enormously burdened with the responsibilities of triage, early diagnosis, and first response.[2] Globally, primary healthcare physicians upskilled themselves and served as the link between communities and the rapidly evolving healthcare delivery frameworks by adhering to the latest protocols and reporting guidelines.

Lessons learned from past pandemics proved that vaccination is the key to reducing the case fatality ratio and also the achievement of herd immunity has the potential to reduce morbidity. Even in vaccine delivery, it was up to primary care physicians to ensure that communities developed confidence in the vaccine, overcoming vaccine hesitancy, thus paving the way for mass administration.[3] Administered vaccine doses as of November 2022 are over 12 billion globally.[4] Although, in low-income countries (LIC), only 25% of the population has received at least one vaccine dose, whereas, in high- (HIC) and upper-middle-income (UMIC) countries, this figure is as high as 82%.[5] This could be attributed to a variety of factors that impacted the effectiveness of vaccination drives carried out in LICs like vaccine availability, policy of vaccination drives, etc., These factors are highly dependent on the economic stability of the country and national investment in healthcare. Therefore, the authors wish to address how to make vaccination drives more effective while considering the economic status of the country via using this structured systemic analysis of data published or available in open access on the internet. A thorough understanding of the vaccination policies shall guide our way forward for preparedness for future pandemics.

The World Health Organization (WHO) and national governments have already emphasized developing a framework for mass vaccination, which includes considerations like coordination with COVID-19 task teams, implementing tailored vaccination strategies, engagement of community leaders, vaccination campaign planning, health message dissemination, etc. Primary healthcare is the fundamental cog of any healthcare system, and their role in mitigating the pandemic cannot be underestimated.

While cultural beliefs such as vaccine hesitancy[5] and public distrust[6] were a common major setback in high-, middle-, and low-income countries, supply chain issues,[7] vaccine hoarding,[8] lack of cold chain facilities,[9] and export bans[10] were some other issues faced by the low-income countries.

Despite the setbacks, high-income countries like Israel led the world on mass vaccination by covering 80% of its population by the end of 2020.[10,11] What led to Israel's success is credited to policy-making strategies like signing vaccine purchase contracts with pharmaceutical companies, a clear focus on the target population (stepwise), and established vaccination and healthcare setups coupled with rapid financial mobilization.[10] Amongst the low-income countries in south-east Asia and Africa,[12] emphasis on large-scale vaccine manufacturing, addressing gender gaps in vaccine distribution, improving public communication, using social media to tackle mistrust, launching alleviation programs, and implementing tax levies to adapt to vaccine expenses are effective.

In this study, we analyze the population coverage of COVID-19, vaccination locations, availability and distribution of vaccines, as well as waste and hesitancy, according to the income levels of the countries. We also consider compliance with the guide "12 COVID-19 Vaccination Strategies for Your Community" from the centres for disease control and prevention (CDC). Finally, we briefly discuss the socioeconomic impact of the pandemic.

We also aim to strategically evaluate national vaccination policies with economy-wise slabs adapted from the World Bank income classification, with an attempt to provide recommendations and understand global situations.

Materials and Methods

Income classification was used as a parameter to select countries. A list of the six most populated countries across each income classification as per the World Bank was drawn up.[13] Healthcare strategies implemented are dependent on a country's budget allocation.[14] This ultimately depends on a country's financial status. For LICs, the final countries identified were Ethiopia, the Democratic Republic of Congo, Sudan, Mozambique, Afghanistan, and Uganda. For LMICs, the countries were India, Pakistan, Philippines, Indonesia, Nigeria, and Bangladesh. For UMICs, the countries were Brazil, Mexico, Turkey, South Africa, Thailand, and Colombia. For UICs, the countries were China,

Russia, the United States of America, the United Kingdom, Japan, and Germany.

Data extraction

Data from these countries ensured coverage of the majority of the population belonging to a particular income classification. Data about the vaccine distribution strategies from these countries was extracted by a team of eight independent researchers in duplicate. This data was extracted from national government portals and official health department websites of the respective countries. Additional sources used included the WHO dashboard and peer-reviewed medical databases including PubMed and Google Scholar. Data extraction was done in June 2022.

Ethics

Since the project made use of secondary data available online on official portals, ethics, the data analyzed did not involve any confidential patient information, no new interventions were performed on any population, and, thus, a clinical trial registration and ethics committee approval were not needed.

Outcomes assessed

Information was collected on whether the vaccine rollout was carried out age-wise (focus on the elderly), occupation-wise (priority for frontline workers), or disease-wise manner (for e.g., people with comorbidities). Vaccine administration attributes include the location where it was made possible (hospitals, home-based vaccination, workplace vaccination, or special vaccine centres), availability of vaccine storage facilities including cold chains as well as the use of vaccine advocacy strategies like combating misinformation, providing financial incentives, employing vaccine ambassadors, and using reminder messages were also noted. Data on the number of approved vaccines in the countries, medical provider recommendations, vaccine requirements, and dosing regimens were also extracted. We also included the guide "12 COVID-19 Vaccination Strategies for Your Community" from the CDC.

Statistical analysis

The data was converted into binary 'Yes/No' responses for quantitative analysis on Excel worksheets. Data from continuous variables, such as the percentage of the population vaccinated, was presented as mean and standard deviation (SD). The percentage was calculated and shown via tables and graphs. The stochasticity of the data was assessed. Inter-group statistical testing for continuous variables was done using analysis of variance (ANOVA) for more than two groups, and categorical variables were done using the Chi-square test of independence. Univariate and multivariate regression models (with the forced entry of all variables) were used to test whether several variables predicted the proportion of the population vaccinated. *P*-Value less than 0.05 was considered to be statistically significant. The entire statistical analysis was carried out using SPSS software v28.0. (IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY).

Results

Data from $n = 24$ countries from the top six most populated countries of each income classification as per the World Bank were included as significant representatives from each income slab. 78.17 ± 11.72% and 73.83 ± 13.26% population in HIC; 30.33 ± 15.08% and 25.33 ± 13.32% population in LICs are vaccinated with at least 1 and 2 doses, respectively ($P < .001$). Only 0.78% of the population are vaccinated with more than 2 doses in LICs (the data summarized in Table 1).

Comparative proportion of the percentage of the population vaccinated (difference with the proportion of vaccinations in the world and difference with the country having the highest proportion of vaccinations—China) is elaborated in [Figure 1].

The number of vaccine doses, country income category, and percentage of the population who have received them are plotted in Boxplots illustrated in [Figures 2 and 3].

Health centres were the most common vaccination locations, followed by home in LICs, while HICs utilized mass centres followed by health centres only, as described in Table 2.

Other vaccination drive parameters and country slabs by income have been described in Tables 3 and 4.

Linear regression univariate analysis of vaccination drive parameters as predictors of single-dose vaccination of the country yielded statistically significant results for medical provider vaccine standardization, vaccination requirements, and provider recommendation, as illustrated in Table 5. Rest correlations were insignificant.

Discussion

The COVID-19 stroke, a zoonotic disease that turned into a global pandemic was identified in the Chinese city of Wuhan. Despite

Table 1: Percentage of Population Vaccinated in each country slab

Country slab	Population (%) vaccinated with at least 1 dose (Mean±SD) (*P*)	Population (%) vaccinated with at least 2 doses (Mean±SD) (*P*)	Population (%) vaccinated with >2 doses (Mean±SD) (*P*)	Number of doses given per 100 people (Mean±SD) (*P*)
LIC	30.33±15.08	25.33±13.32	0.78±0.92	44.5±33.29
LMIC	63.83±23.08	57.5±22.81	14.55±8.77	132.83±53.57
UMIC	72.67±18.39	65±22.81	37.88±18.11	167.83±54.93
HIC	78.17±11.72	73.83±22.81	51.33±25.17	205.83±48.06

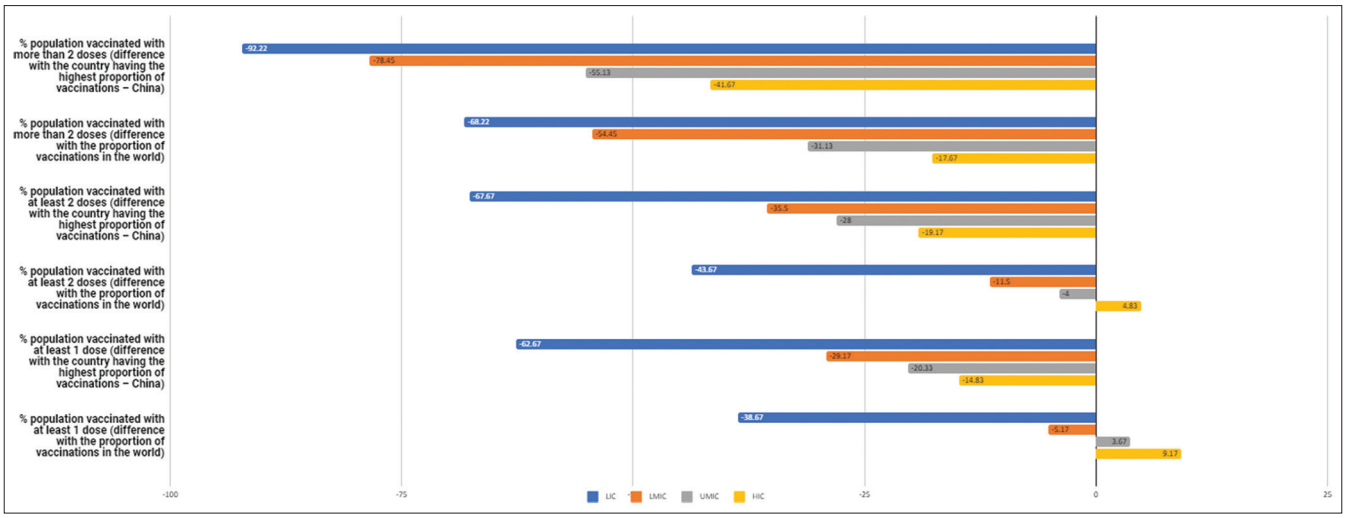

Figure 1: Comparative Proportion of percentage of population vaccinated in LICs, LMICs, UMICs, and HICs

Table 2: Vaccination locations utilized in each country slab

Vaccination locations	LIC	LMIC	UMIC	HIC
Homes	20%	40%	40%	0%
Pharmacy	0%	50%	50%	0%
Mass centers	15%	30%	25%	30%
Health centers	21.70%	26.10%	26.10%	26.10%

its uniqueness in its transmission and virulence, COVID-19 is similar to other SARS variants and MERS in exhibiting severe flu-like symptoms and acute respiratory distress.[15]

The coronavirus SARS-CoV-2 was identified as the causative agent for a series of atypical respiratory diseases in the Hubei Province of Wuhan, China in December of 2019. The disease was officially declared a pandemic by the WHO on March 11, 2020[16] and was widespread in the whole world. By 1 May 2021, there have been 152,661,445 Covid-19 cases with 3,202,256 deaths globally.[17]

The initial response given by the different countries was less coordinated than expected due to the existence of international protocols and the distrust caused by the information coming from China and the WHO when it took a few months to declare the disease a global pandemic. However, once this declaration was made, the developed countries began to work on obtaining a vaccine, and in less than 12 months different vaccines against COVID-19 were obtained. As of November 2022, more than 630 million people have been affected by the SARS-COV pandemic, with 6 million deaths and 12 billion doses of vaccines administered, with large differences in the distribution between HICs and LICs, creating unequal access.

Our study provided information on population coverage in COVID-19 vaccination, hesitancy, vaccine waste, and the different components of vaccination strategies worldwide, stratified by the country's income level. As of November 2022, the study done over the 24 countries from the top six most populated countries were included as significant representatives from each income slab showed that 78.17 ± 11.72% and 73.83 ± 13.26% population in HIC; 30.33 ± 15.08% and 25.33 ± 13.32% population in LICs are vaccinated with at least 1 and 2 doses, respectively ($P < 0.001$).

Vaccine access, strategies of vaccination, and hesitancy

Inequalities in access to vaccines have also been seen for other diseases, such as the human papillomavirus[18] or the previous H1N1 epidemic.[19] Economic and social factors, among them the health policies and systems of each country, strongly influenced the distribution of vaccines and became determinants for population coverage.[20] Those countries with a higher human or sociodemographic development index or a higher gross domestic product per capita had greater access, being able to achieve greater population coverage.[21-23] We agree on the great disparity and inequality worldwide, mainly concerning the LICs, generating gaps in immunity. Vaccine donations, whether through diplomacy or empathy, can help narrow the gap between countries with more and less resources,[24] easing "vaccine nationalism" where high-income countries get large advance orders for vaccines by negotiating directly with suppliers, leaving countries with limited resources struggling for access.[25,26] LICs have less capacity to purchase vaccines, so global efforts such as COVID-19 Vaccine Global Access (COVAX) are critical.[27] On the other hand, countries that sold or donated the vaccine had higher coverage than those that received it.[21]

Sanctions imposed on certain countries also affected the provision of vital inputs during the pandemic, including vaccines.[28] In addition, our results indicate that lower-income countries were more prone to waste, probably due to infrastructure aspects, both physical and human resources.

We also analyze vaccination strategies using the guide "12 COVID-19 Vaccination Strategies for Your Community" from CDC. We found significant differences in 3 out of the 12 strategies. Medical provider vaccine standardization (referring to offering vaccination as a default

Table 3: Vaccination Drive Parameters in each country slab

Vaccination drive parameters	LIC	LMIC	UMIC	HIC
Age-wise slab distribution *n* (%)				
Yes	4 (19%)	5 (23.8%)	6 (28.6%)	6 (28.6%)
No	2 (66.7%)	1 (33.3%)	0 (0%)	0 (0%)
Disease-wise slab distribution *n* (%)				
Yes	5 (23.8%)	5 (23.8%)	5 (23.8%)	6 (28.6%)
No	1 (33.3%)	1 (33.3%)	1 (33.3%)	0 (33.3%)
Occupation-wise slab distribution *n* (%)				
Yes	5 (29.4%)	6 (35.3%)	5 (29.4%)	1 (5.9%)
No	1 (14.3%)	0 (0%)	1 (14.3%)	5 (71.4%)
Transport availability (from government sites) *n* (%)	6 (25%)	6 (25%)	6 (25%)	6 (25%)
No. of Vaccination locations				
Homes	Yes (1)	Yes (2)	Yes (2)	No (0)
Pharmacy	No (0)	Yes (1)	Yes (1)	No (0)
Mass centers	Yes (3)	Yes (6)	Yes (5)	Yes (6)
Health centers	Yes (5)	Yes (6)	Yes (6)	Yes (6)
No. of Vaccines Available	7	13	16	16
Vaccine wastage				
High (>20%)	2 (33%)	2 (33%)	2 (33.3%)	0 (0%)
Moderate (10–20%)	0 (0%)	2 (28.6%)	2 (28.6%)	3 (42.9%)
Low (<10%)	0 (0%)	2 (40%)	0 (0%)	3 (60%)
Unknown	4 (66.7%)	0 (0%)	2 (33.3%)	0 (0%)
Vaccine hesitancy in the general population				
High (>50%)	2 (33.3%)	2 (33.3%)	0 (0%)	2 (33.3%)
Moderate (20–50%)	3 (25%)	4 (33.3%)	4 (33.3%)	1 (8.3%)
Low (<20%)	0 (0%)	0 (0%)	2 (40%)	3 (60%)
Unknown	1 (100%)	0 (0%)	0 (0%)	0 (0%)

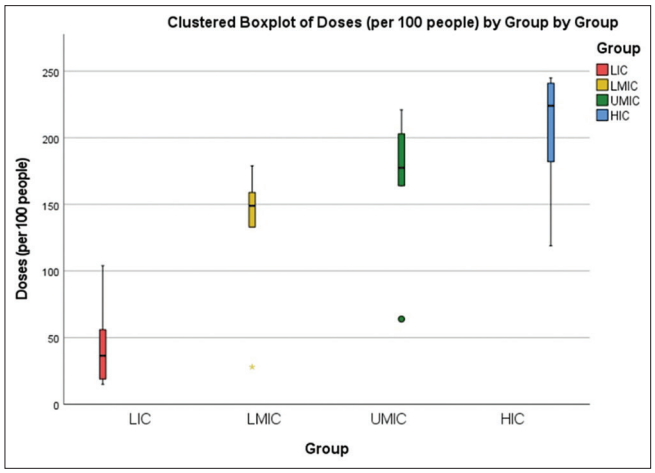

Figure 2: Percentage of population vaccinated compared against country income group. *The solid horizontal line depicts the median, the boxes depict the interquartile range, the upper whisker depicts 1.5 times the 3rd quartile, and the lower whisker depicts 1.5 times lower than the 1st quartile. Point values depict outliers*

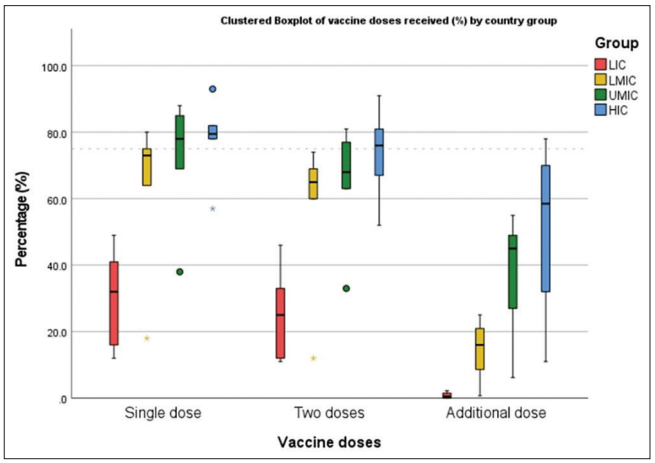

Figure 3: Number of doses given per 100 population according to different country income categories. *The solid horizontal line depicts the median, the boxes depict the interquartile range, the upper whisker depicts 1.5 times the 3rd quartile, and the lower whisker depicts 1.5 times lower than the 1st quartile. Point values depict outliers*

option during patient visits and integrating vaccination into medical practice procedures) was a resource absent in the LICs, unlike the others. Default patient scheduling has proven to be a strategy that increases vaccination[29] as well as standardizes what the doctor says upon entering the office.[30] Vaccination requirements are policies that may require employees, students, or other social groups to provide proof of vaccination for access to certain venues. This strategy has demonstrated its effectiveness both in the child population[31] and health workers.[32] Finally, provider recommendation (healthcare professionals recommending that a patient receives a COVID-19 vaccination) was absent in most LICs and may increase the likelihood of vaccination, as seen in previous influenza[33] and HPV[34] studies.

Faced with the global spread of the virus around the world, a response of equal magnitude was needed from global political authorities. The equitable distribution of vaccines was a

Table 4: Compliance with "12 COVID-19 Vaccination Strategies for Your Community" guide from the CDC

"12 COVID-19 Vaccination Strategies for Your Community" guidelines	LIC	LMIC	UMIC	HIC
Vaccine ambassadors				
Present	4 (44.4%)	3 (17.6%)	4 (44.4%)	6 (35.3%)
Absent	2 (28.6%)	3 (42.9%)	2 (28.6%)	0 (0%)
Motivational interviewing				
Present	2 (13.3%)	4 (26.7%)	3 (20%)	6 (40%)
Absent	4 (44.4%)	2 (22.2%)	3 (33.3%)	0 (0%)
Medical reminder				
Present	1 (7.7%)	2 (15.4%)	4 (30.8%)	6 (46.2%)
Absent	5 (45.5%)	4 (36.4%)	2 (18.2%)	0 (0%)
Medical provider vaccine standardization				
Present	1 (5.6%)	6 (33.3%)	5 (27.8%)	6 (33.3%)
Absent	5 (83.3%)	0 (0%)	1 (16.7%)	0 (0%)
Financial incentives				
Present	0 (0%)	2 (33.3%)	2 (33.3%)	2 (33.3%)
Absent	6 (33.3%)	4 (22.2%)	4 (22.2%)	4 (22.2%)
School-located vaccination programs				
Present	1 (20%)	2 (40%)	2 (40%)	0 (0%)
Absent	5 (26.3%)	4 (21.1%)	4 (21.1%)	6 (31.6%)
Home-delivered vaccination				
Present	2 (28.6%)	3 (42.9%)	2 (28.6%)	0 (0%)
Absent	4 (23.5%)	3 (17.6%)	4 (23.5%)	6 (35.3%)
Workplace vaccination				
Present	0 (0%)	4 (100%)	0 (0%)	0 (0%)
Absent	6 (30%)	2 (10%)	6 (30%)	6 (30%)
Vaccination requirements				
Present	0 (0%)	4 (100%)	0 (0%)	0 (0%)
Absent	6 (30%)	2 (10%)	6 (30%)	6 (30%)
Effective messages				
Present	4 (18.2%)	6 (27.3%)	6 (27.3%)	6 (27.3%)
Absent	2 (100%)	0 (0%)	0 (0%)	0 (0%)
Trusted messengers				
Present	4 (18.2%)	6 (27.3%)	6 (27.3%)	6 (27.3%)
Absent	2 (100%)	0 (0%)	0 (0%)	0 (0%)
Provider recommendation				
Present	1 (5.3%)	6 (31.6%)	6 (31.6%)	6 (31.6%)
Absent	5 (100%)	0 (0%)	0 (0%)	0 (0%)
Aids for Combating misinformation				
Present	3 (100%)	0 (0%)	0 (0%)	0 (0%)
Absent	3 (14.3%)	6 (28.6%)	6 (28.6%)	6 (28.6%)

Table 5: Predictors of single-dose vaccination

Vaccination Parameters	Univariate analysis	
	β-coefficient [95% CI]	*P*
Medical provider vaccine standardization present	33.889 [13.805–53.973]	0.002*
Vaccination requirements present	41.222 [24.027–58.417]	<0.001*
Provider recommendation present	41.747 [22.432–61.062]	<0.001*

**P*<0.05 is indicative of statistical significance of results

humanitarian imperative, as the interdependence of the world means that no one is safe until we are all safe.[35]

Our research suggests that hesitancy is not related to each country's income level. Some previous studies indicate that certain demographic factors, such as age or sex, influence this decision, although, in line with us, they do not consider the economic level.[36-39] Certain racial/ethnic minorities and rural populations have also been associated with a higher probability of hesitancy.[40] During the first year of the pandemic, the intention to be vaccinated ranged from 28% to 93%, depending on sociodemographic factors and the perception of risk to the disease. Low confidence in the health system and negative information on social media about

vaccines were associated with lower acceptability among the community.[41]

Historically, primary healthcare physicians have been key to dispelling these myths.[42] Especially in remote communities, the primary care physician is often their only link to the healthcare system. Previous research has indicated that up to 50% of unvaccinated individuals were willing to take the shot if it was provided as part of their routine primary care visits.[3] This indicates the trust placed on primary care physicians and the kind of impact that a well-developed primary health infrastructure can have. Thus, ensuring the availability of vaccines at the primary health care setup and ensuring efficient administration strategies can greatly boost the vaccine uptake levels internationally. These reforms are of vital importance in ensuring that primary care is suitably equipped for future pandemics as well.

While anti-vaccine narratives have little persuasive capacity, they do possess a high probability of diffusion and can have a significant cost not only for those who share it but for the entire population, due to the impact of limited vaccination.[43] How governments respond to COVID-19 is a key factor in public confidence and acceptance of COVID-19 vaccination,[44] becoming the strongest indicator of willingness to accept a vaccine.[26] Most of the studies evaluating hesitancy of vaccines have been done individually; as far as we know, this is the first study to do so at the country's income level.

Social and economic impact

The coronavirus has affected the lives of human beings in various areas and different ways. For example, it has had a huge negative impact on the economic and social sphere in many different social strata.[45] In the educational scenario, COVID-19 has affected millions of children and young people. In approximately 107 countries, the closure of schools was implemented as a preventive strategy.[45] As a result of the crisis caused by the health emergency, a distance and remote education model has been adopted to continue with the training processes and study plans.[46]

COVID-19 has configured educational gaps that have become more relevant and evident amid the crisis. According to the ILO, an increase between 5.3 million and 24.7 million in unemployment is estimated due to the current crisis.[47] On the other hand, ECLAC points out that COVID-19 "will affect the number of jobs, the quality of work (reduced wages and less access to social protection), and the most vulnerable groups, such as workers in the sector".[48]

On the other hand, in the context of informality, the pandemic brings significant impacts in terms of unemployment and underemployment, especially among informal workers. When reflecting on the distribution of informality, differentiating among them the employed, underemployed, and unemployed, it was found that the incidence of informality is higher than those reflected in the results found and in those who are counted as more vulnerable in the labour force. The pandemic crisis, compulsory social isolation, and the educational emergency interact with the existing complexity of workers' tenure and income-generating capacity, employment circumstances, access to goods and services, and access to quality education, among others. others, making individuals who are part of the informal context particularly vulnerable to economic paralysis with unconventional responses.

The 10 most common fears refer mostly to fears related to contamination, disease, and death due to the coronavirus. A total of 5 out of the 10 most common fears belong to this category of fears. Next in relevance are fears related to work loss of income and fears of social isolation. This pattern is very similar among the participants, regardless of gender and age.[49]

Some international conflicts related to the dispersal of the vaccine have also been reported during these pandemic years, beyond the vaccination restrictions that each country has declared for visitors.[10,11,13]

Altogether, we speculate that the current pandemic emergency will trigger detailed studies of coronaviruses, their mechanism of infection, the development of systematic drug repurposing approaches, and novel drug discoveries for current and future pandemic outbreaks.

Limitation

Some limitations must be expressed. Some of the data used in our research were obtained from public sources, with the possible bias of information that is succinct. On the other hand, subnational policies within each country can strongly influence and include different strategies in the same country, complicating data analysis.

Conclusions

The world wakes up every day with enhanced risk for the breakthrough of a new infectious disease due to advanced environmental risks caused by human interventions. Policy leaders and governments should be prepared with the learnings of the COVID-19 vaccination drive to inculcate the positive factors while removing the low output factors and strategizing a vaccination plan, as there is a huge inequality between the income levels and vaccination strategies implemented internationally. There is an urgent need for scientific work on Vaccination Drive Planning in the field of global health.

List of abbreviations

COVID-19: Coronavirus disease 2019
SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2
LIC: Low-income country
LMIC: Lower middle-income country
UMIC: Upper middle-income country

HIC: High income-country
WHO: World Health Organization
ANOVA: Analysis of Variance
CDC: Centres for Disease Control and Prevention
SPSS: Statistical Package for the Social Sciences
COVAX: COVID-19 Vaccines Global Access
H1N1: Swine Flu
HPV: Human papillomavirus
ILO: International Labour Organization
ECLAC: United Nations Economic Commission for Latin America and the Caribbean

Ethics approval

Since the project made use of secondary data available online on official portals, ethics. The data analyzed did not involve any confidential patient information and no new interventions were performed on any population, thus, a clinical trial registration and ethics committee approval were not needed.

Availability of data and materials

The data is available from the corresponding author on reasonable request.

Acknowledgements

The authors would like to acknowledge the open-access resources from where data was collected under the Creative Common License.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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