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COVID-19 VACCINE UPTAKE AMONG OPULENT VS SLUMS OF URBAN SETTING IN KARACHI, PAKISTAN. A CROSS-SECTIONAL STUDY.

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ABSTRACT

Background: COVID-19 vaccine effectiveness and acceptability are critical for a number of important outcomes, including symptomatic COVID-19, severe illnesses, and COVID-19-related mortality.

Aim: To assess the immunization status regarding age, gender, and living standards and the reason for non-compliance to the Covid-19 vaccine among people of urban opulent and slums areas of a single city, i.e., Karachi, Pakistan.

Method: This cross-sectional study was conducted from December 2022 to January 2023 in Karachi, Pakistan. Data were collected through social media websites, including WhatsApp and Facebook, telephonic interviews from opulent urban areas, and direct contact during the visit to primary health care clinics in urban slum areas. STATA software was used for data analysis.

Result: Of 1265 respondents from slums and opulent areas, 15.8% were non-vaccinated slums, whereas 14.16% belonged to opulent areas needing vaccination with adjusted OR 95% is 0.74(0.41-0.95). Of 1265 respondents, 825(65%) were females, and 440 (34.7%) were male. The vaccine compliance among females was 49%, and 32% among male respondents with adjusted OR 95% 1.84(1.12-3.03). Only 6% of the slums area were vaccinated with the required shots of vaccine (2 doses and one booster) compared to opulent areas, i.e., 20%.

Conclusion: Our research at the population level adds to the knowledge we now have from patient data and demonstrates how aggregated data from fully functioning epidemic surveillance and monitoring may provide information about the possible effects of extended COVID on national and international public health.

Key words: *COVID-19, Immunization status, Vaccine acceptance, Hesitancy, Pandemic, Conspiracies, slums, opulent.*

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INTRODUCTION

With record-breaking numbers of cases and fatalities, the COVID-19 pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has disrupted people's lives all over the globe as mentioned by Chow EJ et al. in 2023. In Pakistan, as per reported by Perveen S (2022) that states that COVID-19 was first detected in Karachi on February 26, 2020. Similarly, according to WHO, 1,580,631 confirmed cases have been reported in Pakistan, with 30,656 deaths till June 14, 2023.

Though these tactics facilitated flattening the pandemic curve, these were not the definitive solution as mentioned by VoPham T et al. 2020. AstraZeneca/AZD1222, Oxford's Pfizer-mRNA-1273,

BioNTech's, and Moderna's mRNA-1273 were some of the first vaccines designed to receive Food and Drug Administration (FDA) as reported in one of the study by Thanapluetiwong S et al. 2021. Numerous vaccinations have undergone testing and received authorization for emergency use after the COVID-19 epidemic. Voysey M (2021) claimed that Phase III trials revealed high vaccine effectiveness (VE) against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection with these vaccines, including 70.4% effectiveness of the ChAdOx1 nCoV-19 vaccine (AZD1222; Oxford-AstraZeneca), 95% effectiveness of the BNT162b2 mRNA COVID-19 vaccine (Pfizer-BioNTech) were reported by Polack FP et al. (2020). It is important to gauge the efficacy of vaccinations released to the public in real-world situations since the research conditions used in clinical trials may impact the results.

In Pakistan, the coronavirus vaccination campaign called COVID-19 vaccine tracker began on February 3, 2021, after the arrival of the first batch of vaccines from China. Seven vaccines are approved for use in Pakistan, including Sinopharm, Sinovac, AstraZeneca, CanSino, Sputnik, Pfizer-BioNTech, and Moderna. On contrary, CDC published the report in 2021, which talked about developing immunity following a vaccination might occasionally result in undesirable side effects [11].

According to the World Health Organization (WHO), assessing COVID-19 Vaccine efficacy and acceptance is vital for several key outcomes, including symptomatic COVID-19, severe illnesses, and COVID-19-related deaths reported by different researchers such Huang Z et al. (2022) and Rapaka RR et al. (2022). One recent meta-analysis done by Zheng C et al. (2022), has been supporting the efficacy of the COVID-19 vaccine [14]. Therefore, this study was conducted in comparison to the acceptance and compliance of two settings, urban slums vs. Urban Opulent in one city of Pakistan, Karachi.

To assess the reasons the non-vaccinated respondents gave for their non-compliance with the COVID-19 vaccine in terms of age, sex, living standards, and reasons for hesitancy.

METHOD

A comparative analytical cross-sectional study was considered between the two settings of Karachi, Pakistan. The data was collected from urban slums and the opulent urban population of Karachi, Pakistan. Slum areas included four locations, i.e., Baldia Town, Korangi Town, Surjani Town, and Gadap Town. In contrast, opulent areas, including Jamshed Town, Shah Faisal Town, Gulshan Town, and Nazimabad Town, were selected randomly based on feasibility. Figure 1 shows the pictorial presentation of the target population. Multisectoral primary healthcare sites were considered for access to slum people, whereas different educational institutions, tertiary healthcare setups, and employers were considered for the opulent area populations.

The population of urban slums and opulent areas of Karachi, Pakistan, was included in our comparative cross-sectional study. A self-designed pre-tested questionnaire was used for data collection based on a detailed literature review. The questionnaire was created in English but was translated into the national language (Urdu) to narrow the communication gap. The survey was pre-tested, allowing the identification of irrelevant questions, estimation of the survey's completion duration, and estimation of response rates. The questionnaire was improved and modified in light of pre-testing results and expert recommendations. The final questionnaire contained two sections with close-ended questions.

In the first section of the questionnaire, participants' sociodemographic data were recorded, including their age, gender, employment status, and residential area. In the second section, the respondent was asked if he/she was vaccinated. If the respondent is vaccinated, questions related to vaccine hesitancy, their reluctance to get the COVID-19 vaccine, and their motive for participating in the vaccination program were asked.

In opulent areas, data were collected using electronic questionnaires through social media platforms (i.e., WhatsApp and Facebook). Additionally, participants were urged to share the survey link with their friends and family. On the survey's cover page, the title, goal, and inclusion/exclusion criteria were explained to the respondents, and their consent to participate was required before the questionnaire could be filled out. On the other hand, people in urban slum areas were not educated enough to understand the electronic questionnaire, so research associates surveyed each by asking questions individually to each participant after getting their verbal consent.

This cross-sectional study was conducted during two months, i.e., December 2022 to January 2023. The sample size was calculated by Open epi software based on a recorded and updated prevalence of 59% through a literature search as per the published number in Pakistan COVID-19 vaccination rate in 2022, with a 99.9% confidence level and 0.1% absolute precision, and 20% of no response rate; the final data size was 1266. Six hundred eighteen respondents belong to an opulent urban area, and 648 belong to an urban slum area.

The participant who was interested in sharing their consent and agreed to participate, aged above 18, were included in the study, and those who were unable to answer the questionnaire due to a language barrier or inability to understand the questionnaire were excluded from the study. Study variables are shown in Table 2 and further elaborated in the following bifurcation. Outcome or Response Variable: Covid 19 vaccine compliance.

Independent or Predictor Variable:

1. Age (years)
2. Gender (male/female)
3. Education (none/school/college/university)

4. Area (urban slums/opulent)
5. Comorbid (yes/no)
6. Concerned about the vaccine (yes/no)
7. Substance abuse (yes/no)
8. Consider vaccine is important (yes/no)
9. Fear of side effect ((yes/no))

The data were entered using Microsoft Excel and exported to STATA-17 MP—Parallel Edition for analysis. To describe the sociodemographic features, clinical variables, and depression, descriptive statistics (frequencies, tables, percentages, and averages) were generated. There were univariate and multivariate logistic regression analyses performed. To avoid possible confounders, variables with p-values less than 0.25 in the bivariate model were added to the multivariate analysis. Variables with P-values less than 0.05 were deemed statistical predictors of depression in the multivariate model. The strength of the link was measured using the odds ratio with a 95% confidence interval.

RESULT

We had taken 1265 participants, of which 1030 complained about COVID-19 vaccination. There were 617 subjects from affluent areas, and the remaining 648 were from slum regions. The most representative age groups were between 18-29 years and 30-39 years, with 520 and 322 participants, respectively; among them, 448 and 251 respective age group participants were vaccination compliant. Among the total of 398 subjects having comorbidity, 201 subjects were non-compliant with vaccination, and similarly, in study counts with no comorbidities, 833 were from the compliant vaccination group. A total of 1040 participants showed concern about COVID-19 vaccination; among them, 819 participants were compliant with the vaccine. There were 694 deaths among the study population, of which 215 subjects were non-compliant with the vaccination. There was a total of 825 females, and 440 were males among the study participants, out of which 622 (49.1%) were females and 408 (32.2%) males were compliant with the COVID-19 vaccination. A total of 156 subjects were using substance abuse, of which 39 were non-compliant with the vaccine. Most of the study participants were illiterate (37.5%) and had a university-level degree, out of which 374 and 319 subjects were compliant with the vaccine. Seven hundred seventy-two cases knew the importance of the COVID-19 vaccine; among them, 719 contributors were vaccination compliant. Three hundred forty-six contributors feared vaccination side effects; 324 subjects were non-compliant with vaccination. See Table 2 for a detailed view of the descriptive analysis of study variables, as shown in table 2.

Table 2
Descriptive statistics of predictor variables with respect to vaccine compliance

Variables	Total n (%) =1265	Non-compliant to vaccine n (%)	Compliant to vaccine n (%)
Area			
0=opulent	617 (48.77)	35 (14.89)	582 (56.50)
1= slums	648 (51.23	200 (85.11)	448 (43.50)
Age			
0=18-29	520 (41.11)	72 (30.64)	448 (43.50)
1=30-39	322 (25.45)	71 (30.21)	251 (24.37)
2=40-49	214 (16.92)	45 (19.15)	169 (16.41)
3=50-59	124 (9.80)	29 (12.34)	95 (9.22)
4=60-69	62 (4.90)	13 (5.53)	49 (4.76)
5=70-79	23 (1.82)	5 (2.13)	18 (1.75)
Comorbid			
0=No	867 (68.54)	34 (14.47)	833 (80.87)
1=Yes	398 (31.46)	201 (85.53)	197 (19.13)
Concerned for vaccine safety & Efficacy			
0=No	225 (17.79)	14 (5.96)	211 (20.49)
1=Yes	1040 (82.21)	221 (94.04)	819 (79.51)
Covid deaths			
0=No	694 (54.86)	215 (91.49)	479 (46.50)
1=Yes	571 (45.14	20 (8.51)	551 (53.50)
Covid history			
0=No	661 (52.25)	39 (16.60)	622 (60.39)
1=Yes	608 (47.74)	196 (83.40)	408 (39.61)
Gender			
Female(ref)	825 (65.22)	203 (86.38)	622 (60.39)
Male	440 (34.78)	32 (13.62)	408 (39.61)
Substance			
No (0)	1109 (87.67)	196 (83.40)	913 (88.64)
Yes (1)	156 (12.33)	39 (16.60)	17 (11.36)
Education status:			
0=none	474 (37.47)	100 (42.55)	374 (36.31)
1=school	170 (13.44)	42 (17.87)	128 (12.43)
2=college	238 (18.81)	29 (12.34)	209 (20.29)
3=university	383 (30.28)	64 (27.23)	319 (30.97)

Importance of vaccine			
0=No	493 (38.97)	182 (77.45)	311 (30.19)
1=Yes	772 (61.03)	53 (22.55)	719 (69.81)
Fear for side effect			
0=No	284 (22.45)	276 (26.80)	8 (3.40)
1=Yes	346 (27.35)	324 (31.46)	22 (9.36)

Table 2 shows the possible difference in vaccine compliance with the sampling regions, and it has been found that there is a mean difference between both regions concerning vaccine compliance (p-value<0.001). The opulent regions showed more vaccination compliance (56%) than urban slum regions (43.6%).

Table 3
Effect of vaccination compliance with sampling area

Vaccine compliance	Area	
	Urban slums	Urban opulent
NO	85.84%	14.16%
YES	43.65%	56.35%

X2= 135.22; p value <0.0001

Table 3 shows the unadjusted bi-variate analysis between the predictor variable and Covid-19 vaccine compliance. It screened only those variables associated with vaccine compliance (p<0.25) and included them in the multivariate logistics model. Our results showed that all variables were significantly associated (p<0.25) with vaccine compliance except Covid-19 history. Therefore, we should have included it in the multivariate model.

Table 4 (a)
Screening predictor variables through univariate analysis

Variable	Crude OR	Chi square	p-value
Age			
30-39	0.56(0.39-0.81)	13.72	<0.25
40-49	0.60(0.39-0.91		
50-59	0.52(0.32-0.85)		
60-69	0.60(0.31-1.17)		
70-79	0.57(0.20-1.67)		
Gender			
Male	4.16(2.80-6.16)	64.48	<0.001
Comorbid			
Yes	0.04(.02-.05)	375.90	<0.001
Covid deaths in family			
Yes	12.36 (7.69-19.86)	16.62	0.04
Education			
School			
College	0.81(0.53-1.23)		
University or more	1.92(1.23-3.01) 1.92(1.23-3.01)	13.88	<0.25
Substance abuse			
Yes	0.64(0.43-0.95)	4.54	0.029
Covid history			
Yes	0.87(0.59-1.27)	0.50	0.485
Fear for side effects			
Yes	0.42(.18-0.97)	182.04	<0.001
Consider vaccine is important			
Yes	7.93(5.68-11.08)	178	<0.001
Area			
slums	0.13(0.09-0.19)	144.70	<0.001
Concerned for vaccine			
Yes	0.24(0.14-0.43)	33.73	<0.001

Table 4 shows the multivariate analysis between the vaccination compliance with the screened predictor variables; the odds of covid vaccine compliance among participants between 30 to 39 years is 1.39 times (p-value<0.001, 95% CI: 0.79-2.45) as compared to participants of 18-29 years when adjusted for other variables in the model. The odds of covid vaccine compliance among participants above 70 years is 6.22 times (p-value<0.001, 95% CI: 1.77-21.85) compared to participants of 18-29 years when adjusted for other variables in the model. The odds of covid vaccine compliance are 97% less among participants with comorbid (p-value<0.001, 95% CI: 0.01-0.05) as compared to participants without any comorbid when adjusted for other variables in the model. The odds of vaccine compliance are 7.04 times among participants who experienced covid related deaths in the family (p-value<0.001, 95% CI: 3.93-12.58) compared to participants who experienced covid related deaths in the family when adjusted for other variables in the model. The odds of vaccine compliance among participants who lived in urban slums is 26% less (p-value<0.001, 95% CI: 0.41-0.95) than those who lived in opulent urban areas when adjusted for other variables in the model. The odds of vaccine compliance among males are 1.84 times (p-value<0.001, 95% CI: 1.12-3.03) compared to females when adjusted for other variables in the model. The odds of covid vaccine compliance among those concerned about the vaccine is 71% less (p-value<0.001, 95% CI: 0.15-0.56) compared to those not when adjusted for other variables in the model. The odds of covid vaccine compliance among those who thought vaccination was important is 3.72 times (p-value<0.001, 95% CI: 2.26-6.11) compared to

those who did not when adjusted for other variables in the model.

Table 4 (b)
Multicollinearity between the variables.

Variables	Age	Comorbid	Covid deaths	Area	Gender	Concerned for vaccine	Consider vaccine is important
Comorbid	0.43	1					
Covid Deaths	0.15	-0.31	1				
Area	0.28	0.47	-0.49	1			
Gender	0.07	-0.18	0.06	-0.14	1		
Concerned For Vaccine	0.05	0.07	0.10	-0.10	-0.1	1	
Consider Vaccine Is Important	0.19	-0.40	0.34	-0.58	0.13	0.05	1
Education Status	0.05	0.07	0.04	0.04	0.13	0.48	0.04

Table 4 shows that the opulent population complies more with vaccination than urban slums.

Table 5
Multivariate logistic regression between the study variable and screened predictor variables

Variables	Adjusted OR 95%CI
Age	
18-29	Ref
30-39	1.39(0.79-2.45)
40-49	3.10(1.63-5.89)
50-59	4.14(2.03-8.43)
60-69	5.02(2.08-12.12)
70+	6.22(1.77-21.85)
Gender	
Male	1.84(1.12-3.03)
Female	Ref
Comorbid	
Yes	0.03(0.01-0.05)
No	Ref
Covid deaths in family	
Yes	7.04(3.93-12.58)
No	Ref
Importance of vaccine	
Yes	3.72(2.26-6.11)
No	Ref
Area	
Urban slum regions	0.74(0.41-0.95)
Opulent region	Ref
Concerned for vaccine	
Yes	0.29(0.15-0.56)
No	Ref

Table 5 showed that the 18-29 age group 215 (16.9%) were more compliant with covid vaccine (two doses with two boasters than any other age group). On the contrary, ages 50 and above show limited compliance with vaccines, i.e., one dose with no boaster, two with no boaster, and so on.

DISCUSSION

As per our collected data from two different settings, 346(27.35%) showed fear about the side effects of the COVID vaccine even after getting an immunization, same as a recent study in Germany by Holzmann-Littig C et al. (2022), in which the researcher concluded that there is only one due to individual circumstances and worry about adverse impacts. Fear includes so many directions. Some think it may cause infertility among couples of childbearing age, similar to the study reported by USA researchers named Diaz P et al., 2022. In contrast, others showed anxiety and depression about the side-effect, which has already been reported in the present study from a group of Researches Jun J et al., 2022 from the USA, France, Canadian researchers named Awijen H et al., 2022, and researchers from Poland Kałucka S et al., 2022. There is a considerable difference in the vaccination rate of urban slums vs. opulent urban areas even after being located in the same city, similar to the studies highlighted between urban vs. rural areas in the same country by Sun Y et al. (2022) and McNeil A et al. (2022).

As per the collected data, 15% of people had some other comorbidities and were non-compliant with vaccines, as reported in one of the studies from the USA. In this study, those with serious disease complications showed more hesitancy towards vaccination for COVID than counterparts suggested by Tsai R et al. 2022. As per the survey, the dosage of COVID vaccine, first and second vaccine shots with additional two booster shots were more compliant among opulent 27.2% than those in urban slums area. This has been reported in one of the past studies conducted by different researchers from Brazil named Aguilar Ticona JP et al., (2021), the USA, and the UK that slum dwellers are least bothered and interested in vaccination. On the contrary, this concept is denied by another study recently conducted in Bangladesh by Patwary MM et al. 2022, which reported that vaccine acceptance was more in slums.

As per the collected data, the younger age group got immunizations, contrary to the study

conducted in Saudia Arabia in 2021 by Almaghaslah D et al., in which more young people feared getting vaccinated.

Education also plays an imperative role in vaccine compliance. As per our collected data, lower and no education status hesitate more to get vaccinated than those with good knowledge about this virus and its immunity. This is further supported by a recent study in Austria done by Humer E et al. 2023, where educated adolescents have higher vaccine compliance than illiterate.

CONCLUSION

The causes of acceptance and resistance to the COVID-19 vaccination are still unclear. Maintaining a careful balance between sharing what is known and admitting the unanswered questions will be crucial when new SARS-CoV-2 mutations emerge, increasing complexity and new vaccines hit the market. Therefore, the media should report ethically and openly, giving viewers accurate and balanced information. Finally, those who use the internet and social media—including researchers and medical professionals—should do so responsibly to avoid disseminating untruths or using language that can be understood incorrectly and, as a result, might contribute to vaccination reluctance. Following that, research should be utilized to create contextualized marketing and information-sharing that will eventually lead to an increase in trust and usage of the vaccinations that are now accessible.

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ATTACHMENTS

Table 1
Study variables

S#	Variable	Type	Code Unit
1	Age	Qualitative	0=18-29 1=30-39 2=40-49 3=50-59 4=60-69 5=70+
2	Gender	Qualitative	0=Female 1=Male
3	Area	Qualitative	0=opulent 1=slums
4	Comorbid	Qualitative	0=No 1=Yes
5	Concerned for vaccine	Qualitative	0=No 1=Yes
6	Covid death in family	Qualitative	0=No 1=Yes
7	History of covid	Qualitative	0=No 1=Yes
8	Substance abuse	Qualitative	0=No 1=Yes
9	Education	Qualitative	0=none 1=school 2=college 3=university or more
10	Importance of vaccine	Qualitative	0=No 1=Yes
11	Fear of side effects	Qualitative	0=No 1=Yes

Table 6
Dose wise slums and opulent setting COVID vaccine uptake

COVID vaccine doses	Opulent n (%)	Slums n (%)
1 shot	-	92(7.2)
2shots	-	262(20.7)
2shots with 1 booster	258(20.3)	76(6)
2 shots with both boosters	324(25.6)	18(1.4)
Not vaccinated	35(2.76)	200(15.8)