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Overcoming Vaccine Skepticism in Pakistan: A Cross-Sectional Study of Public Knowledge, Attitudes, and Behaviors towards COVID-19 Vaccination

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ABSTRACT

This study examines the knowledge, attitudes, and perspectives of the public towards COVID-19 immunization in Pakistan. A cross-sectional survey was conducted using a well-structured questionnaire and distributed through internet means. The results showed that socio-economic variables such as age, gender, education level, and wealth are essential predictors of vaccination uptake. Highly educated, wealthy, and urban residents have a positive attitude towards vaccination. The media plays a critical role in distributing information and shaping attitudes. Effective communication and availability of information also significantly contribute to illness susceptibility and prevention behavior. The study suggests that the government and healthcare system can improve public awareness and adopt preventive behavior to combat the COVID-19 pandemic.

Keywords: COVID-19 Pandemic; Vaccine phobia; People's perception; Attitude; Preventive behavior; Pakistan.

1. INTRODUCTION

Since its introduction, the novel COVID-19 virus has disastrously affected societies' health, social, and economic aspects (Qiao et al., 2020). Around 80846181 persons have been infected, and 1762319 fatalities have been documented worldwide. In Pakistan, 1273560 confirmed cases had been recorded, with 28456 fatalities till November 2020 (GoP, 2020). To contain the epidemic and preserve lives, many preventative measures have been implemented, including face masks, quarantine, and vaccinations. Vaccinations have been an efficient method of controlling pandemics (Ward et al., 2020). Numerous vaccinations are accessible worldwide, but issues with public acceptability continue. Public skepticism regarding vaccinations has become a worldwide concern (Dubé et al. 2013; Larson et al., 2016). COVID-19's fourth wave is very sluggish compared to the preceding three waves. Pakistan's government has pledged \$1.1 billion to acquire vaccines. In Pakistan, healthcare personnel and paramedics are initially vaccinated, and the vaccine is now offered to the public for free. According to the World Health Organization, vaccine hesitancy is one of the world's most severe threats to public health today. The majority of the world's population is averse to vaccination because they are unaware of its benefits (World Health Organization, 2020). The issue of vaccine reluctance is prevalent around the globe.



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Vaccine hesitancy is a significant concern for the Pakistani government since a considerable deal of fake news, deception, and incorrect ideas exist in the minds of the Pakistani people. While Pakistan has a supply chain difficulty with vaccines, the government has secured 40 million doses from the WHO, China, the United States of America, the United Kingdom, and Germany. The government has set a goal of 70 million vaccinations by 2021 (Khan, 2021). Numerous factors contribute to vaccine acceptability, the most significant of which are disinformation, erroneous beliefs, and fake news. Religious conspiracy theories against polio vaccinations and now against COVID-19 vaccines may influence public opinion about vaccine uptake (Islam et al. 2021). COVID-19 epidemic hurt Pakistan's health care system, economy, and social life. Pakistan's government has imposed restrictions on the spread of the virus and is making significant attempts to contain it via immunization. In Pakistan, various vaccinations are available, including those manufactured by Pfizer, Sinovac, and Sino pharm. The rising issue of vaccination hesitancy has been a source of contention for the administration. Pakistan's vaccination efforts are minimal compared to other countries (Tahir et al., 2021).

The research aims to address the following potential questions: what is the public's reaction to COVID 19 vaccination? Many of them are hesitant due to their ignorance of the health advantages. May they believe it is dangerous? The second question is: How do individuals believe that the COVID-19 vaccination has negative health consequences? Due to massive awareness campaigns about contagious diseases and quality education, individuals are more confident about vaccination. Larson et al. (2018) describe how education significantly influences growing people's faith in the health care system and health information. In this context, the third question is: Do highly educated individuals have a lower level of resistance to COVID -19 vaccination? Islam et al., (2021) discovered that many socioeconomic characteristics substantially influence people's attitudes toward vaccination, leading to fear and hesitation about vaccine uptake. The remaining questions are in line as follows:

- Do socioeconomic factors influence people's awareness of health communication?
- Do young individuals express less apprehension regarding COVID -19 vaccination? And
- Does increasing health information via the media promote public knowledge of COVID -19 vaccination?

The following prospective research goals have been developed to address the aforementioned study issues:

- I. To analyze the numerous demographic characteristics that may influence public opinion on COVID-19 vaccine uptake in Pakistan.
- II. To ascertain the individual and socioeconomic variables influencing the public's reaction to the COVID-19 vaccination uptake in Pakistan, and
- III. To provide policy recommendations based on the study's results.

Numerous researches is conducted to have a thorough understanding of the issue. It was discovered that many social factors such as income, age, education, marital status, and gender had a substantial influence on people's perceptions of COVID-19 uptake, similar to the findings of Viswanthet al.,(2021) and Verger &Dubé (2020).

Vaccine reluctance is the primary impediment to resolving the world's chronic COVID-19 epidemic. Our nation is likewise confronted with the same issue, and communities must be vaccinated entirely to minimize the occurrence of this disease. Numerous research is conducted in this area to ascertain the numerous aspects that may impact the vaccination process. This research examines the many characteristics such as age, income, education, marital status, and occupation that may influence people's attitudes and behaviors towards COVID-19 vaccination uptake in Pakistan. The data is gathered from a representative sample of people from different regions of Pakistan using a well-designed questionnaire. The survey is administered by WhatsApp using a Google form. The findings will be obtained using hierarchical regression.

The study is divided into different sections. The introduction is covered in the first section. The second section provides a literature review, and the third section covers the research methodology. The fourth section describes the findings, and the last section discusses the conclusions and suggestions based on the study findings.

2. LITERATURE REVIEW

Some of the literature is examined to acquire deep insight into the topic. Recent research linked to this subject is classified into several subgroups depending on the hypothesis created are divided into distinct subgroups.

2.1. Impact of education and other socioeconomic variables on COVID-19 immunization uptake

The current research that has been conducted in different regions of the globe. For instance, Singh et al. (2020) studied knowledge and perspective regarding universal safety measures during the early phase of the COVID-19 epidemic in Nepal. Online cross-sectional research was done involving 871 respondents were undertaken. It was discovered that most of the participants had a good attitude toward the universal safety precautions of COVID-19. It was also noted that knowledge, age, educational level, career type, and monthly household income had considerable influence. Also, it was noted that misconceptions and misunderstandings

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concerning COVID also occur. Serwaa et al. (2020) undertook an online poll to ascertain Ghanaian citizens' awareness, risk perception, and readiness about the COVID-19 epidemic. It was discovered that although public awareness of the condition is generally high, disparities occur among the least educated. Additionally, it was discovered that the study population is somewhat equipped to react to the COVID-19 sickness. The research emphasizes the necessity of educational efforts in rural areas through the Internet and mass media broadcasts. Irigoyen-Camacho et al. (2020) performed cross-sectional research to determine the influence of income level and perceptions of COVID susceptibility and severity on stay-at-home preventative behavior in a sample of older individuals in Mexico. A cross-sectional survey was done by telephone with 380 interviewees aged 65 years or older. Educational attainment was related to remaining at home, with the overall impact being primarily mediated by the perceived vulnerability. It was advised that government assistance should focus on low-income and less educated older persons to increase pandemic preparedness habits. Islam et al. (2021) performed exploratory research on Bangladesh residents' knowledge, attitudes, and perceptions of COVID-19 vaccination. A cross-sectional e-survey of 1658 participants was undertaken for this aim. The findings were produced by the use of a multiple regression model. Around 61% of the population had vaccinations, and over 90% felt that vaccines must have adverse effects. Higher education, nuclear families, and prior vaccine use were associated with significantly more favorable opinions regarding vaccination, with the majority of respondents being female. Salimi et al. (2020) studied the general public in North America has a strong comprehension of COVID-19. Cross-sectional research was undertaken using an internet source to assess public awareness of COVID-19, risk perception, and pandemic preparedness measures. A descriptive analysis was conducted on the whole population. The findings indicate that a young and educated sample of North Americans has a high awareness of COVID-19 and that a sizable proportion of the population also practices preventative actions. The stated findings corroborate our first hypothesis:

H1: Education has a beneficial effect on people's attitudes toward COVID-19 vaccination.

Similarly, Bae and Chang (2021) examined the influence of COVID-19 risk perception on behavioral intentions regarding tourism in South Korea during the first pandemic wave. A structured questionnaire was sent to 877 South Korean citizens through an internet survey, and attitude was a mediating factor between practical risk perception and behavioral intention. Gender and marital status acted as a partial moderator of the putative link between factors. Rodriguez-Besteiro et al. (2021) investigated Spanish university students' risk perception, psychology, and behavior. Three hundred volunteer university students were questioned using an online questionnaire. The research factors include perceived COVID-19 risk, psychological profile, dietary and dental health, and physical activity habits. The research found that female students had a greater impression of risk from COVID illness. Additionally, the female had a significant degree of anxiety awareness, neuroticism, and receptivity to experience. Males consumed more soft drinks, meat, and rice and had poor personal hygiene. Ceccato et al. (2021) studied the effect of age on perceptions of COVID-19 emergency in Italy during the pandemic. The research explored age-related changes in pandemic-related emotions, cognitive attitudes, and behavioral responses. An online poll was done with persons aged 18 to 85 years old from various demographic groups. The findings indicated that elderly persons exhibit less unpleasant feelings than their younger and middle-aged counterparts. Additionally, it was shown that older adults had a positive attitude toward resolving the situation. Kricorian et al. (2022) performed a study to ascertain the American public's attitudes and experiences about COVID-19 immunization. The findings indicated that those with less education, a lower income, and a rural location believed vaccines were harmful. However, those with higher education, a higher income, and a city-dwelling class believed vaccines were safe. Thus, the stated findings lead to the study's second hypothesis, i.e.,

H2: People with a high income and married status have a favorable attitude toward COVID 19 vaccination.

Khubchandani & Macias (2021) shown that vaccination hesitation was high among African-Americans (41.6%) and Hispanics (30.2%). Multiple regression models suggest that vaccination reluctance is substantially associated with sex, education, occupation, income, the presence of children in the household and political affiliation. Guidry et al. (2021) examine the willingness of individuals to get the COVID -19 immunization with and without emergency use authorization. Seven hundred eighty-eight people in the United States of America were polled online to determine vaccination's demographic and psychological characteristics. Age, race, positive subjective norms, high perceived behavioral control, a favorable attitude toward vaccines, and high perceived sensitivity to COVID-19 were significant predictors of readiness to take the vaccination. The investigations bolster our argument made in the third hypothesis, which is as follows:

H3: Socioeconomic factors significantly affect how individuals perceive COVID -19 immunization.

2.2. The government's and social networks' roles in containing the COVID-19 epidemic and immunization efforts

The following research demonstrates social media's critical role in sharing information about COVID-19 illness and its preventative measures. Additionally, these studies demonstrate the effectiveness of government programs for pandemic control in different regions of the globe.

Wise et al. (2020) examined changes in risk perception and self-reported protective behavior in the United States during COVID-19. In 1591, cross-sectional and longitudinal research was done on persons residing in the United States. The study's variables include the relevance of risk perception and preventive behavior in the event of a pandemic. The findings underscored the critical nature of risk perception during a large-scale epidemic. It was discovered that social separation and handwashing habits are crucial for preventing illness transmission. Mahmood et al. (2020) examined Pakistan's general public's attitude, perception, and knowledge of COVID-19. The study performed a cross-sectional survey using an online Google form. A total of 1000 people were interviewed. The results indicated that 42.9 percent of participants were aware of COVID through social media, which was the primary source of information. The participants had a high level of awareness about the illness and a favorable attitude toward preventative measures. Additionally, it was determined that the government made reasonable efforts to contain the outbreak. Kumari et al. (2021) conducted a qualitative study involving focus group discussions and thematic analysis to ascertain current knowledge, attitudes, perceptions, and concerns about COVID vaccines in the Indian population. Eight focus groups were formed in this study, with participants chosen via purposive sampling. The findings indicated that the public had mixed opinions about the COVID Vaccine. It was thought that channeling the appropriate signals would boost people's willingness to accept vaccines. Honarvar et al. (2020) investigate the knowledge, attitudes, risk perceptions, and behaviors of adults in Iran about COVID-19. This research aims to educate policymakers on how to handle the COVID-19 pandemic. A population-based survey was done in Shiraz by conducting face-to-face interviews using a multistage stratified and cluster sample. It was discovered that the sickness had a detrimental influence on most participants' everyday activities. Additionally, it was shown that participants followed news on national broadcasting channels and social media platforms. Motta Zanin et al. (2020) assessed public perceptions of risk associated with the COVID -19 health emergency in Italy. The research sought to ascertain the Italian public's perception of health risks. A questionnaire was sent to 9000 persons in Italy and other countries. The findings indicated that mass media had a considerable influence on respondents' level of knowledge and emotion. Neuburger and Egger (2021) investigated travel risk perception and behavior. This research aimed to assess the perception of travel risk and travel behavior in Germany, Austria, and Switzerland. The data were obtained at two periods in time: during March 2020, a sample of 1158 tourists was analyzed, and the second sample of 212 travelers was investigated. Cluster analysis was conducted. The findings indicated a considerable rise in pandemic risk perception. Additionally, it was shown that travel risk perception and travel behavior are related to time. Aldarhami et al. (2020) performed research in Saudi Arabia during COVID-19 on public perception and commitment to social distance. A countrywide online poll of 5105 people was undertaken. It was discovered that a high level of knowledge about remaining at home is mainly connected with female participants who have a high level of education and money. It was determined that the general application of social distancing was adequate. Additionally, it was found that the Saudi Ministry of Health's planned approach has been beneficial in raising public awareness and strengthening social distancing practices. Al-Amer et al. (2022) examined vaccination intentions for COVID-19 in the first year of the pandemic among health care professionals and the general public worldwide. A systematic review and meta-analysis were used to explore seven databases for COVID-19 intention-related material published on or before 31 December 2020. This review includes 30 papers. COVID-19 vaccination intention varied from 27.7 percent to 93.3 percent throughout the first year of the pandemic. The findings demonstrated that sociodemographic disparities, risk perception, and sensitivity to COVID -19 vaccine characteristics affected vaccination intentions. Rubaltelli et al. (2020) identified environmental and psychological factors influencing how people respond to the COVID -19 epidemic in Italy. Two cross-sectional studies were conducted, the first with a sample size of 992 respondents and the second with 103 respondents during the outbreak's start and the lockdown, respectively. The findings indicated that media exposure affected Italy's risk perception and preventive behavior. In the second wave, it was discovered that emotion risk perception is associated with expected protective behavior. Additionally, this information will be helpful in the coming months to determine who was most affected by stress and subsequent preventative measures during the epidemic.

2.3. Public opinion on COVID-19 vaccination

The following research has been undertaken worldwide to ascertain public opinion towards vaccination, i.e., Shahin and Hussien (2020) examined the risk perception of COVID-19 illness among the general population in the Middle East. A cross-sectional online survey was conducted with 723 participants from Saudi Arabia, Egypt, and Jordan, utilizing a simple sample approach. The results indicated that Egyptian participants had a lower mean score for perceived effectiveness in dealing with COVID illness. Additionally, a positive link was discovered between the perceived severity of COVID-19 illness and self-efficacy to manage the condition. Seale et al. (2021) studied the Australian public's attitude and behavior about the COVID-19 vaccination. A cross-sectional online survey of the Australian population aged 18 and above was conducted. The study included both univariate and multivariate logistic regression models. Overall, respondents had a favorable view of immunization. It was proposed that the government use effective communication and strategy to aid in the disease's containment. Biasio et al. (2021) tested COVID-19 literacy in the general public using an online survey to ascertain their knowledge and beliefs. It was noticed that conducting a poll over the internet is the

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most appropriate way for determining the general public's vaccination literacy during an epidemic. Ward et al. (2020) performed four online questionnaires to ascertain the adult population's sentiments regarding vaccination in France. Attitudes regarding vaccines were substantially linked with political partisanship and involvement with the political system. Qiao et al. (2020) investigated risk exposures, perceptions, unfavorable attitudes about universal immunization, and acceptability of COVID-19 among South Carolina college students. According to an online poll of 1062 college students, perceived severity and fear of COVID-19 were favorably connected with vaccine acceptance. However, increased risk exposure and a negative attitude toward general immunization were adversely correlated with vaccine acceptance. Burke et al. (2021) examined perceptions and intentions in international research on Enablers and Barriers to COVID -19 Vaccine Uptake. The study evaluated factors affecting vaccination hesitation, health beliefs, and individual characteristics such as wealth, age, religion, altruism, and collectivism. Four thousand three hundred three respondents from Australia, Canada, New Zealand, England, and the United States were questioned using a well-structured questionnaire. The findings indicated that vaccination uptake was significantly influenced by faith in vaccine approval, perceived vaccine efficiency for protecting others, and conspiracy ideas. Individual and societal variables of COVID-19 vaccination uptake in the United States were studied by Viswanath et al., (2021). The poll surveyed 1012 individuals. The study investigated risk perception, exposure to COVID-related media coverage, political party affiliation, and faith in scientists. The findings reveal that race, risk perception, media exposure, political affiliation, and trust in scientists play a role in an individual's vaccination uptake. Saeed et al. (2021) investigated the adverse reactions and perceptions of the Sinopharm vaccination in the United Arab Emirates. Demographic information was gathered through an online survey of the adult population. The results indicated that post-vaccination side effects were modest and predictable for both doses (first and second), with no occurrences of hospitalization. The findings of this research will aid in the decrease of vaccination reluctance among people. Caserotti et al. (2021) examined the relationship between COVID -19 risk perception and vaccination reluctance in Italian citizens. This research aims to examine the characteristics that influence vaccination uptake for COVID-19 compared to seasonal flu and determine how this process proceeded under lockdown. It was discovered that more persons were willing to get vaccinations during the lockdown period than during the pre-lockdown phase. Psychological and demographic aspects were shown to be beneficial in improving health communication to increase response during epidemics.

This research aims to determine how the general population in Pakistan feels about the uptake of COVID-19 immunization. Because most research is conducted in industrialized countries, very little research has been undertaken in the Asian context. The people of Pakistan have been battling to keep the epidemic under control, which has had a catastrophic effect on all segments of society. This research aims to examine the numerous individual and socioeconomic determinants of vaccination uptake among Pakistani citizens. It may provide some more information to researchers and policymakers to assist them in dealing with the epidemic in our area.

3. MATERIALS AND METHODS

This section contains detailed information on the data-gathering strategies used, the model's estimate, and the variables included in the investigation.

3.1. Data Collection

The information is gathered via a well-structured questionnaire using a five-point Likert scale by taking into account the numerous demographic characteristics of the relevant population.

3.2. Study's Population

The study population consists of persons living in Pakistan above the age of 18. Gender, age, income, marital status, education, employment position, and place of residence are just a few of the demographic parameters to consider.

3.3 Sampling Techniques and Sample of the Study

Purposive sampling (also known as non-probability sampling) is used to select the sample for this study. Purposive sampling is a method of selecting participants for a research project based on the researcher's assessment of who will be most suited. It is both cost-effective and time-effective to do this. When only a few primary data sources are accessible, this is the most suitable strategy for choosing a sample. The information is gathered from various cities in the KPK and Punjab provinces of Pakistan. Individuals from Lahore, Islamabad, Rawalpindi, Faisalabad, Peshawar, Abbottabad, Mardan, Swaabi, Charsada, Mansehra, Battagram, and Haripur are included. A total of 273 questions have been completed using WhatsApp using a Google form. It is decided to use the methodology of purposeful sampling to save the researcher's time and money. It is also the most convenient method of collecting data for our study project.

3.4 Data collection and analysis

The information is gathered via the use of a well-structured questionnaire. All respondents completed the questionnaire and sent it

by postal mail, email, and a WhatsApp group. Affective perceptions of individuals regarding COVID-19 immunization are the dependent variables; perceptions of risks, behavior control measures used to avoid exposure to harmful information, and attitudes toward vaccine uptake are independent factors. In the current research, I questioned participants, "do you believe that the COVID - 19 immunization is effective?" and "do you closely adhere to the preventative measures?" As an additional inquiry, I asked them what their thoughts were on whether or not their relative should be vaccinated and what they thought about news and information from the media. In addition, questions on subjective norms and social distance have been introduced.

3.5. Theoretical Framework

The fear appeal theory has been extensively used in health management to determine the effect of threat information on an individual's behavioral shift toward preventative actions (Floyd et al., 2000; Ruiter et al., 2014). This theory comprises two theoretical frameworks: one is based on protection motivation theory, while the other is based on the extended parallel process model. PMT (protective motivation theory) takes four types of information into account.

- i) The noxiousness of a described incident,
- ii) The efficiency of the depicter's response,
- iii) The likelihood of occurrence, and
- iv) Self-efficacy depickers described by Rogers, 1975: Maddux & Roger, 1983.

Individuals' attitudes about response are influenced by the elements listed above. However, as Witte (1992) noted, EPPM (extended parallel Process model) enhanced prior fear appeal PMT in three ways.

- i) PMT considers the danger-avoidance process, while EPPM considers the fear-avoidance process.
- ii) EPPM views fear as the primary variable to regulate and serve as a preventative element in cognitive processes.
- iii) It considers how individual variations may influence one's assessment of danger and effectiveness.

EPPM was advanced to E-EPPM by So et al. (2013), who cited fear and anxiety as significant risk perception elements. Additionally, they discovered that worry, rather than fear, is the primary motivator for taking preventative action. Fear helps theory aids in deciphering patient location information in order to take preventative action during a pandemic. According to this logic, research conducted by Wu. et al. (2021) examined perceived patient location information related to citizen fear and attitude during a pandemic. According to fear appeal theory, patient location information may manage crises and promote patient health.COVID-19 has elicited significant anxiety, motivated mainly by worries of death and infection. The rapid spread of coronavirus necessitates social seclusion, exacerbating anxiety and sadness. According to the "Anxiety Buffer Hypothesis," self-esteem functions as a buffer against feelings of isolation, anxiety, and sadness. Self-esteem is a depression-fighting element. Psychological health may be improved physically via the use of Targeted Psychological Interventions (Rossi et al., 2020).This research takes three things into account: To begin, we evaluate the public's stance toward vaccination. The judgment is vaccinated regardless of whether it is safe or hurts human life. Finally, to examine public opinion to determine if the government's participation is adequate to deal with a pandemic.

3.6. Data Analysis

The following sequential stages were used in the research to analyze the data, i.e.

Step -I: Chronbach's alpha reliability analysis

Cronbach's alpha, also known as coefficient alpha, quantify the trustworthiness of data. Internal consistency is another term for reliability. This alpha is used to evaluate multiple-choice questions in surveys that use the Likert scale. Cronbach's alpha is employed when categorical variables are included in the research, and it indicates how these questions are linked to the study's items. Yahaghi et al. (2021) employed the Cronbach's alpha to determine the dependability of their data. They discovered a value of 0.89 for subjective norms on vaccine uptake. 0.94 in terms of attitude toward vaccination uptake. 0.92 for COVID-19 vaccination intention. Similarly, Tahir et al. 2021 employed Cronbach's alpha to determine the trustworthiness of data collected in research on Pakistani community attitudes on readiness to pay for the COVID-19 vaccine and its acceptability.

Step-II: Respondents' demographic information

Numerous demographic factors of respondents are addressed in this study since these qualities may differ across individuals and may significantly impact our research domain. The study examined a variety of demographic and socioeconomic parameters in the study's variable construct.

Step-III: Frequency Distribution

In the primary research, frequency distributions summaries enormous data sets. It is mainly used to give probabilities to each possible result of a recurring event. Consider the following example of election results and test scores organized by percentile.

Histograms may be used to visualize a frequency distribution. When dealing with vast amounts of data, the form of the histogram resembles a bell curve, which represents the normal distribution. Frequency distributions are especially effective for summarizing and assigning a probability to massive data sets.

Step-IV: Descriptive Statistics of the Variables

Descriptive statistics illustrate the characteristics of the data used in the main investigation. Its primary objective is to summarize the samples and different metrics of the variables under investigation. There are two forms of descriptive statistics. 1. Measures of central tendency, and 2. Variability indices (spread). The mean, median, and mode are all included in the measure of central tendency. In contrast, the standard deviation, variance, minimum and maximum variables, Skewness, and Kurtosis are all included in the measure of variability.

Step-V: Correlation Matrix

Correlation is the linear link between two or more factors. It denotes the predictive link and correlation of variables based on their strength. It also conveys causal information, albeit not consistently. Numerous correlation coefficients exist, and Pearson correlation coefficients for linear relationships and Spearman's rank correlation coefficients for nonlinear relationships are used to explaining variable relationships.

Step VI: Multiple Regression

The OLS regression technique is utilized to assess the public's knowledge, attitude and preventive behavior about the use of COVID-19 vaccine in Pakistan. The dependent variable of the study is "Fear of Vaccine (denoted by FOV)" while the regressors included "Attitude Towards the Use of Vaccine (denoted by ATUOV)", "Intentions Towards Vaccine Uptake (denoted by INTVU)", "Preventive Behavior (denoted by PB)", and "Access to Information (denoted by AINFO)". The study used the following demographic factors as controlled variables, including Gender (denoted by GENDER), Age (denoted by AGE), Education (denoted by EDU), Employment status (denoted by EMPLOY), Marital status (denoted by MS), Household income (denoted by INCOME), and residence type (denoted by RESID). Equation (1) shows the following empirical equation for estimation, i.e.,

$$FOV = \beta_0 + \beta_1 ATUOV + \beta_2 INTVU + \beta_3 PB + \beta_4 AINFO + \varepsilon \quad (1)$$

Step VII: Paired Samples t- Test

The final step is to utilize the paired samples t-test statistics between the controlled variables and the main outcome variable, i.e., FOV. The statistics would be helpful to assess the variations between the two-paired of the variables to reach some conclusive inferences. The significant t-statistics value would allow to see the variations in the regressand that infused due to the controlled variables of the study.

4. RESULTS AND DISCUSSION

The data is gathered utilizing a well-structured questionnaire and various communication methods such as WhatsApp, Facebook, and email. The participants have a high level of education and are above 18. The responders are provided with the link to the google form. Consent is obtained prior to data collection. Gender, age, education, marital status, work status, residence, and household income are all provided as responses. The poll surveyed 198 male representatives and 75 female representatives. One hundred ninety respondents are between the ages of 20 and 30, while 34 respondents are between 30 and 40. Twenty-nine respondents are above the age of 40. One hundred twenty-six respondents have a bachelor's degree, whereas 52 respondents have a master's degree. 46.2 percent of participants are graduates. One hundred twenty-nine respondents are single, 72 are married, and remaining 72 respondents are committed to married with someone. Seventy-one respondents have a monthly income of more than 100,000 Pakistani rupees. In comparison, 60 respondents have a monthly income of between 20,000 and 30,000 Pakistani rupees, 38 respondents have a monthly income of between 30,001 and 40,000 Pakistani rupees, and 46 respondents have a monthly income of between 40,001 and 50 thousand Pakistani rupees. One hundred fifty-seven respondents live in rural parts of Pakistan, while the remaining 116 live in metropolitan areas. Table 1 shows the demographic survey of the respondents.

Table 1: Demographic Survey of the Respondents

Survey	Frequency	Percentages (%)
Gender		
Male	198	72.5
Female	75	27.5
Age		
20-30 years	190	69.6
31-40 years	54	19.8
>40 years	29	10.6
Education		

Survey	Frequency	Percentages (%)
10 years of schooling	14	5.1
12 years of schooling	16	5.9
Graduate	126	46.2
Masters	52	19.0
M.Phil.	20	7.3
PhD	45	16.5
Marital Status		
Single	129	47.3
Married	72	26.4
Others	72	26.4
Employment		
Self-employed	174	63.7
Employed in either government or private job	87	31.9
Unemployed	12	4.4
Residence		
Rural	157	57.5
Urban	116	42.5
Household Income		
PKR20,000 – 30,000	60	22
PKR30,001 - 40,000	38	13.9
PKR40,001 – 50,000	46	16.8
PKR 50,001 – 60,000	54	19.8
PKR 60,001 – 100,000	4	1.5
>PKR100,000/month	71	26

Source: Author's survey.

The variables' descriptive statistics are shown in Table 2. The mean score for several questions answered by participants is shown in the given table. The questionnaire includes 13 questions on fear of COVID-19 vaccination, attitudes toward vaccine use, intentions toward vaccine use, preventative behavior, and access to information. All questions used a five-point Likert scale, with 1 indicating significant disagreement and 5 indicating agreement.

Table 2: Descriptive statistics

Variables	Number of Observations	Minimum	Maximum	Mean	Std. Deviation
Fear of COVID-19 Vaccine Uptake (FOV)	273	1	5	3.0916	1.05320
Attitude towards vaccine uptake (ATUOV)	273	1	5	4.0733	0.86291
Intention towards vaccination (INTVU)	273	1	5	4.2894	0.91080
Preventive behavior (PB)	273	1	5	3.9846	0.63471
Access to information (AINFO)	273	1	5	4.0623	0.85629

Source: Author's survey.

According to Table 2, the mean score for fear of vaccination is 3.0916, whereas the mean score for attitude toward vaccination is 4.0733. Similarly, 4.2894 for vaccination intention and 3.9846 for preventative action. The mean value of access to information is 4.0623 with a standard deviation value of 0.8562. Fear of COVID-19 vaccination uptake has a higher standard deviation, indicating widespread vaccine phobia in a country. Table 3 shows the Cronbach' alpha value of the study's items.

Table 3: Cronbach's Alpha Estimates

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
FOV1	47.967	33.488	0.057	0.670
FOV2	47.761	35.609	-0.050	0.678
ATUOV1	46.743	31.059	0.370	0.608
ATUOV2	47.022	32.375	0.209	0.634
INTVU1	46.648	29.611	0.482	0.588
INTVU2	46.685	30.614	0.436	0.598
PB1	46.750	33.644	0.295	0.625
PB2	47.172	32.275	0.259	0.626
PB3	46.853	29.478	0.492	0.586
PB4	46.838	31.533	0.387	0.608
PB5	47.241	28.831	0.447	0.589
AINFO1	46.802	31.880	0.269	0.624
AINFO2	46.985	32.603	0.150	0.647

Source: Author's survey.

The statistics show that the Cronbach's Alpha value is greater than 0.55 of each items, hence we safely conclude that the dependability of the items close to each other's and the regression estimates would be helpful to assessed the variations between the regressors and regressand of the study. Table 4 shows the correlation matrix.

Table 4: Correlation Analysis

Variables		FOV	ATUOV	INTVU	PB	AINFO
FOV	Pearson Correlation	1	-.260**	-.183**	.077	-.027
	Sig. (2-tailed)		.000	.002	.205	.660
	N		273	273	273	273
ATUOV	Pearson Correlation	-.260**	1	.565**	.242**	.156*
	Sig. (2-tailed)	.000		.000	.000	.010
	N	273		273	273	273
INTVU	Pearson Correlation	-.183**	.565**	1	.333**	.253**
	Sig. (2-tailed)	.002	.000		.000	.000
	N	273	273		273	273
PB	Pearson Correlation	.077	.242**	.333**	1	.218**
	Sig. (2-tailed)	.205	.000	.000		.000
	N	273	273	273		273
AINFO	Pearson Correlation	-.027	.156*	.253**	.218**	1
	Sig. (2-tailed)	.660	.010	.000	.000	
	N	273	273	273	273	

Source: Author's survey. Note: Correlation is significant at the 0.01 level (2-tailed) **, and 0.05 level (2-tailed)*.

attitude towards vaccine uptake and intention towards vaccine uptake. On the other hand, there is a positive correlation between intention, prevention, and access to information regarding vaccine uptake. Preventive behavior and access to information positively correlated with the intention toward respondent vaccination. Finally, there is a positive correlation between access to finance and preventive behavior.

According to Table 5, attitudes toward vaccine uptake and preventative behavior positively and negatively affected the fear of COVID-19 vaccination uptake. The finding suggests that a more favorable attitude toward vaccination uptake significantly reduces the anxiety of COVID-19 vaccine uptake. On the other hand, increased preventative behavior heightened anxiety about COVID-19 vaccination uptake. The findings of this study corroborate those of Liu and Chu (2022), Kotta et al. (2022), and Jankowska-Polaska et al. (2022). Liu and Chu (2022) contended that the more trust built-in healthcare practitioners, the more favorable views for vaccine usage and intention would grow. The study concludes that healthcare practitioners should have a favorable attitude about vaccination safety to avert a COVID-19 pandemic. Kotta et al. (2022) established a multidimensional scale to measure vaccination reluctance for COVID-19 and discovered that fear is a critical and essential scale for assessing vaccine phobia among the general population. Jankowska-Polaska et al. (2022) found that health workers' engagement in pushing for vaccination and pro-health practices is crucial for COVID-19 protection. As a result, pro-health activities foster a more favorable attitude toward vaccine use.

Table 5: Regression Estimates

Model		Unstandardized Coefficients		Standardized Coefficients	t-stats	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.686	.480	-----	7.680	.000
	Attitude towards vaccine uptake	-.298	.086	-.244	-3.456	.001
	Intention towards vaccination	-.118	.085	-.102	-1.384	.168
	Preventive behavior	.282	.104	.170	2.723	.007
	Access to Information	.000	.075	.000	-.003	.998

Source: Authors' survey. Note: Dependent variable: FOV.

The paired samples t-test was performed to determine the relevance of respondents' demographic features about their anxiety about vaccine use. For convenience, Table 6 summarizes the paired samples' t-test statistics.

Table 6: Paired Samples t-Test Estimates

Models	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 AGE – FOV	-1.6813	1.27515	.07718	-1.83326	-1.52938	-21.786	272	.000
Pair 2 EDU – FOV	.57875	1.69727	.10272	.37652	.78099	5.634	272	.000
Pair 3 MS – FOV	-	1.26661	.07666	-1.45129	-1.14945	-16.963	272	.000
Pair 4 EMPLOY –FOV	-	1.20646	.07302	-1.82873	-1.54123	-23.076	272	.000
Pair 5 RESID – FOV	-	1.15311	.06979	-1.80406	-1.52927	-23.881	272	.000
Pair 6 INCOME - FEAR	.32234	2.21678	.13417	.05821	.58648	2.403	272	.017
Pair 7 GENDER - FEAR	-	1.17861	.07133	-1.95728	-1.67642	-25.470	272	.000

Source: Authors' survey.

The findings indicate that all demographic characteristics are associated with fear of the COVID-19 vaccination, indicating that they are significant factors of vaccine uptake in a country. The age of respondents might be beneficial in making a swift choice regarding whether or not to use vaccination. Compared to their younger counterparts, the elderly age group exhibits less vaccination anxiety. Respondents with a higher level of education were keener to take up the vaccination, while those with a lower level of

education expressed more anxiety about using the COVID-19 vaccine. In comparison to singles, married couples are more committed to vaccination uptake. Individuals who are self-employed or get employment are more inquisitive about vaccination uptake than those who are jobless. Persons who live in urban areas are more aware of the COVID-19 susceptibility and the significance of coronavirus vaccination to avoid contracting this disease. However, people who live in rural regions are less likely to be vaccinated due to a lack of information about infectious diseases. The high-income group is more concerned with their health and is more prepared to pay for it; their vaccine uptake is larger than that of the low-income group. Finally, males are less fearful of vaccination uptake than females.

5. CONCLUSIONS

The aim of the study is to find the public attitude towards the use of COVID-19 vaccination in the Pakistan's economy, as the country strive hard to limit the exacerbation of COVID-19 cases by its strategic wisdom and strict compliance of the given guidelines by the WHO. The results of the study show that attitude towards vaccine uptake and preventive behavior has a positive and negative impact on fear of COVID-19 vaccine uptake in a country. The higher the attitude towards uptake of COVID-19 vaccine mainly decreases the fear of vaccine uptake in a country. On the other hand, the increase preventive behavior among the masses in a country increases the fear of vaccine uptake in a country. Hence, based on the result, the following policies are suggested to contain the virus and minimize the fear of vaccines uptake in a country, i.e.,

- i) Effective communication has a favorable effect on people's attitudes about vaccine uptake.
- ii) The media is crucial in disseminating information on risk perception and sickness acceptance.
- iii) Education and access to information have a significant impact on sickness susceptibility and risk awareness.
- iv) Prevention is crucial for building self-efficacy and avoiding sickness.
- v) Health education initiatives increase public awareness and assist in the control of pandemics.
- vi) Public health practitioners contribute to increased awareness of COVID-19 vaccine uptake.
- vii) The media and mass communication are vital in boosting public knowledge of pandemics; and
- viii) Friends, family, and civil society are critical in sharing current information on vaccine safety.

As the epidemic spreads and is unlikely to vanish, we have to be prepared to face new variant attacks. There is an opportunity to work on such a research area for globally shared prosperity.

Ethical approval

All international standards have been adopted and compliance.

Informed consent

The study was conducted with equal participation by all authors.

Conflicts of interests

The authors declare that there are no conflicts of interests.

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Data and materials availability

All data associated with this study are present in the paper.

Annexure –A
QUESTIONNAIRE

Part A : Demographic Survey

- I. Gender: _____
- II. Age:years
- III. Education: literate? Y/N If literate, highest qualification.....
- IV. Employment Status
 - Self Employed.....
 - Profession.....
 - Unemployed.....
- V. Marital Status
 - Married
 - Single
 - Others
- VI. Household Income
 - 20,000 -30,000
 - 30,001 – 40,000
 - 40,001 – 50,000
 - 50,001 – 60,000
 - 60,001 – 100,000
 - > 100,000
- VII. Residence
 - Rural
 - Urban

Part B: Items**a. Fear of Vaccine**

S.No.	Questions	Strongly Disagree	Disagree	Neutral	Strongly Agree	Agree
1	Do you have a fear of vaccines?					
2	Do you think that the COVID-19 vaccine has some adverse effects on human health?					

b. Attitude

1	Do you think you should take the vaccine on a priority basis?					
2	Do you think that the COVID-19 vaccine is safe?					

c. Intentions towards vaccine uptake

1	Do you want to get a vaccine?					
2	Do you want to get the vaccine for your family and relatives?					

d. Preventive Behavior

S.No.	Questions	Strongly Disagree	Disagree	Neutral	Strongly Agree	Agree
1	Do you wash your hands regularly?					
2	Do you sanitize your belongings?					
3	Do you purchase washing and sanitizing products for your hygiene?					
4	Do you wear face masks?					
5	Do you maintain social distance?					

E. Access to Information

1	Do you have access to news about the disease?					
2	Do you have money and facilities available to be vaccinated?					

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