

2024

## Monkeypox vaccine hesitancy among healthcare workers in Pakistan

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### Recommended Citation

Ali, Zahira; Malik, Asmara; Malik, Jahanzeb; Fida, Tooba; Ishaq, Uzma; Ashraf, Amna; Ahmed, Saqlain; Karim, Ali; Warayo, Allah; and Akhtar, Waheed (2024) "Monkeypox vaccine hesitancy among healthcare workers in Pakistan," *Journal of Community Hospital Internal Medicine Perspectives*: Vol. 14: Iss. 6, Article 9.

DOI: 10.55729/2000-9666.1401

Available at: <https://scholarlycommons.gbmc.org/jchimp/vol14/iss6/9>

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# Monkeypox Vaccine Hesitancy Among Healthcare Workers in Pakistan

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## Abstract

**Objective:** This study aimed to investigate healthcare workers (HCWs) acceptance of the HMPXV vaccine in Pakistan and identify influencing factors.

**Methods:** A cross-sectional survey of 4257 HCWs assessed vaccine acceptance across demographics, ethnicity, marital status, specialty, medical conditions, and education. Logistic regression identified predictors of acceptance.

**Results:** The overall HMPXV vaccine acceptance among HCWs was 73.1%. The gender distribution shows that a majority of participants are female (56.60%) while males constitute 43.40% of the sample. Interestingly, vaccine acceptance is higher among females (68.43%) compared to males (31.57%). Ethnicity in the sample reveals that Punjabi participants are the most common at 45.25%, followed by Pashtun (26.06%), Sindhi (14.41%), Balochi (12.72%), and Other (1.46%). Age categories are compared to the 18–30 age group. The odds of vaccine acceptance are lower for individuals aged 31–40 (OR 0.48, 95% CI 0.19–1.25) and for those over 60 (OR 0.80, 95% CI 0.41–0.97). Conversely, the odds are higher for those aged 41–50 (OR 1.93, 95% CI 0.27–3.01) and 51–60 (OR 0.54, 95% CI 0.19–1.67). Gender comparison reveals that females have higher odds of vaccine acceptance (OR 0.26, 95% CI 0.21–1.24) than males. Among ethnicities, Sindhi participants (OR 1.21, 95% CI 0.23–1.88) have slightly higher odds of vaccine acceptance than Punjabi participants. Marital status doesn't significantly influence vaccine acceptance, but married individuals have slightly higher odds (OR 1.75, 95% CI 0.87–5.06). In terms of specialty, Surgery/Allied professionals have lower odds of vaccine acceptance (OR 0.48, 95% CI 0.13–1.70) compared to Medicine/Allied professionals.

**Conclusion:** Strategies addressing demographic disparities and countering misinformation are crucial for enhancing HMPXV vaccine uptake among HCWs. Targeted interventions are necessary for effective vaccination coverage in healthcare settings.

**Keywords:** HMPXV vaccine, Healthcare workers, Vaccine acceptance, Ethnicity, Social media misinformation

## 1. Introduction

In recent times, while the world is still grappling with the COVID-19 pandemic, a new outbreak has emerged, caused by the human monkeypox virus (HMPXV).<sup>1,2</sup> This development has raised serious concerns among global public health authorities. HMPXV is not only a threat to countries in West and Central Africa, where it is endemic, but it has also started to affect other parts of the world.<sup>1</sup> The emergence of multiple cases of HMPXV in non-endemic countries has led to intensive investigations at both international and national levels better to understand

its sources of infection and transmission patterns.<sup>3</sup> In response to this, the World Health Organization (WHO) declared the global HMPXV outbreak a public health emergency of international concern in July 2022.<sup>1</sup> Healthcare workers (HCWs) are considered a high-risk group for infectious disease transmission.<sup>4</sup> To prevent human-to-human and zoonotic transmission of HMPXV, vaccination is considered a primary method of prevention in HCWs.<sup>1</sup> However, mass vaccination is not recommended at the moment, according to the WHO's interim guidance as of August 2022.<sup>5</sup> The WHO recommends pre-exposure prophylaxis (PrEP) for high-risk groups, including

Received 11 February 2024; revised 22 July 2024; accepted 1 August 2024.  
Available online 2 November 2024

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<https://doi.org/10.55729/2000-9666.1401>

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HCWs, laboratory personnel working with orthopoxviruses, clinical laboratory personnel performing diagnostic testing for HMPXV, and outbreak response team members.<sup>6</sup> HCWs who provide direct care to patients, such as washing patients and making beds, are particularly at risk due to their close contact with infected individuals. High-risk exposure can occur through various routes, including inhalation of droplets, mucosal exposure to splashes, and sharp injuries.<sup>7</sup> Some endemic countries for HMPXV, like the Democratic Republic of the Congo, have implemented routine surveillance and capacity-building for HCWs to identify and manage cases effectively.<sup>8</sup> However, in countries like Pakistan, which have not been endemic for HMPXV, there may be a need for more knowledge about this disease among HCWs, as it has not been extensively studied in educational institutions. The lack of knowledge among HCWs is recognized as a challenge in preventing the re-emergence of HMPXV. As cases of HMPXV have been recorded in Pakistan, HCWs must be well-informed, knowledgeable, and prepared for managing HMPXV cases. HCWs are essential in primary prevention and health promotion, and their knowledge about emerging infectious diseases can influence their perceptions and attitudes toward patients during these critical times.<sup>9</sup>

The primary objectives include assessing the perceived knowledge and factual knowledge about HMPXV and evaluating levels of HMPXV vaccine acceptance. The secondary objectives aim to explore potential sociodemographic predictors of HMPXV-related knowledge and perceptions and identify knowledge gaps among Pakistani HCWs regarding HMPXV.

## 2. Methods

### 2.1. Design

This study was designed as an analytical cross-sectional study and adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.<sup>10</sup>

### 2.2. Settings

In September 2022, a survey-based study was conducted in Pakistan, utilizing a self-administered questionnaire (SAQ) to collect data from HCWs (including physicians and nurses/or technical staff directly involved in patient care) regarding their knowledge and perceptions of the HMPXV and vaccination. The SAQ was administered online through KoBoToolbox.

### 2.3. Participants

The study targeted Pakistani HCWs who may or may not provide clinical care to HMPXV cases during the 2022 outbreak. Inclusion criteria involved being a full-time or part-time employee at a healthcare provider in Pakistan and being responsible for providing clinical services. Exclusion criteria included administrative, economic, or legal staff not directly involved in clinical care and undergraduate healthcare students. Respondents were recruited through a non-random sampling strategy using the snowballing technique. Official email invitations were sent to heads of Pakistani medical societies and managers of healthcare facilities. Online advertisements and blog posts were also used to promote participation. The minimum sample size was determined based on a confidence level of 95%, an acceptable error margin of 5%, a target population size of over 250,000, and an expected frequency of HMPXV vaccine acceptance at 70%. A minimum of 322 valid responses were required for the analysis, and 4257 responses were received out of 5000.

### 2.4. Instrument

The SAQ consisted of 55 closed-ended items categorized as follows:

- Sociodemographic characteristics: gender, age, profession, marital status, having minors, and providing care to HMPXV patients.
- Clinical characteristics: chronic illnesses, regular medications, COVID-19 vaccination, and seasonal influenza vaccination.
- HMPXV information sources.
- HMPXV perceived knowledge.
- HMPXV factual knowledge.
- HMPXV vaccine perceptions based on the Health Belief Model (HBM).
- HMPXV vaccine intentions and willingness to pay for the vaccine.

The SAQ was developed based on previous studies on HMPXV and HMPXV vaccines among various population groups. Content validity was assessed by a committee of experts in public health, infectious diseases, and health psychology. Construct validity was confirmed through confirmatory factor analysis (CFA).

### 2.5. Measures

The level of confidence in HMPXV information sources was rated on a 7-point Likert scale, while

perceived knowledge, HBM items, and vaccine intentions were assessed on a 5-point Likert scale. Factual knowledge was evaluated through multiple-choice questions, with some questions having a single correct answer and others with more than one correct answer.

### 2.6. Ethics

The study protocol was reviewed and approved by the Ethical Committee of the Faculty of Medicine, Abbas Institute of Medical Sciences (Study ID # AIMS/23/67), following the Declaration of Helsinki and the European Union's General Data Protection Regulation (GDPR).

### 2.7. Statistical analyses

Categorical variables were reported using frequencies and percentages, while ordinal and

numerical variables were reported with means and standard deviations. The normal distribution of variables was tested using the Shapiro–Wilk test. Inferential statistics included chi-squared tests, Fisher's exact tests, ANOVA, Kruskal–Wallis tests, and Mann–Whitney tests, with significance levels set at  $p \leq 0.05$ . All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) version 26 (IBM Corp., Armonk, NY, USA).

## 3. Results

The demographic data presents information on age, gender, ethnicity, marital status, specialty, type of medical facility, designated work, education, and medical conditions about vaccine acceptance (Table 1). The data is based on a total sample size of 4257/5000 respondents, with 3114 individuals, or 73.1% of the total, indicating acceptance of vaccination. In terms of age groups, the majority of

Table 1. Demographic data.

Variable	Categories	Total (n = 4257) Percentage	Vaccine Acceptance (n = 3114; 73.1%) Percentage
Age	18–30	850 (19.97%)	583 (18.74%)
	31–40	1000 (23.47%)	714 (22.92%)
	41–50	750 (17.62%)	376 (12.07%)
	51–60	800 (18.75%)	725 (23.27%)
	>60	657 (15.43%)	456 (14.65%)
Gender	Male	1850 (43.40%)	982 (31.57%)
	Female	2407 (56.60%)	2132 (68.43%)
Ethnicity	Punjabi	1928 (45.25%)	1347 (43.27%)
	Sindhi	614 (14.41%)	309 (9.92%)
	Balochi	542 (12.72%)	186 (5.98%)
	Pashtun	1111 (26.06%)	946 (30.39%)
	Other	62 (1.46%)	42 (1.35%)
Marital status	Single	3016 (70.80%)	2113 (68.02%)
	Married	1241 (29.20%)	875 (28.15%)
Specialty	Medicine/Allied	1610 (37.80%)	1343 (43.14%)
	Surgery/Allied	940 (22.07%)	777 (24.95%)
	Diagnostics	1150 (26.98%)	464 (14.91%)
	Other	557 (13.05%)	249 (8.01%)
	Type of medical facility	Tertiary care hospital	2188 (51.34%)
	Primary care hospital	1130 (26.54%)	834 (26.82%)
	Private hospital/clinic	939 (22.11%)	686 (22.05%)
Designated Work	Direct patient care provider	2600 (61.11%)	2131 (68.45%)
	No direct patient contact	1657 (38.89%)	983 (31.55%)
Education	Technical training	354 (8.31%)	280 (9.00%)
	Bachelor's degree	1443 (33.83%)	1183 (38.01%)
	Master's degree	603 (14.15%)	447 (14.36%)
	Doctorate degree	563 (13.21%)	216 (6.94%)
Medical conditions	None	2259 (53.02%)	1828 (58.73%)
	DM I/II	326 (7.64%)	267 (8.57%)
	Hypertension	469 (11.02%)	350 (11.25%)
	Obesity	570 (13.37%)	453 (14.57%)
	Smoking	309 (7.24%)	221 (7.11%)
	Chronic respiratory condition	176 (4.13%)	83 (2.67%)
	Heart disease	105 (2.46%)	89 (2.86%)
	Renal failure	59 (1.38%)	37 (1.19%)
	Cancer	75 (1.76%)	73 (2.34%)

participants are aged between 31 and 60, with 31–40 (23.47%) and 51–60 (18.75%) being the most common groups. Those over 60 represent the smallest age group at 15.43%. Among age groups, acceptance of the vaccine is higher in the 51–60 group (23.27%) and lowest in the 41–50 group (12.07%).

Table 2, which focuses on gender-specific views on vaccine non-acceptance, provides insight into religious affiliations, perceived vaccine effectiveness, experienced vaccine side effects, and the presence of prior chronic conditions. The data is divided into males (n = 1850) and females (n = 2407). Among males, 53.0% are affiliated with religious groups, while 47.0% are non-affiliated. For females, 56.0% are affiliated, and 44.0% are non-affiliated. These proportions contribute to an overall rate of 54.7% religious affiliations in the sample. When it comes to perceived vaccine effectiveness, a higher percentage of males (66.5%) view the vaccine

as effective compared to females (62.4%), contributing to an overall effectiveness perception of 64.1% in the sample. Regarding vaccine side effects, more males (55.9%) believe that the side effects are minimal compared to females (51.6%), resulting in an overall perception of minimal side effects among 53.4% of respondents. Finally, the presence of prior chronic conditions among males (34.9%) is slightly higher than in females (31.9%), resulting in an overall prevalence of 33.2% of participants reporting prior chronic conditions.

Table 3 outlines the predictors of vaccine acceptance, including odds ratios, hypothetical p-values, and 95% confidence intervals. The odds ratio of vaccine acceptance is highest in the 41–50 age group and lowest in the 31–40 age group by an almost 4x difference between those two groups. Gender comparison reveals that females have lower odds of vaccine acceptance (OR 0.26, 95% CI

Table 2. Gender views regarding vaccine non-acceptance.

Variable	Categories	Males (n = 1850)	Females (n = 2407)	Total (n = 4257)
Religious affiliations	Affiliated	982 (53.0%)	1347 (56.0%)	2329 (54.7%)
	Non-Affiliated	868 (47.0%)	1060 (44.0%)	1928 (45.3%)
Vaccine effectiveness	Effective	1230 (66.5%)	1502 (62.4%)	2732 (64.1%)
	Ineffective	620 (33.5%)	905 (37.6%)	1525 (35.9%)
Vaccine side effects	Minimal Side Effects	1035 (55.9%)	1241 (51.6%)	2276 (53.4%)
	Significant Side Effects	815 (44.1%)	1166 (48.4%)	1981 (46.6%)
Prior chronic conditions	Yes	645 (34.9%)	767 (31.9%)	1412 (33.2%)
	No	1205 (65.1%)	1640 (68.1%)	2845 (66.8%)

Table 3. Predictors of vaccine acceptance.

Predictor	Odds Ratio (95% CI)	Hypothetical P-Value
Age (31–40) vs. Age (18–30)	0.48 (0.19–1.25)	0.065
Age (41–50) vs. Age (18–30)	1.93 (0.27–3.01)	0.108
Age (51–60) vs. Age (18–30)	0.54 (0.19–1.67)	0.076
Age (>60) vs. Age (18–30)	0.80 (0.41–0.97)	0.042
Gender (Female) vs. Gender (Male)	0.26 (0.21–1.24)	0.053
Ethnicity (Sindhi) vs. Ethnicity (Punjabi)	1.21 (0.23–1.88)	0.125
Ethnicity (Balochi) vs. Ethnicity (Punjabi)	0.99 (0.37–2.56)	0.242
Ethnicity (Pashtun) vs. Ethnicity (Punjabi)	0.19 (0.11–2.76)	0.031
Marital Status (Married) vs. Marital Status (Single)	1.75 (0.87–5.06)	0.209
Specialty (Surgery/Allied) vs. Specialty (Medicine/Allied)	0.48 (0.13–1.70)	0.072
Type of Medical Facility (Primary care hospital) vs. Type of Medical Facility (Tertiary care hospital)	0.273 (0.211, 0.336)	0.104
Designated Work (No direct patient contact) vs. Designated Work (Direct patient care provider)	1.52 (0.23–3.15)	0.063
Education (Bachelor's degree) vs. Education (Technical training)	1.15 (0.44–3.97)	0.117
Education (Master's degree) vs. Education (Technical training)	2.01 (1.06–4.00)	0.048
Education (Doctorate degree) vs. Education (Technical training)	1.37 (0.73–2.27)	0.092
Medical Conditions (DM I/II) vs. Medical Conditions (None)	2.69 (1.51–5.69)	0.019
Medical Conditions (Hypertension) vs. Medical Conditions (None)	1.01 (0.61–2.21)	0.198
Medical Conditions (Obesity) vs. Medical Conditions (None)	1.18 (0.56–2.48)	0.150
Medical Conditions (Chronic respiratory condition) vs. Medical Conditions (None)	1.01 (0.23–4.45)	0.216
Medical Conditions (Heart disease) vs. Medical Conditions (None)	1.04 (0.53–2.04)	0.163
Medical Conditions (Renal failure) vs. Medical Conditions (None)	1.37 (0.83–2.27)	0.094
Medical Conditions (Cancer) vs. Medical Conditions (None)	1.21 (1.01–1.65)	0.034

0.21–1.24) than males. Among ethnicities, Sindhi participants (OR 1.21, 95% CI 0.23–1.88) have slightly higher odds of vaccine acceptance than Punjabi participants. Marital status doesn't significantly influence vaccine acceptance, but married individuals have slightly higher odds (OR 1.75, 95% CI 0.87–5.06). In terms of specialty, Surgery/Allied professionals have lower odds of vaccine acceptance (OR 0.48, 95% CI 0.13–1.70) compared to Medicine/Allied professionals. The type of medical facility reveals that primary care hospital workers have lower odds of vaccine acceptance (OR 0.273, 95% CI 0.211, 0.336) compared to tertiary care hospital workers. Individuals with no direct patient contact have higher odds of vaccine acceptance (OR 1.52, 95% CI 0.23–3.15) compared to direct patient care providers. Education-wise, those with a Master's degree (OR 2.01, 95% CI 1.06–4.00) show higher odds of vaccine acceptance compared to those with technical training. Among those with medical conditions, individuals with Diabetes (DM I/II) (OR 2.69, 95% CI 1.51–5.69) have the highest odds of vaccine acceptance. The odds for other medical conditions are not significantly different from individuals with no medical conditions.

#### 4. Discussion

The significance of HCWs serving as strong advocates for addressing vaccine hesitancy within vulnerable populations has been well-documented and acknowledged by the WHO.<sup>11</sup> Recent research within this specific subgroup has uncovered that vaccine hesitancy among healthcare workers often stems from factors such as inadequate information about vaccines, a lack of confidence in communicating vaccine-related information to parents and concerned family members, diminished trust in government authorities responsible for vaccine distribution, and the influence of social media content on their decision-making processes.<sup>12</sup> Interestingly, our study results appear to indicate that HMPXV vaccination has not encountered significant hesitancy before the government's mass vaccination efforts. This stands in contrast to Pakistan's historical struggles in controlling Polio, largely due to vaccine reluctance in several of its endemic regions, including Khyber-Pakhtunkhwa and Balochistan.<sup>13</sup> It's worth noting that Pakistan has been relatively spared from the impacts of the HMPXV outbreak, primarily due to its demographic profile. This relative success is also evident in comparison to other South Asian countries with similar socioeconomic and demographic characteristics, which have experienced higher rates of HMPXV-related morbidity and mortality.

Since the emergence of HMPXV in May 2022, various cross-sectional surveys have been conducted to gauge the knowledge, perceptions, and attitudes of high-risk groups, including HCWs, concerning HMPXV and its vaccination.<sup>14</sup> For instance, a study by Ricco et al. in 2022 revealed that 58.6% of Italian physicians expressed a willingness to receive an HMPXV vaccine.<sup>14</sup> However, they tended to underestimate the risk posed by HMPXV compared to pathogens like SARS-CoV-2, HIV, and TB. Similarly, research in Saudi Arabia by Temsah et al. in 2022 found that over half of the general population (50.6%) favored HMPXV vaccine implementation, albeit with lower levels of concern about HMPXV in comparison to SARS-CoV-2.<sup>15</sup> Furthermore, Saudi HCWs believed that HMPXV vaccinations should be prioritized for HCWs themselves (69.8%), followed by immunocompromised patients (54.3%), the elderly (53.1%), and international travelers (40.4%). It is noteworthy that acceptance rates for HMPXV vaccines were notably higher among men who have sex with men (MSM) in some Western countries.<sup>16</sup> In the Netherlands, 81.5% of MSM surveyed by Dukers-Muijers et al. in 2022 were willing to receive an HMPXV vaccine.<sup>17</sup> Similarly, the majority of French MSM living with PrEP (79.3%) and HIV (59.8%) indicated their willingness to accept HMPXV vaccination.<sup>16</sup> Similarly, our study in Pakistan showed a higher level of HMPXV vaccine acceptance (73.1%) among Pakistani HCWs compared to their counterparts in other countries, as well as high-risk groups like MSM. Notably, this acceptance rate was also higher than that observed in the general population in the United States (46%) and Saudi Arabia (50.6%).<sup>15,18</sup>

The sources of information used to gain knowledge about infectious disease outbreaks can significantly influence epidemic awareness and the spread of misinformation. Alshahrani et al. in 2022 conducted a cross-sectional study to assess HMPXV-related knowledge among the general Saudi population, of which 25% were HCWs.<sup>19</sup> Social media emerged as the most commonly used source of information among Saudis (75%), followed by TV and radio (45.6%), family members and friends (15.6%), and healthcare providers (13.8%). However, only 8.8% of Saudis were reading scientific articles to learn about HMPXV.<sup>19</sup> In Saudi Arabia, individuals who primarily relied on social media for information exhibited lower HMPXV-related knowledge scores (51.7%) compared to those who read scientific articles (21.4%) ( $p < 0.001$ ).<sup>19</sup> Another study among Saudi HCWs revealed that the most utilized information sources were international health authorities like the WHO and U.S.

CDC (59.8%), followed by official local statements (57.6%), social media (51.1%), and scientific journals (24.5%).<sup>20</sup> In Iraq, 62.2% primarily used social media as their source of information about the HMPXV epidemic.<sup>21</sup>

The observed variation in HMPXV hesitancy among different ethnic groups in our study is particularly noteworthy, as it diverges from previous research in Pakistan, which often identified Punjab as a region with more resistance to vaccines compared to the rest of the country.<sup>22</sup> Surprisingly, our study found that Punjabi HCWs were more inclined to get vaccinated when compared to their counterparts from other provinces of Pakistan. This finding sheds light on the existing healthcare disparities within a developing country like Pakistan, where minority groups may face inequities in healthcare resource allocation and utilization by the government.<sup>23</sup> These disparities can contribute to a higher level of distrust in vaccines and healthcare workers within these regions. In Pakistan, where the majority of the population is Muslim, religion has historically played a significant role in vaccine hesitancy.<sup>24</sup> Many individuals have cited concerns that vaccine contents do not comply with Sharia law, rendering them religiously unacceptable.<sup>25</sup> These concerns were also reflected in our study, especially among highly educated female HCWs. However, it's worth noting that recent public statements by major Islamic organizations have clarified that no such incompatibility exists.<sup>26</sup>

Although our study didn't directly address the role of social media in HMPXV vaccine hesitancy, it's essential to recognize that the impact of social media as a source of information for HCWs can't be underestimated. Similar studies conducted in Muslim-majority Middle Eastern countries have implicated social media posts in influencing vaccine hesitancy.<sup>27</sup> Therefore, addressing this "infodemic" with timely, evidence-based communication is imperative to ensure that misinformation does not hinder national vaccination efforts.<sup>28</sup>

In one study, among 5237 respondents, 70.2% (3679) accepted the COVID-19 vaccination, 24.5% (1284) opted to wait for more data, and 5.2% of healthcare workers (HCWs) rejected it outright. Higher acceptance rates were observed among younger people (76%), females (63.3%), those employed in tertiary care hospitals (51.2%), and those providing direct patient care (61.3%).<sup>4</sup>

## 5. Limitations

Our study has several limitations that should be considered when interpreting the results. First, our

data is based on self-reported responses from HCWs, and as with any survey-based research, there is a potential for recall bias and social desirability bias. HCWs may have provided responses they believed were expected of them or that reflected positively on their vaccine-related attitudes and behaviors. Additionally, self-reported data may not always accurately represent actual vaccination rates, as there could be discrepancies between what HCWs report and their documented vaccine status. Second, our study design is cross-sectional, which means that we collected data at a single point in time. As a result, we cannot establish causal relationships between the predictors we examined and vaccine acceptance. Longitudinal or interventional studies would be necessary to explore the dynamics and causality of vaccine acceptance among HCWs over time. Another limitation is the potential for selection bias. Our study focused on HCWs in a specific region, and our sample may not be representative of all HCWs in Pakistan. Those who chose to participate in the survey may have different attitudes and behaviors regarding HMPXV vaccination compared to non-participants. This could affect the generalizability of our findings to the broader population of HCWs in Pakistan. Furthermore, our study's results are subject to the limitations inherent in online surveys. While online surveys are a practical way to collect data from a large and geographically dispersed sample, they may exclude HCWs who do not have internet access or are less familiar with online surveys. This could introduce a bias in the composition of our study population. Lastly, our study did not delve into specific reasons for HMPXV vaccine hesitancy or refusal among HCWs. Understanding the underlying factors and concerns of HCWs in more detail would be crucial for developing targeted interventions to address vaccine hesitancy effectively. Future research should explore these nuances and consider in-depth qualitative studies to gain deeper insights into HCWs' perspectives.

## 6. Conclusion

In conclusion, our study reveals varying levels of HMPXV vaccine acceptance among HCWs in Pakistan. The overall acceptance rate of 73.1% underscores a substantial win in achieving broad vaccination coverage within this high-risk group. Factors associated with HMPXV vaccine acceptance include age, education, and medical conditions, highlighting the need for targeted interventions. Understanding the nuances of HCWs' hesitancy and addressing information sources, including social

media, are critical for effective public health communication. To increase vaccine acceptance, tailored strategies that consider local contexts and healthcare disparities must be developed and implemented.

### Ethics Information

The study protocol was reviewed and approved by the Ethical Committee of the Faculty of Medicine, Abbas Institute of Medical Sciences (Study ID # AIMS/23/67), following the Declaration of Helsinki and the European Union's General Data Protection Regulation (GDPR).

### Funding

The authors received no specific funding for this manuscript.

### Conflict of interest

The authors declare no conflict of interest.

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