



# A Systematic Review on the Mental Health Status of Patients Infected With Monkeypox Virus

Anila Jaleel<sup>1</sup>, Ghulam Farid<sup>2</sup>, Haleema Irfan<sup>1</sup>, Khalid Mahmood<sup>3</sup>, and Saeeda Baig<sup>4</sup>

<sup>1</sup>Department of Biochemistry, Shalimar Medical and Dental College, Lahore, Pakistan

<sup>2</sup>Shalimar Medical and Dental College, Lahore, Pakistan

<sup>3</sup>Information Management, University of Punjab, Lahore, Pakistan

<sup>4</sup>Department of Biochemistry, Ziauddin University, Karachi, Pakistan

**Objectives:** This study aims to extract and summarize the literature on the mental health status of patients with monkeypox.

**Methods:** This review was carried out according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines using different databases and publishers such as Scopus, Sage, ScienceDirect, PubMed, BMJ, Wiley Online Library, Wolters Kluwer OVID-SP, and Google Scholar. The literature review was based on monkeypox and mental health. The year of publication was 2021–2023, during the monkeypox disease period. Data were extracted from opinions, editorials, empirical studies, and surveys.

**Results:** Based on the literature related to the mental status of patients with monkeypox, the following themes and subthemes were identified: anxiety and depression, self-harm and suicidal tendencies, neuropsychiatric symptoms, mental health, social stigma, sex workers, vaccination, and stress-related diseases.

**Conclusion:** A review of monkeypox virus infection studies reveals that 25%–50% of patients experience anxiety and depression due to isolation, boredom, and loneliness. Factors such as infected people, a lack of competence among healthcare professionals, and shame over physical symptoms exacerbate mental insults. The implications of society include increased self-harm, suicide, low productivity, fear of stigmatization, and transmission of infection.

**Keywords:** Monkeypox; Mental stress; Anxiety; Depression; Suicide.

Received: October 13, 2023 / Revised: November 14, 2023 / Accepted: December 6, 2023

Address for correspondence: Anila Jaleel, Department of Biochemistry, Shalimar Medical and Dental College, Lahore, Pakistan  
Tel: +92-4236852660, Fax: +92-03009205779, E-mail: anilajaleel@gmail.com

## INTRODUCTION

The world has not yet recovered from the physical, mental, and financial implications of COVID-19 since the World Health Organization (WHO) declared the outbreak of the monkeypox virus (MPXV) in 2022 [1]. MPXV was first identified in 1958 in monkeys and rodents. MPXV is a viral zoonotic disease, and cases in humans were first reported in the Congo and identified in a Danish laboratory. Outbreaks occurred in other parts of the world in 2022, as cases were reported in 99 countries and 15 deaths were declared until August 2022. Four patients were reported, isolated, and hospitalized in India in July 2022. Similarly, cases have been reported in Middle Eastern countries such as Saudi Arabia, Qatar, Oman, and the UAE. Most of the patients had a history of travel [2–4]. The mental state of pandemic-driven individuals is expected to improve during the monkeypox (MPX) outbreak. Isola-

tion, quarantine, and fear of being stigmatized can lead to increased stress, anxiety, depression, fear, and negative thoughts, such as self-harm, which can even lead to suicide [3–6]. Recent studies have shown an increase in mental health disorders, with some reported suicides due to the COVID-19 pandemic [7–11]. Adolescents and young adults in low- and middle-income countries face a high risk of infectious diseases, such as HIV, meningitis, tuberculosis, and neglected tropical diseases. Mental illnesses also persist from childhood to adulthood, affecting social adjustment and mental health, leading to substance abuse, self-harm, suicide attempts, and a lack of interest in life [12]. Nepal and Bhutan suffer from mental stress due to the economic burden of the increase in the prices of all commodities, making their existence impossible. MPX outbreaks can cause disasters in these countries. Governments should take every measure to prevent the spread of this disease, including travel checks, animal market screening, medications, and vaccinations.

Few studies have been conducted to determine the mental health status of people who can be exposed to or are victims

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

of MPX. A group of people oppose vaccination because they believe it may be responsible for autism in children. People had to get their children vaccinated due to mandatory conditions in schools in developing countries, which caused increased mental stress for parents, adding to other anxiety situations. Multiple dilemmas must be investigated to take action, especially in countries where mental health is not recognized as a disease and stigmatized. Therefore, we systematically reviewed the existing literature on the mental health status of patients with MPX.

## METHODS

This systematic review was prepared and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Fig. 1).

### Search strategy

To meet the objectives of the study, the related literature was systematically reviewed with the help of different sets of keywords, i.e., “monkeypox and mental stress” OR “mental stress and monkeypox” OR “monkeypox and mental health” OR “monkeypox effects mental health” OR “MP and mental stress” OR “monkeypox disease on mental stress” OR “mental presser and MPD” OR “Mental disorder and monkeypox”

OR “mental illness, stress, issue” (Opinion\* OR editorial\* OR empirical study\* OR Survey\* OR Questionnaire\* OR adopt\* OR evaluate\* OR test\* OR interviews\*).

### Data availability

The review data used to support the findings of this study are included in this article. The data used to support the findings of this study are included in Supplementary Table 1 (in the online-only Data Supplement). The readers can access the data supporting the conclusions of the study from our search, which was carried out using different databases and publishers such as Scopus, Sage, ScienceDirect, PubMed, BMJ, Wiley Online Library, Wolters Kluwer OVID-SP, and Google Scholar (search engine) in January 2023 and updated in March 2023. References to the data used are included in Supplementary Table 1 (in the online-only Data Supplement).

### Selection of studies

This review was performed in accordance with the PRISMA guidelines. The systematic review approach can also be part of qualitative research, which emphasizes comprehensive and structured methods to review the literature and systematically analyze published research.

Studies on MPX, mental stress, and health were eligible for inclusion in this review. Restrictions on the year of publica-

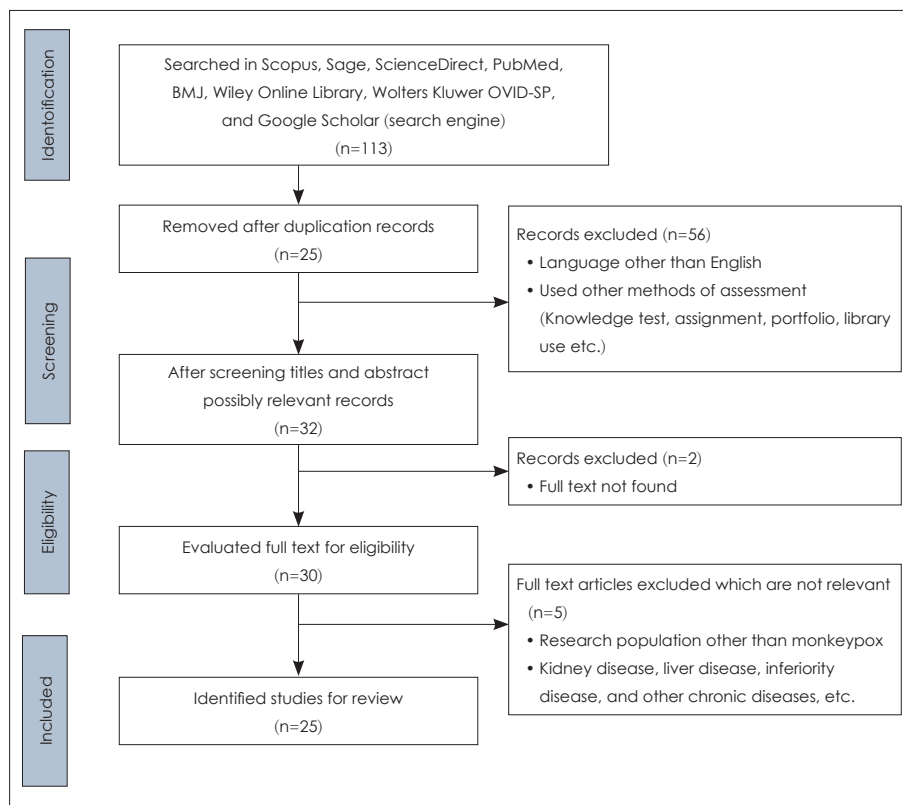


Fig. 1. PRISMA chart on monkeypox and mental stress, illness, and health.

tion were applied during the MPX disease period. However, only studies in English were selected and other languages were excluded.

The inclusion criteria were as follows: 1) studies that covered the topics of MPX and mental stress, illness, and health; 2) studies using the tools or practice of MPX and mental stress, illness, and health; 3) studies in English; 4) studies published from July 2022 onward; and 5) journal articles, reviews, opinions, editorials, conference papers, meeting papers, and dissertations.

The exclusion criteria were: 1) the book chapters; 2) viral diseases other than MPX; and 3) data from Wikipedia and unpublished data.

### Data extraction and synthesis

The flowchart in Fig. 1 (PRISMA diagram) shows the scanning procedure and the reasons for the exclusion and selection of qualified studies. As evaluated by the selection criteria, there were two phases of data scanning: title, abstract, and full-text articles, and 25 studies were selected for inclusion. A material extraction structure was used for each qualified study to collect data on MPX and mental stress, illness, and health.

A data extraction table was prepared for each eligible study to collect information on the title, name of the author(s), publication year, journal name, country, and major findings and conclusions.

## RESULTS

Table 1 summarizes the studies on the mental health status of patients with MPX. Most of the studies were conducted in developed countries, except a few published in peer-reviewed impact factor journals. Table 1 includes the authors, year of publication, and country names, type of the study, and major findings.

### Themes Identified

#### Anxiety and depression

Ahmed and Colleagues [13,14] discussed social anxiety due to loneliness, quarantine, and fear of being contagious to others. Patients felt helpless and considered themselves a burden on their caregivers. There are also financial constraints, especially in developing countries, where 40%–50% of the population is below the poverty line, daily wage earners, and the sole earners of their families. The authors emphasized that awareness of the mental health status of these patients must be raised and that special measures should be taken to bring them back to life [15]. Farooq et al. [16] noted that 25% of patients with MPX experience anxiety or depression due to

the disease. Healthcare professionals are advised to keep an eye on symptoms of anxiety, depression, etc., in patients with MPX.

#### Self-harm and suicidal tendencies

Rogers et al. [7] and Zortea et al. [8] discussed thoughts of self-harm and reported cases of suicide among patients with depression who were victims of several viral diseases over the past 2 years, including COVID-19. Ogoina et al. [3] reported cases of an outbreak of MPXV in Africa in 2017 and its implications. There are various factors, including depression among these patients due to prolonged quarantine and people who avoid them due to contagious diseases. Tiecco et al. [17] pointed out that special attention should be paid to the mental health of these patients to prevent self-harm and suicide. Another important aspect pointed out by Hirani et al. [18] is the increase in suicide rates among physicians. Although their services met the needs of the hour, especially during the peak of the pandemic, their health could have affected the way they treated their patients, resulting in unintentional suboptimal care.

#### Social stigma

The mental health of patients is affected because they are stigmatized by the people around them.

People suffer social boycotts and experience loneliness, which depresses them. This was also seen in the COVID-19 pandemic, where the bodies of the patients were not given to their relatives, creating anxiety; people started hiding their symptoms and stopped reporting them to hospitals. This was expressed in studies by Lee and Morling [19] and Islam et al. [20] that concluded that public education, preventive measures, rapid identification and isolation of cases, contact tracing, and appropriate treatment are necessary to prevent fear of contagion among patients.

#### Neuropsychiatric symptoms

Nonspecific neuropsychiatric symptoms, including myalgia, fatigue, and headache, have been reported in patients with MPX. A study by Badenoch et al. [11] also reported complications, including encephalitis and meningitis. To avoid complications, special attention should be paid to patients with MPX who have similar symptoms. Lee and Morling [19] reported that public health issues are increasing worldwide.

#### Mental health status of pregnant women

Shi et al. [21] and Ennab et al. [22] discussed the mental health status of pregnant women who were infected with MPXV or had any of their close relatives suffering from MPX. The fear and anxiety of these women were far greater than

**Table 1.** Summary of the main findings of the reviewed studies on the mental health status of patients with MPX

Author & years	Reference number	Country name	Title	Type of study	Major findings
Ahmed et al., 2022	13	Iraq	Timely mental health care for the 2022 novel monkeypox outbreak is urgently needed	Opinion	Factors such as social media, quarantine, guilt, fear, stigma, blame, boredom, loneliness, symptoms, healthcare providers, side effects, and anger contribute to mental health problems in monkeypox patients.
Badenoch et al., 2022	11	UK	Neurological and psychiatric presentations associated with human monkeypox virus infection: a systematic review and meta-analysis	Systematic review and meta-analysis	Preliminary evidence suggests severe neurological complications and nonspecific neurological features in MPX, but less about psychiatric presentations or sequelae. Surveillance and longitudinal studies are needed to evaluate potential causality and explain prevalence heterogeneity.
Ahmed et al., 2022	14	Iraq	Study of knowledge, attitude and anxiety in Kurdistan-region of Iraq population during the monkeypox outbreak in 2022	Cross sectional survey	Significant differences in anxiety scores towards MPX were observed among respondents based on gender, marital status, religion, education level, and residence, emphasizing the need for public awareness and emotional wellbeing management.
Ogoina et al., 2022	3	Nigeria	A case of suicide during the 2017 monkeypox outbreak in Nigeria	A case report	A 34-year-old Nigerian businessman was admitted to a tertiary hospital with fever, headache, malaise, and vesiculopustular rashes, without systemic symptoms or prior history of mental illness, deviant behavior, or substance abuse.
Rogers et al., 2021	7	UK	Suicide, self-harm and thoughts of suicide or self-harm in infectious disease epidemics: a systematic review and meta-analysis	Systematic review and meta-analysis	A systematic review and meta-analysis of 1354 studies found that 8.0% of participants experienced thoughts of suicide or self-harm during infectious disease epidemics, including Spanish flu, severe acute respiratory syndrome (SARS), human monkeypox, Ebola, and COVID-19.
Zorzea et al., 2021	8	UK	The impact of infectious disease-related public health emergencies on suicide, suicidal behavior, and suicidal thoughts	Systematic review	The study found increased suicide rates among older adults during and after the SARS/Ebola epidemic, possibly due to social disconnectedness, fear of virus infection, and burdening others.
Ahmed et al., 2022	52	Iraq	The impact of monkeypox outbreak on mental health and counteracting strategies: a call to action	Commentary	The MPX outbreak has led to a shortage of mental health specialists, counselors, and rehabilitation institutions, necessitating community conversations to support public health efforts.

**Table 1.** Summary of the main findings of the reviewed studies on the mental health status of patients with MPX (continued)

Author & years	Reference number	Country name	Title	Type of study	Major findings
Sah et al., 2022	28	US	Monkeypox reported in India-South East Asia region: health and economic challenges	Commentary	Since July 2022, four cases have been reported in India, indicating a significant compromise in the mental health of the population due to the COVID-19 pandemic.
Tiecco et al., 2022	17	Italy	Monkeypox, a literature review: what is new and where does this concerning virus come from?	Systematic review	The WHO has emphasized the need for more comprehensive understanding of the psychological impact of MPX, particularly in relation to mental health issues and suicide.
Mungmunpunitpanitip et al., 2022	15	India	Anxiety, depression and monkeypox	Editorial	Monkeypox's impact on clinical psychiatry is underresearched, with over 25% of hospitalized patients experiencing anxiety or depression, requiring counseling.
Lee and Moring 2022	19	UK	The global monkeypox outbreak: germ panic, stigma and emerging challenges	Editorial	Germ panic poses a public health issue due to its potential stigmatization of the condition, as affected individuals may be perceived as unclear vectors of disease.
Al-Tammemi et al., 2022	26	Jordan	The outbreak of Ebola virus disease in 2022: a spotlight on a re-emerging global health menace	Review Article	The COVID-19 pandemic and human monkeypox outbreaks pose significant global health and mental health risks, necessitating increased authorities' multi-faceted response, including strict contact tracing and border control, to prevent future EVD crises.
Caycho-Rodríguez et al., 2022	30	Peru	The Monkeypox Fear Scale: development and initial validation in a Peruvian sample	Quantitative	The Monkeypox fear scale in Peru has sufficient psychometric evidence to evaluate fear, potentially guiding future research on its mental health implications.
Ennab et al., 2023	22	United Arab Emirates	The psychological aftermath of an emerging infection affecting pregnant women: is monkeypox to blame?	Letter to editor	The monkeypox outbreak highlights the need to prioritize pregnant women's mental health, involving public health entities early on. The link between deteriorating mental health and pregnancy complications is crucial, presenting an opportunity for a systematic approach.

**Table 1.** Summary of the main findings of the reviewed studies on the mental health status of patients with MPX (continued)

Author & years	Reference number	Country name	Title	Type of study	Major findings
Favre et al., 2022	23	Switzerland	Mental health in pregnant individuals during the COVID-19 pandemic based on a Swiss online survey	Swiss online survey	Pregnant women face high risk of mental health impairment during the pandemic, requiring better informed care from healthcare professionals, especially foreign nationals, regardless of socioeconomic status.
Hirani et al., 2022	18	USA	Monkeypox outbreak in the age of COVID-19: a new global health emergency	Letter to editor	The pandemic exacerbated burnout, mental health issues, and suicide rates among physicians, highlighting the potential impact of their own health on patient care.
Lee and Wu 2022	50	Taiwan	Management of emerging health conditions to improve resilience and mental health	Editorial	Scholars interested in psychology, public health, and disease alleviation are invited to submit manuscripts for the Special Issue "Management in Different Health Conditions."
Mukherjee et al., 2022	27	India	The pathophysiological and immunological background of the monkeypox virus infection: an update	Review	MPXVs are spreading globally, with cases in Kerala linked to past international travel and potential cases.
Shukla et al., 2023	29	India	Discrimination, and psychological distress among the LGBTQ community in times of monkeypox outbreak—a wake-up call	Letter to editor	In developing countries like India, the LGBTQ community faces high stigma, discrimination, mental health treatment gaps, and poor health literacy, highlighting the need for urgent action.
Sah et al., 2022	37	USA	Major sporting events amid monkeypox and COVID-19 outbreaks: considering the impact upon the traveller	Correspondence	Travel stress can negatively impact health, potentially worsening chronic ailments. The FIFA World Cup in Qatar, attracting 1.5 million visitors, is expected to be a significant sporting event.
Li et al., 2023	25	China	Monkeypox awareness and low vaccination hesitancy among men who have sex with men in China	Cross-sectional survey	China's men who have sex with men showed minimal resistance to monkeypox vaccination, attributed to factors like accessibility, price, and safety. Encouraging education about vaccination benefits could support future initiatives.
Kumar et al., 2023	32	India	As the world struggles with the COVID-19 pandemic, another emergency threat arrives on the horizon, the monkeypox: a systematic review	Systematic review	Sexual activity accounts for 55% of transmissions, causing common symptoms like rashes, fever, and fatigue. The USA has the highest mortality rate of 8.65%, with the highest number of young people dying from HIV or sexually transmitted diseases.

**Table 1.** Summary of the main findings of the reviewed studies on the mental health status of patients with MPX (continued)

Author & years	Reference number	Country name	Title	Type of study	Major findings
Chen et al., 2023	24	China	Knowledge of human Mpox (Monkeypox) and attitude towards Mpox vaccination among male sex workers in China: a cross-sectional study	A Cross-Sectional Study	Male sex workers (MSW) have poor understanding of Mpox and high readiness for vaccination, highlighting the need for Mpox health education. High-risk populations, such as MSW, should be prioritized when vaccine availability is limited. Risks include aggression, drug use, mental health issues, and sexually transmitted infections. The WHO warns of unusual consequences of bronchopneumonia, sepsis, and corneal infections, including vision loss, and suggests monitoring existing outbreaks for symptoms like anxiety and depression in MPX patients.
Farooq et al., 2023	16	Pakistan	Neurological complications in Monkeypox: a challenge that demands attention	Short report	Monkeypox infection is not severe, but stigmatization may reduce epidemic reactions. Public education, preventative measures, case identification, isolation, contact tracing, and appropriate treatment are recommended.
Islam et al., 2023	20	Bangladesh	The spreading of monkeypox in nonendemic countries has created panic across the world: could it be another threat?	Letter to editor	

those of others because they were not only concerned with themselves, but also with their newborns. These women needed special psychological help during this period [22-24].

### Rise in stress-related diseases

Li et al. [25] emphasized the need for stringent measures, such as contact tracing and border control, to prevent epidemics. People in developing countries such as India and Bangladesh have also reported cases of MPX. They impose travel restrictions on the fear and anxiety of travelers who want to travel to meet their desired needs. This causes an increase in stress-related diseases, such as diabetes and hypertension, in this population, as reported by several studies [26-28]. Shukla et al. [29] provided evidence using the fear scale of mental stress in the Peruvian population.

### Mental health status of children and adolescents

Adolescent mental problems are becoming increasingly significant throughout life, with most illnesses starting before aged 25 years, usually between 11 and 18 years. However, not all mental health problems persist in adulthood, particularly if they are brief. This has led to a greater focus on early clinical interventions, such as improved access to primary healthcare and adolescent-focused mental health programs.

The methodology should focus on the use of effective clinical interventions, including cognitive behavioral therapy, in the entire adolescent population or specific at-risk subgroups to examine their potential to prevent the onset of illnesses [30,31].

## Challenges and Implications on the Society

### Challenges due to anxiety

Patients with MPX face various difficulties that have a significant impact on society. Anxiety is a frequent and unpleasant psychological adverse effect of this rare disease. Patients often struggle with concerns about problems and long-term effects on their health, which can cause anxiety to increase [14]. This not only has an impact on their mental health, but also has wider social repercussions. Patients with MPX who have anxiety may require additional healthcare resources because they need more assistance and supervision. Furthermore, anxiety can lead to stigma and prejudice, making it difficult for those who have recovered from anxiety to reintegrate into society [15]. It is critical to address the mental health needs of patients with MPX, not just for their well-being, but also to advance a more diverse and compassionate society that recognizes the all-encompassing effects of infectious diseases.

### Challenges from depression

Patients with depression face physical disfigurements, long-term health and self-esteem issues, social isolation, decreased productivity, unemployment, and strained relationships [16]. This burdens healthcare systems and social support networks, and social stigma amplifies suffering. Addressing depression is not just a medical necessity but also a social imperative, emphasizing holistic healthcare and de-stigmatizing mental health struggles not only in adults, but also in children and adolescents, who are more vulnerable to depression due to the spurt of hormonal and emotional changes occurring at this age.

### Challenges due to self-harm and suicide

Patients with MPX often resort to self-harm or suicide due to physical and emotional distress, causing significant emotional and financial burdens to healthcare systems, families, and communities [16,17]. Addressing these issues is crucial to comprehensive care and a more compassionate society that values mental well-being as much as physical health, highlighting the need for robust mental health support systems and public awareness campaigns.

### Challenges due to social stigma

Patients with MPX experience social stigma, leading to discrimination, isolation, and negative stereotyping. This stigma discourages the search for medical care and hinders public health efforts. Addressing this stigma is crucial for the well-being of patients and fostering a more inclusive society [19,20]. Initiatives, such as education, awareness, and empathy, are required to ensure that patients receive the care they deserve. Children and adolescents are more aware of their self-image and need special attention to maintain mental health and contribute to making them useful members of society.

### Challenges due to neuropsychiatric symptoms

Neuropsychiatric symptoms in patients with MPX pose significant challenges, including cognitive impairment, mood disturbances, and psychosis [11]. These symptoms can affect daily life, personal relationships, and employment. Society faces an increasing demand for specialized medical care, mental health services, and challenging healthcare systems. Awareness and education on neuropsychiatric aspects are crucial, as misconceptions and stigma can hinder access to appropriate care. A study in China revealed mental illness in children and adolescents due to misinformation targeting the Chinese population and fear of being stigmatized during and after COVID-19. This has resulted in addiction to the Internet, increased use of smartphones, and substance abuse [21].

### Challenges of mental health of pregnant women

Pregnant women with MPX face significant mental health challenges due to increased stress, anxiety, depression, and limited treatment options. These struggles affect society, leading to increased healthcare demands, adverse birth outcomes, and specialized care [22,23]. Addressing these issues is crucial to the well-being of women, ensuring safe pregnancies and ensuring the health of future generations. Societies must prioritize accessible mental health support and implement comprehensive healthcare strategies.

### Rise in stress-related diseases

Stress-related diseases like hypertension and diabetes are on the rise in developing and developed countries. Stress conditions lead to generation of oxygen free radicals which result in serious health conditions including cancer, cardiovascular illness and imbalance in neurotransmitters causing mental illness [27].

### Mental health of children and adolescents

MPX illness is not only affecting mental health of adult population but also children and adolescents. These may carry long-term implications not only on their own health and life but also on the society [30,31]. Early intervention to educate them and provision of help and assurance will prove fruitful results.

### Sex workers and vaccination

Chen et al. [24] and Li et al. [25] have reported poor knowledge of MPX disease in China and high acceptance of vaccination among male sex workers (MSW). The spread of the disease (55%) was reported in MSW, and the acceptability and availability of vaccinations contributed to reducing fear among them. Education at all levels is necessary to reduce public stress among the masses. Kumar et al. [32] reported that sexual activity accounts for 55% of all transmissions. The symptoms reported most frequently in the anogenital regions included vesicular-pustular rashes (97.54%), fever (55.25%), inguinal lymphadenopathy (53.6%), exanthema (40.21%), fatigue, headache, asthenia (26.32%), myalgia (16.33%), and vesicles and ulcers (30.61%).

## DISCUSSION

This study is based on some available data on the psychiatric manifestations of MPXV infection. Our systematic review is designed to present an extensive survey of relevant studies on psychiatric disorders, including mental stress, as a co-presentation of MPXV infection. Many studies, systematic reviews, and cross-sectional surveys are available that fo-



cus only on the physical symptoms of the disease, including dermatological manifestations, but not psychological manifestations. It is necessary to focus on mental issues along with physical ones related to any epidemic disease, especially those in which issues such as corporeal disfigurement, social anxiety related to the epidemic, and a particular stress-prone personality type exaggerate each other's existence.

According to a previous study on this issue [13], 25%–50% of patients with MPX experience psychiatric symptoms, such as anxiety and depression but are not measured or studied scientifically. The study speculates that many elements, such as being isolated, bored, and lonely during the active disease span and having to feel the responsibility of being a patient with MPX but not a vector, contribute to the surfacing of symptoms showing psychiatric burnout. Other factors, such as the terror of infected people around and in the family, health professionals treating them with medications they know nothing about, and finally, shame and blame for physical symptoms, especially skin-related symptoms. A systematic review by Badenoch et al. [11] states that the involvement of the nervous system, whether neurological or psychiatric, is not well distinguished in MPX or any of the orthopoxvirus-related diseases. There is some initial but vague evidence for a variety of neurological manifestations, such as encephalitis and/or seizures, headache, and confusion; however, data on psychological sequelae of MPX disease are very limited. This justifies the need to gather more clinical evidence and scrutinize the long-term possible consequences of viral disease through longitudinal studies, and to use vigorous techniques to gauge the prospective connection of MPXV with other clinical presentations, such as psychiatric ones. In an online cross-sectional survey by Ahmed et al. [14], it was found that the mean rank score for MPX-related anxiety differed significantly according to sex, religion, education level, marital status, and residence (all *p*-values of <0.01).

There is an alarming increase in MPX cases in many countries, highlighting the urgent need to increase public knowledge of the disease and its possible outcomes so that they are emotionally well prepared before the outbreak to effectively combat the endemic [31,33-35]. Controlling the falsehood and deception of the infodemic and disseminating the true details can protect people's emotional integrity and prevent misconceptions and panic [24]. In a case report by Ogoina et al. [3], it was reported that there is also a psychosocial side in patients hospitalized with human MPX [36,37]. A 34-year-old married and father of three children, businessman, and according to the report was hospitalized as a suspected case of human MPX in Nigeria with no previous history of any mental disorder or irrational behavior, but he had committed suicide during the course of the disease even before his PCR

was positive for MPX. This may be attributed to reactive low mood, quarantine, psychosocial problems, and financial concerns of the patient regarding the disease outbreak [38]; however, other factors may be present, such as a particular personality type that is more stress-prone and stigma-sensitive or a prior psychological disorder. Patients can also breakdown and attempt to impulsively commit suicide in crisis moments, especially when uncertainty is fueled by the media. Another systematic review and meta-analysis [7], which included epidemics such as the Spanish flu, Ebola virus, COVID-19, severe acute respiratory syndrome (SARS), and human MPXV, over a period ranging from 1910 to 2020 in different global regions, stated that out of the 57 studies that met the eligibility criteria, seven showed suicidal deaths, nine showed incidents of self-harm, and 45 showed thoughts of suicidal or self-harm during the course of the disease. A secondary meta-analysis of suicidal and self-harming thoughts during the epidemic established a pooled prevalence of 8%, with a 95% confidence interval over 7 days to 6 months. In a systematic review [8], eight studies were included to survey the effects of different epidemics on serious psychological consequences, such as mental stress, leading to suicide. The study revealed elevated rates of suicidal tendencies, especially among adults during and in the following year of epidemics such as SARS. The reason for this could be disconnection from society and the feeling of being a burden on others during a viral epidemic. Due to misinformation and disinformation, laymen can cultivate many false beliefs about the epidemic that can be directly proportional to mental stress, leading to suicide attempts in adolescents and adults [39,40].

There is a mandatory requirement to have a large number of psychiatrists and other professional specialists related to mental health to reduce serious psychological disorders, including stress and anxiety, in an epidemic outbreak [41] such as MPXV. Rehabilitation centers and counselors should be arranged, and communities should provide support systems and participate in activities for the improvement of public mental health [1]. Indian state of Kerala and the capital, Delhi, reported the events of the first four patients infected with MPXV since July 2022. The country has already taken a great toll on health, especially the mental health of its citizens, due to the COVID-19 pandemic. To reduce the rate of mental morbidity, appropriate health policies should be used and the public should adhere to them [28]. After the COVID-19 pandemic, it is clear that the emergence of a new viral epidemic can spread fears, which can cause psychological impairment among individuals. People who are already weak in coping with stressful conditions are at increased risk. The WHO has emphasized spreading substantial awareness of maintaining the psychological integrity of people during

MPXV, as the psychiatric impact of the virus is not very well marked [17,42,43]. In an editorial by Mungmunpantipantip et al. [15], the effect of MPXV is stated to be rarely discussed in the study of psychiatry, so there is negligible knowledge available about the connection between MPXV and psychological issues. According to one study, approximately  $\geq 25\%$  of hospitalized patients with MPX suffered from depression or anxiety and needed psychological counseling.

The spread of panic during and even after a public health issue stigmatizes the situation because infected individuals are usually believed to be unclean vectors of the viral disease, and the fear of the virus was scaled to be very high when psychometric analysis was performed in the Peruvian population. This analysis can serve as a great guide for relevant future studies on the impact of MPX on mental health and can fend off the stress of the disease [19,30,31]. Among the major outbreaks of infectious diseases, such as COVID-19 and EVD, MPXV can become a serious threat to physical and psychological well-being, as it has taken a great toll on the mental health of patients regardless of sex, race, religion, and even psychiatric history. To avoid such a global health burden, regular and frequent psychiatric screening is recommended [34,44]. Studies by Ennab et al. [22] and Cuérel et al. [45] have emphasized the need to consider the psychological state of a pregnant woman and the emerging problems during the disease outbreak, such as COVID-19, have already been shown to exert deleterious mental health effects. This may be because pregnant women are already in a vulnerable psychological state; therefore, it is crucial to assess and address maternal psychiatric issues related to MPXV at an initial stage and inform them about the aftermath of the pandemic on pregnancy to avoid complications [45,46]. Health professionals play a key role in improving the standards of mental health assessment, especially during pregnancy. Mental disorders can be the first clinical signs of MPX disease [47].

Disasters, such as epidemics, pose a significant risk to adolescents with mental health problems, potentially disrupting treatment and causing symptoms to worsen or develop into new conditions. Increased stress, anxiety, and depression related to viral outbreaks have led to psychological burnout and suicidal tendencies among clinicians and physicians. Although their services are required and the ultimate need of the hour, additional workload, in addition to other emotional factors, can lead to unintentional and substandard patient care [18,31,48,49]. Health issues related to the general public, including viral infectious diseases, are increasing exponentially worldwide. Similarly, MPXV has spread to various nations. The cases are more relevant in underdeveloped and newly developing countries, such as India, due to a lack of health literacy despite global health awareness. Disgrace to-

ward and discrimination against the lesbian, gay, bisexual, transgender, and queer (LGBTQ) community in these nations is usually the norm, and any interaction with this community is considered a stigma. They were discriminated against and denied access to medical facilities; therefore, this community avoided testing or seeking medical advice. The mental health toll during MPX disease in the LGBTQ community can increase due to lack of medical help and the main difference of opinion [29,50]. The progression of trade between countries, increased excursions, and increased population have increased the chances of human-to-human and human-to-animal interaction. Increased contact with animal reservoirs harboring the virus [51]. Travel struggles can negatively affect psychological health and lead to mental stress. This struggle can increase if an epidemic is also on the rise. The MPXV cases found in Kerala also have epidemiological connections, showing a history of recent international trips and direct contact with diseased cases. International sporting events can also lead to an increase in the spread of disease; however, instead of postponing these events, organizers must take preventive measures in addition to alleviating travelers' fears and addressing their concerns. They should be educated to reduce travel stress [27,28,52]. Parents and educators should be aware of mental health issues to avoid delays in referral to psychiatric services. Addressing social concerns and working together with families, schools, and communities are crucial to effective mental health care. Therefore, the establishment of mental health services in schools may be beneficial.

## CONCLUSION

This extensive survey of MPXV infection-related studies on psychiatric disorders, including mental stress, shows that 25%–50% of patients with MPX experience anxiety and depression, mainly due to isolation, boredom, and loneliness during the active course of the disease. This study speculates that many psychological elements are not measurable and cannot be studied scientifically. Other terrifying factors, such as infected people around them and in the family, non-competency of health professionals treating them, and finally, shame and blame for the physical symptoms, especially related to the skin, further aggravate and add to the mental insults not only in adults, but also in children and adolescents. Challenges and implications for society include increased self-harm, suicide cases, low productivity, fear of stigmatization, spread of infection, transmission of infection to newborns, and lack of awareness of its spread among sex workers.

Mental health of monkeypox patients should be prioritized, with counseling and medication provided. Mothers

should be assured of the disease's transmission, and public education should reduce stigma. Awareness should be raised to identify mental health issues and get adequate management in time.

### Supplementary Materials

The online-only Data Supplement is available with this article at <https://doi.org/10.5765/jkacap.230064>.

### Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

### Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

### Author Contributions

Conceptualization: Anila Jaleel. Data curation: Anila Jaleel, Ghulam Farid. Formal analysis: Anila Jaleel, Ghulam Farid. Investigation: Anila Jaleel, Ghulam Farid, Haleema Irfan, Saeeda Baig. Methodology: Ghulam Farid. Project administration: Anila Jaleel, Khalid Mahmood. Resources: Ghulam Farid. Software: Ghulam Farid, Haleema Irfan. Supervision: Khalid Mahmood. Validation: Saeeda Baig. Visualization: Ghulam Farid. Writing—original draft: Anila Jaleel, Ghulam Farid, Haleema Irfan, Saeeda Baig. Writing—review & editing: Khalid Mahmood.

### ORCID iDs

Anila Jaleel <https://orcid.org/0000-0002-5530-3696>  
 Ghulam Farid <https://orcid.org/0000-0002-3299-5220>  
 Haleema Irfan <https://orcid.org/0009-0007-9561-9322>  
 Khalid Mahmood <https://orcid.org/0000-0003-1601-7168>  
 Saeeda Baig <https://orcid.org/0000-0003-0944-8066>

### Funding Statement

None

### Acknowledgments

The authors thank the Principal of Shalamar Medical and Dental College for supporting the research.

## REFERENCES

- 1) Centers for Disease Control and Prevention. 2022-2023 Mpox outbreak global map [Internet]. Atlanta, GA: Centers for Disease Control and Prevention [cited 2023 Nov 23]. Available from: <https://www.cdc.gov/poxvirus/monkeypox/response/2022/world-map.html>.
- 2) Rabiul Islam M, Hasan M, Rahman MS, Rahman MA. Monkeypox outbreak—no panic and stigma; only awareness and preventive measures can halt the pandemic turn of this epidemic infection. *Int J Health Plann Manage* 2022;37:3008-3011.
- 3) Ogoina D, Mohammed A, Yinka-Ogunleye A, Ihekweazu C. A case of suicide during the 2017 monkeypox outbreak in Nigeria. *IJID Reg* 2022;3:226-227.
- 4) Yinka-Ogunleye A, Aruna O, Dalhat M, Ogoina D, McCollum A, Disu Y, et al. Outbreak of human monkeypox in Nigeria in 2017-18: a clinical and epidemiological report. *Lancet Infect Dis* 2019; 19:872-879.
- 5) Daskalakis D, McClung RP, Mena L, Mermin J; Centers for Disease Control and Prevention's Monkeypox Response Team. Monkeypox: avoiding the mistakes of past infectious disease epidemics. *Ann Intern Med* 2022;175:1177-1178.
- 6) Choi J, Taylor S. (2019). The psychology of pandemics: preparing for the next global outbreak of infectious disease. Newcastle upon Tyne, UK: Cambridge Scholars Publishing. *Asian Commun Res* 2020;17:98-103.
- 7) Rogers JP, Chesney E, Oliver D, Begum N, Saini A, Wang S, et al. Suicide, self-harm and thoughts of suicide or self-harm in infectious disease epidemics: a systematic review and meta-analysis. *Epidemiol Psychiatr Sci* 2021;30:e32.
- 8) Zortea TC, Brenna CTA, Joyce M, McClelland H, Tippett M, Tran MM, et al. The impact of infectious disease-related public health emergencies on suicide, suicidal behavior, and suicidal thoughts. *Crisis* 2021;42:474-487.
- 9) Schluter PJ, Généreux M, Hung KK, Landaverde E, Law RP, Mok CPY, et al. Patterns of suicide ideation across eight countries in four continents during the COVID-19 pandemic era: repeated cross-sectional study. *JMIR Public Health Surveill* 2022;8:e32140.
- 10) Asmundson GJG, Taylor S. How health anxiety influences responses to viral outbreaks like COVID-19: what all decision-makers, health authorities, and health care professionals need to know. *J Anxiety Disord* 2020;71:102211.
- 11) Badenoch JB, Conti I, Rengasamy ER, Watson CJ, Butler M, Hussain Z, et al. Neurological and psychiatric presentations associated with human monkeypox virus infection: a systematic review and meta-analysis. *EClinicalMedicine* 2022;52:101644.
- 12) Patton GC, Coffey C, Romaniuk H, Mackinnon A, Carlin JB, Degenhardt L, et al. The prognosis of common mental disorders in adolescents: a 14-year prospective cohort study. *Lancet* 2014;383: 1404-1411.
- 13) Ahmed SK, M-Amin HI, Abdulqadir SO, Hussein SH, Ahmed ZK, Essa RA, et al. Timely mental health care for the 2022 novel monkeypox outbreak is urgently needed. *Ann Med Surg (Lond)* 2022;82: 104579.
- 14) Ahmed SK, Abdulqadir SO, Omar RM, Hussein SH, M-Amin HI, Chandran D, et al. Study of knowledge, attitude and anxiety in Kurdistan-region of Iraqi population during the monkeypox outbreak in 2022: an online cross-sectional study. *Research Square* [Preprint]. 2022 [cited 2023 Nov 23]. Available from: <https://doi.org/10.21203/rs.3.rs-1961934/v2>.
- 15) Mungmunpantip R, Sriwijitalai W, Wiwanitkit V. Anxiety, depression and monkeypox. *Medp Psychiatry Behav Sci* 2022;1: mppbs-202206002.
- 16) Farooq M, Butt MM, Butt MA. Neurological complications in monkeypox: a challenge that demands attention. *IJS Short Rep* 2023;8: e63.
- 17) Tiecco G, Degli Antoni M, Storti S, Tomasoni LR, Castelli F, Quiros-Roldan E. Monkeypox, a literature review: what is new and where does this concerning virus come from? *Viruses* 2022;14:1894.
- 18) Hirani R, Rashid D, Lewis J, Hosein-Woodley R, Issani A. Monkeypox outbreak in the age of COVID-19: a new global health emergency. *Mil Med Res* 2022;9:55.
- 19) Lee ACK, Morling JR. The global monkeypox outbreak: germ panic, stigma and emerging challenges. *Public Health Pract (Oxf)* 2022; 4:100291.
- 20) Islam MR, Asaduzzaman M, Shahriar M, Bhuiyan MA. The spreading of monkeypox in nonendemic countries has created panic across the world: could it be another threat? *J Med Virol* 2023;95:e27919.
- 21) Shi W, Zhao L, Liu M, Hong B, Jiang L, Jia P. Resilience and mental health: a longitudinal cohort study of Chinese adolescents before and during COVID-19. *Front Psychiatry* 2022;13:948036.
- 22) Ennab F, Nawaz FA, Al-Sharif GA, Yaqoob S, Nchasi G. The psychological aftermath of an emerging infection affecting pregnant women: is monkeypox to blame? *Arch Womens Ment Health* 2023; 26:75-77.

- 23) Favre G, Kunz C, Schwank S, Chung HF, Radan AP, Raio L, et al. Mental health in pregnant individuals during the COVID-19 pandemic based on a Swiss online survey. *Sci Rep* 2022;12:18448.
- 24) Chen Y, Li Y, Fu L, Zhou X, Wu X, Wang B, et al. Knowledge of human Mpox (monkeypox) and attitude towards Mpox vaccination among male sex workers in China: a cross-sectional study. *Vaccines (Basel)* 2023;11:285.
- 25) Li Y, Peng X, Fu L, Wang B, Sun Y, Chen Y, et al. Monkeypox awareness and low vaccination hesitancy among men who have sex with men in China. *J Med Virol* 2023;95:e28567.
- 26) Al-Tammemi AB, Sallam M, Rebhi A, Soliman L, Al Sarayrih L, Tarhini Z, et al. The outbreak of Ebola virus disease in 2022: a spotlight on a re-emerging global health menace. *Narra J* 2022; 2:e97.
- 27) Mukherjee AG, Wanjari UR, Kannampuzha S, Das S, Murali R, Namachivayam A, et al. The pathophysiological and immunological background of the monkeypox virus infection: an update. *J Med Virol* 2023;95:e28206.
- 28) Sah R, Mohanty A, Siddiq A, Singh P, Abdelaal A, Alshahrani NZ, et al. Monkeypox reported in India – South East Asia region: health and economic challenges. *Lancet Reg Health Southeast Asia* 2022;4:100063.
- 29) Shukla M, Panda TK, Nikketha BS, Christy J, Damodharan D. Stigma, discrimination, and psychological distress among the LG-BTQ community in times of monkeypox outbreak-a wake-up call. *Indian J Psychol Med* 2023;45:101-102.
- 30) Caycho-Rodríguez T, Vilca LW, Carbajal-León C, Gallegos M, Reyes-Bossio M, Noe-Grijalva M, et al. The monkeypox fear scale: development and initial validation in a Peruvian sample. *BMC Psychol* 2022;10:280.
- 31) Stockings EA, Degenhardt L, Dobbins T, Lee YY, Erskine HE, Whiteford HA, et al. Preventing depression and anxiety in young people: a review of the joint efficacy of universal, selective and indicated prevention. *Psychol Med* 2016;46:11-26.
- 32) Kumar S, Rahul K, Gupta AK, Gupta H, Sonkar SK, Atam V, et al. As the world struggles with the COVID-19 pandemic, another emergency threat arrives on the horizon, the Monkeypox: a systematic review. *Cureus* 2023;15:e33596.
- 33) Abdelhamid AA, El-Kenawy ESM, Khodadadi N, Mirjalili S, Khafaga DS, Alharbi AH, et al. Classification of monkeypox images based on transfer learning and the AI-Biruni earth radius optimization algorithm. *Mathematics* 2022;10:3614.
- 34) Sallam M, Eid H, Awamleh N, Al-Tammemi AB, Barakat M, Athamneh RY, et al. Conspiratorial attitude of the general public in Jordan towards emerging virus infections: a cross-sectional study amid the 2022 monkeypox outbreak. *Trop Med Infect Dis* 2022; 7:411.
- 35) Guarner J, Del Rio C, Malani PN. Monkeypox in 2022-what clinicians need to know. *JAMA* 2022;328:139-140.
- 36) Nimbi FM, Baiocco R, Giovanardi G, Tanzilli A, Lingiardi V. Who is afraid of monkeypox? Analysis of psychosocial factors associated with the first reactions of fear of monkeypox in the Italian population. *Behav Sci (Basel)* 2023;13:235.
- 37) Sah R, Alshahrani NZ, Head MG, Abdelaal A, Mohanty A, Padhi BK, et al. Major sporting events amid monkeypox and COVID-19 outbreaks: considering the impact upon the traveller. *Int J Surg Open* 2022;49:100576.
- 38) Adler H, Gould S, Hine P, Snell LB, Wong W, Houlihan CF, et al. Clinical features and management of human monkeypox: a retrospective observational study in the UK. *Lancet Infect Dis* 2022;22: 1153-1162.
- 39) Kim SJ, Lee J. Introduction of child and adolescent mental health services in Korea and their role during the COVID-19 pandemic: focusing on the Ministry of Education policy. *J Korean Acad Child Adolesc Psychiatry* 2023;34:4-14.
- 40) Shah I, Doshi C, Patel M, Tanwar S, Hong WC, Sharma R. A comprehensive review of the technological solutions to analyse the effects of pandemic outbreak on human lives. *Medicina (Kaunas)* 2022;58:311.
- 41) Vahedian-Azimi A, Moayed MS, Rahimibashar F, Shojaei S, Ash-tari S, Pourhoseingholi MA. Comparison of the severity of psychological distress among four groups of an Iranian population regarding COVID-19 pandemic. *BMC Psychiatry* 2020;20:402.
- 42) Dsouza VS, Pattanshetty S, Brand H. Global monkeypox policy tracker - a digital platform for data visualisation and policy discourse. *Lancet Reg Health Southeast Asia* 2023;8:100115.
- 43) Dsouza VS, Rajkhowa P, Mallya BR, Raksha DS, Mrinalini V, Cauvery K, et al. A sentiment and content analysis of tweets on monkeypox stigma among the LGBTQ+ community: a cue to risk communication plan. *Dialogues Health* 2023;2:100095.
- 44) Campion J, Javed A, Lund C, Sartorius N, Saxena S, Marmot M, et al. Public mental health: required actions to address implementation failure in the context of COVID-19. *Lancet Psychiatry* 2022; 9:169-182.
- 45) Cuérel A, Favre G, Vouga M, Pomar L. Monkeypox and pregnancy: latest updates. *Viruses* 2022;14:2520.
- 46) Cabanillas B, Murdaca G, Guemari A, Torres MJ, Azkur AK, Aksoy E, et al. A compilation answering 50 questions on monkeypox virus and the current monkeypox outbreak. *Allergy* 2023;78:639-662.
- 47) Sookaromdee P, Wiwanitkit V. Monkeypox and psychotic manifestations: possible but little recognized clinical manifestations. *World J Clin Med* 2022;1:11-15.
- 48) Eibschutz LS, Sackett C, Sakulsaengprapha V, Faghankhani M, Baumann G, Pappa S. Mental health effects of the COVID-19 pandemic on healthcare professionals. In: Gholamrezanezhad A, Dube MP, editors. *Coronavirus disease 2019 (COVID-19): a clinical guide*. Hoboken, NJ: Wiley-Blackwell;2022. p.554-579.
- 49) Lee KS, Sung HK, Lee SH, Hyun J, Kim H, Lee JS, et al. Factors related to anxiety and depression among adolescents during COVID-19: a web-based cross-sectional survey. *J Korean Med Sci* 2022; 37:e199.
- 50) Lee YC, Wu WL. Management of emerging health conditions to improve resilience and mental health. *Healthcare* 2022;10:1908.
- 51) Harris E. What to know about monkeypox. *JAMA* 2022;327:2278-2279.
- 52) Ahmed SK, Abdulqadir SO, Hussein SH, Omar RM, Ahmed NA, Essa RA, et al. The impact of monkeypox outbreak on mental health and counteracting strategies: a call to action. *Int J Surg* 2022;106: 106943.