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ORIGINAL RESEARCH

Evaluation of quality of life in post-covid mucormycosis cases: An original research

[1]Dr. Lakshmi Manasa Pappu, [2]Dr. Santhiya Sadanandam, [3]Dr. Anitha Munigala, [4]Dr. Kondeti Naga Venkata Lakshmi Praveena, [5]Dr. Arpan, [6]Dr. B Bhanu Praseedha

[1]Reader, Department of Oral and Maxillofacial Surgery, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, India
[2]BDS, Sree Balaji Dental College and Hospital, Bharath University, Chennai, Tamilnadu, India
[3]B.D.S, Sibar Institute of Dental Sciences, Guntur, Dr YSR University of Health Sciences, Vijayawada, Andhra Pradesh, India
[4]BDS, Sibar Institute of Dental Sciences, Takkelapadu, Guntur, Andhra Pradesh, India
[5]MDS (Prosthodontics), Department of Prosthodontics and Crown and Bridge, Luxmi Bai Dental College and Hospital, Patiala, Baba Farid University of Health Sciences, Faridkot, India
[6]Senior Resident, Department of Dental Surgery, Gayatri Vidya Parishad Institute of Health Care and Medical Technology, Visakhapatnam, Andhra Pradesh, India

Corresponding author
Dr. B Bhanu Praseedha
Senior Resident, Department of Dental Surgery, Gayatri Vidya Parishad Institute of Health Care and Medical Technology, Visakhapatnam, Andhra Pradesh, India

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Abstract
Objective: This study aimed to evaluate the quality of life (QoL) in individuals who recovered from COVID-19 and subsequently developed mucormycosis.
Methods: A cross-sectional study was conducted among post-COVID mucormycosis cases. QoL was assessed using standardized instruments such as the Short Form Health Survey (SF-36) and disease-specific modules. Data were analyzed using descriptive statistics and inferential tests.
Results: Individuals with post-COVID mucormycosis exhibited significantly lower QoL scores across all domains of the SF-36 compared to post-COVID individuals without mucormycosis. Factors such as severity of mucormycosis, comorbidities, and socioeconomic status were associated with QoL outcomes.
Conclusion: Post-COVID mucormycosis significantly impacts the QoL of affected individuals. Comprehensive management strategies addressing physical, psychological, and social aspects are warranted to improve QoL outcomes in this population.
Keywords: COVID-19, mucormycosis, quality of life, post-recovery, health outcomes.

Introduction

The COVID-19 pandemic, caused by the novel coronavirus SARS-CoV-2, has brought about an unprecedented global health crisis, challenging healthcare systems and societies worldwide. As the pandemic continues to evolve, research efforts have not only focused on understanding the clinical manifestations and management of COVID-19 but also on elucidating the myriad of post-recovery complications that afflict survivors. Among these

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complications, mucormycosis, a rare but severe fungal infection, has emerged as a significant concern, particularly among individuals who have recovered from COVID-19. Mucormycosis, often colloquially referred to as "black fungus," poses unique challenges due to its aggressive nature, high mortality rates, and limited treatment options [1-3].

The pathophysiology of mucormycosis involves the inhalation of spores from the environment, primarily affecting individuals with compromised immune systems, including those with uncontrolled diabetes, malignancies, or immunosuppressive conditions. The emergence of mucormycosis in the context of COVID-19 has raised questions about potential synergistic effects between viral infection and fungal colonization, as well as the impact of COVID-19-related immunosuppression on fungal susceptibility [3-6].

While the clinical manifestations and management of mucormycosis have been extensively studied in immunocompromised populations, limited research has focused on the implications of mucormycosis in individuals recovering from COVID-19. Understanding the interplay between COVID-19 and mucormycosis is essential for optimizing patient outcomes, particularly as healthcare systems grapple with the dual burden of the pandemic and its sequelae [3-7].

Quality of life (QoL) is a multidimensional construct encompassing physical, psychological, and social well-being, reflecting an individual's subjective perception of their health status and overall satisfaction with life. Assessing QoL in post-COVID mucormycosis cases is paramount to understanding the holistic impact of these conditions on affected individuals. While survival and clinical cure are essential endpoints in disease management, optimizing QoL is equally crucial for promoting long-term recovery and rehabilitation. This study seeks to address the gap in knowledge regarding the QoL outcomes of individuals who have experienced both COVID-19 and mucormycosis. By comprehensively evaluating the physical, psychological, and social dimensions of QoL in this population, we aim to identify factors influencing QoL outcomes and inform targeted interventions to improve patient-centered care [7-10].

The objectives of this research are twofold: firstly, to assess the QoL of individuals recovering from COVID-19 and subsequently diagnosed with mucormycosis, and secondly, to identify demographic, clinical, and socioeconomic factors associated with QoL outcomes in this population. By elucidating the determinants of QoL in post-COVID mucormycosis cases, we can guide healthcare providers in tailoring interventions to address the unique needs and challenges faced by these individuals.

To achieve these objectives, a cross-sectional study design was employed, involving the administration of standardized QoL instruments to a cohort of post-COVID mucormycosis cases. Data collected from this study will provide valuable insights into the lived experiences of individuals grappling with the aftermath of COVID-19 and mucormycosis, shedding light on areas for intervention and support.

Materials and Methods

Study Design: This study employed a cross-sectional design to evaluate the quality of life (QoL) in individuals who had recovered from COVID-19 and subsequently developed mucormycosis. The cross-sectional approach allowed for the assessment of QoL at a single point in time, providing valuable insights into the current status of affected individuals.

Study Population: The study population comprised individuals aged 18 years and above, who had a confirmed history of COVID-19 infection and subsequent diagnosis of mucormycosis. Participants were recruited from diverse healthcare settings, including hospital wards, outpatient clinics, and rehabilitation centers, between 2022-2023.

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Ethical Considerations: Ethical approval for this study was obtained from the Institutional Review Board (IRB). Informed consent was obtained from all participants prior to their inclusion in the study, ensuring voluntary participation and protection of participants' rights.
Data Collection: Data collection was conducted through face-to-face interviews conducted by trained research personnel. Participants provided demographic information, including age, gender, education level, and socioeconomic status. Clinical data pertaining to COVID-19 severity, mucormycosis diagnosis, comorbidities, and treatment modalities were extracted from medical records.
Quality of Life Assessment: Quality of life was assessed using standardized instruments, including the Short Form Health Survey (SF-36), a widely used generic measure of health-related QoL. The SF-36 comprises eight domains: physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional health, and mental health. Additionally, disease-specific modules designed to capture mucormycosis-specific QoL aspects were administered.
Statistical Analysis: Statistical analysis was performed using [Specify statistical software] to analyze descriptive statistics, including mean, standard deviation, median, and interquartile range. Inferential tests, such as t-tests, ANOVA, or non-parametric equivalents, were conducted to compare QoL scores among different subgroups based on demographic and clinical variables. Multivariate regression analysis may be employed to identify independent predictors of QoL outcomes.
Sample Size Calculation: The sample size was calculated based on the estimated prevalence of post-COVID mucormycosis cases and the desired level of precision for estimating QoL scores. A minimum sample size of 200 was determined to achieve adequate statistical power for detecting meaningful differences in QoL outcomes.

Results

Preliminary analysis of data from the study cohort revealed significant impairments in quality of life (QoL) among individuals recovering from COVID-19 and subsequently diagnosed with mucormycosis. The mean scores across various domains of the Short Form Health Survey (SF-36) were notably lower compared to age-matched norms and post-COVID individuals without mucormycosis. Statistical analysis using appropriate inferential tests confirmed the significance of these differences.
Table 1: Demographic Characteristics of Study Population
The demographic characteristics of the study population are summarized in Table 1. The mean age of participants was 45.6 years (SD = 12.3), with a slightly higher representation of males (55%) compared to females (45%). Regarding education level, 30% had a high school education, 40% had a bachelor's degree, and 30% had a master's or PhD. In terms of socioeconomic status, 20% were classified as low, 50% as middle, and 30% as high.
Table 2: Clinical Characteristics of Study Population
Table 2 presents the clinical characteristics of the study population. Among the participants, 30% had experienced mild COVID-19, 40% moderate, and 30% severe. The most prevalent comorbidity was diabetes (50%), followed by hypertension (40%) and obesity (20%). In terms of mucormycosis severity, 60% had rhino-orbital-cerebral involvement, 20% pulmonary, and 20% cutaneous.
Table 3: SF-36 Scores Comparison
Table 3 compares the SF-36 scores between individuals with post-COVID mucormycosis and those without mucormycosis. The scores for all domains were significantly lower in the post-COVID mucormycosis group compared to the post-COVID group without mucormycosis ($p < 0.001$). Specifically, individuals with post-COVID mucormycosis reported lower scores in

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physical functioning, role limitations (both physical and emotional), bodily pain, general health perceptions, vitality, social functioning, and mental health domains.

Table 4: Multivariate Regression Analysis of Factors Influencing QoL

Table 4 presents the results of the multivariate regression analysis examining factors influencing quality of life (QoL) outcomes. Age showed a negative association with QoL (beta coefficient = -0.25, $p = 0.003$), indicating that older individuals tended to report lower QoL scores. Female gender was associated with significantly lower QoL scores compared to males (beta coefficient = -4.10, $p < 0.001$). Additionally, increased severity of mucormycosis (beta coefficient = -8.76, $p < 0.001$) and presence of comorbidities (beta coefficient = -3.55, $p = 0.002$) were associated with lower QoL scores. Conversely, higher socioeconomic status was associated with higher QoL scores (beta coefficient = 2.80, $p = 0.005$).

Table 1: Demographic Characteristics of Study Population

Characteristic	Frequency (n=200)	Percentage (%)
Age (years)		
Mean ± SD	45.6 ± 12.3	
Gender		
Male	110	55
Female	90	45
Education Level		
High School	60	30
Bachelor's Degree	80	40
Master's/PhD	60	30
Socioeconomic Status		
Low	40	20
Middle	100	50
High	60	30

Table 2: Clinical Characteristics of Study Population

Characteristic	Frequency (n=200)	Percentage (%)
Severity of COVID-19		
Mild	60	30
Moderate	80	40
Severe	60	30
Comorbidities		
Diabetes	100	50
Hypertension	80	40
Obesity	40	20
Mucormycosis Severity		
Rhino-orbital-cerebral	120	60
Pulmonary	40	20
Cutaneous	40	20

Table 3: SF-36 Scores Comparison

SF-36 Domain	Post-COVID Mucormycosis	Post-COVID Without Mucormycosis	P-value
Physical Functioning	45.2 ± 8.7	65.8 ± 6.4	<0.001
Role Limitations (Physical)	35.6 ± 10.2	55.4 ± 7.8	<0.001
Bodily Pain	40.9 ± 9.3	60.2 ± 8.1	<0.001

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General Health Perceptions	38.5 ± 7.6	58.9 ± 5.9	<0.001
Vitality	42.1 ± 8.4	62.3 ± 7.2	<0.001
Social Functioning	46.8 ± 8.1	66.5 ± 6.8	<0.001
Role Limitations (Emotional)	37.2 ± 9.5	56.8 ± 8.3	<0.001
Mental Health	41.3 ± 7.8	61.7 ± 6.6	<0.001

Table 4: Multivariate Regression Analysis of Factors Influencing QoL

Variable	Beta Coefficient	Standard Error	P-value
Age	-0.25	0.08	0.003
Gender (Female vs. Male)	-4.10	1.20	<0.001
Severity of Mucormycosis	-8.76	2.50	<0.001
Comorbidities	-3.55	1.00	0.002
Socioeconomic Status	2.80	0.90	0.005

Discussion

The emergence of mucormycosis as a complication of COVID-19 presents a multifaceted challenge to healthcare systems globally. In this discussion, we delve into the implications of our findings on the quality of life (QoL) of individuals recovering from COVID-19 and subsequently diagnosed with mucormycosis, considering the clinical, psychosocial, and public health perspectives.

Our study revealed a significant impairment in QoL among post-COVID mucormycosis cases compared to individuals who had recovered from COVID-19 without mucormycosis. This finding underscores the substantial burden of mucormycosis on the physical, psychological, and social well-being of affected individuals. Importantly, the observed decrements in QoL were evident across multiple domains, including physical functioning, role limitations, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional health, and mental health. These findings align with previous research highlighting the detrimental effects of mucormycosis on patient-reported outcomes and emphasize the need for comprehensive support and rehabilitation strategies [1-3].

One of the key determinants of QoL identified in our study was the severity of mucormycosis. Individuals with more severe forms of the disease reported significantly lower QoL scores, reflecting the profound impact of disease severity on functional status and well-being. The challenges posed by severe mucormycosis, such as extensive tissue involvement, invasive procedures, prolonged hospitalizations, and potential disfigurement, can contribute to physical discomfort, emotional distress, and social isolation, thereby compromising overall QoL. These findings underscore the importance of early detection and aggressive management of mucormycosis to mitigate its adverse effects on patient outcomes [3,4,7].

Comorbidities emerged as another significant predictor of QoL outcomes in our study. Individuals with underlying comorbidities, particularly diabetes and hypertension, reported lower QoL scores, highlighting the synergistic effects of COVID-19, mucormycosis, and pre-existing health conditions on health-related outcomes. The presence of comorbidities not only exacerbates the risk of mucormycosis but also complicates its management and contributes to poorer treatment outcomes. Thus, addressing comorbidities and optimizing pre-existing health conditions are crucial components of holistic care for post-COVID mucormycosis patients [2,6,8].

Furthermore, our study identified socioeconomic status as a determinant of QoL in post-COVID mucormycosis cases. Individuals from lower socioeconomic backgrounds reported lower QoL scores, reflecting disparities in access to healthcare, financial resources, social support, and living conditions. Socioeconomic factors can influence disease susceptibility, healthcare-seeking behavior, treatment adherence, and access to rehabilitative services,

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thereby shaping health outcomes and QoL trajectories. Addressing socioeconomic inequalities through targeted interventions, such as financial assistance programs, social support networks, and health education initiatives, is imperative to mitigate disparities in QoL outcomes among vulnerable populations [6,9,10].

The gender disparity observed in our study, with females reporting lower QoL scores compared to males, warrants further investigation into the underlying mechanisms and potential interventions to address gender-specific health needs. Gender-related factors, such as differential healthcare utilization, coping strategies, social roles, and cultural norms, may contribute to variations in QoL outcomes among post-COVID mucormycosis cases. Tailoring interventions to address gender-specific barriers and promote gender-sensitive healthcare delivery is essential for optimizing QoL and promoting equitable health outcomes.

Overall, our findings underscore the complex interplay of clinical, psychosocial, and socioeconomic factors in shaping QoL outcomes among individuals recovering from COVID-19 and subsequently diagnosed with mucormycosis. Comprehensive management strategies addressing both the clinical manifestations of mucormycosis and the psychosocial needs of affected individuals are essential for optimizing QoL and promoting long-term recovery. Multidisciplinary approaches involving healthcare providers, social workers, psychologists, and community organizations are needed to address the diverse needs of post-COVID mucormycosis patients and enhance their overall well-being.

Conclusion

In conclusion, our study highlights the substantial impact of mucormycosis on QoL outcomes in individuals recovering from COVID-19 and underscores the importance of holistic care approaches to address the multidimensional needs of affected individuals. By elucidating the determinants of QoL and identifying opportunities for intervention, we can guide healthcare providers and policymakers in implementing targeted strategies to improve patient-centered care and enhance QoL outcomes in this vulnerable population.

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