WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Inhaler Adherence and Management among Asthma Patients during and Post COVID-19 Pandemic: A Community Based Observational Study

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A B S T R A C T:

Introduction: Patients with chronic comorbidities are at a greater risk of developing coronavirus disease (COVID-19). Chronic respiratory diseases such as asthma make patients more vulnerable to respiratory viruses. The WHO declared COVID-19 a pandemic, leading to lockdown. This resulted in a completely different lifestyle which may have affected patient's adherence to treatment.

Objective: To compare asthma inhaler adherence during and post COVID-19 pandemic and to assess asthma management during the pandemic.

Methodology: A prospective observational study was conducted over a period of 6 months in Dakshina Kannada. In total, 151 participants were included in the analysis. Data collection consisted of patient demographics, asthma management details, and a 10-item Test of Adherence to Inhaler (TAI) questionnaire.

Results: The mean age was 49.06±12 years. During the COVID-19 pandemic, 43.7% of the participants reported increased inhaler use, while 31.78% experienced worsened asthma symptoms. Additionally, 70.86% postponed routine healthcare appointments. A significant reduction in the percentage of patients requiring emergency department (ED) or hospital visits was observed from during to post-COVID-19 (31.3% vs. 14.6%, $p < 0.05$). Post-COVID-19 pandemic, inhaler adherence also significantly declined (51.65% vs. 29.80%, $p < 0.05$).

Conclusions: This study highlights the changes in inhaler adherence levels during and after the lockdown period in patients with asthma. The observed shift from good adherence to poor adherence post-pandemic raises questions about the lasting effects of lockdown measures on adherence behaviors. Future research should explore whether inhaler adherence changes during other pandemics.

Keywords: Test of adherence to inhaler, lockdown, inhaled corticosteroids, mental health, asthma management.

Introduction

Coronavirus disease 2019 (COVID-19) had a significant impact on the health status of asthma patients.[1] Asthma presents with a range of respiratory symptoms that bear a striking resemblance to those of COVID-19.[2] A national incident cohort study conducted in Scotland revealed a 3.1% mortality rate among adults with asthma, with 98.3% of these cases attributed to COVID-19, indicating an increased risk of COVID-19-related death among individuals with severe asthma.[3]

The World Health Organization (WHO) declared COVID-19 a pandemic on 11th March 2020, which led to social distancing and global lockdowns. The pandemic led to significant changes in lifestyle and strained healthcare resources, resulting in widespread anxiety, particularly concerning in-person visits to medical facilities, with many people resorting to telehealth. Additionally, disruptions in the supply chain affected the availability of medications, including inhalers, and the overlap of COVID-19 and asthma symptoms further complicated patient self-management and healthcare delivery.[4]

Despite these challenges, concerns about COVID-19 may have prompted improved inhaler adherence, self-management, and shielding practices for asthma patients.[5] Additionally, over the pandemic, a reduction in asthma exacerbations has also been reported, which may be attributed to reduced transmission of other respiratory viruses through hand washing and mask-wearing and a change in patient behavior with improved adherence to inhaled corticosteroids (ICS). During the pandemic, a pronounced surge in ICS prescriptions was observed in London, representing nearly half (49.9%) of all prescriptions, as opposed to the pre-pandemic era. A similar rise was also reported in the United States in March 2020.[6]

Noncompliance with inhaled pharmaceuticals results in suboptimal asthma control, escalated healthcare utilization, higher costs, and decreased health-related quality of life.[7] Understanding the impact of the pandemic on adherence is crucial, as it provides an indirect insight into the effect of global health

crises on the management of chronic diseases such as asthma and aids healthcare providers and policymakers to ensure better preparedness and response in future crises. Therefore, the aim of the study was to compare asthma inhaler adherence during and post COVID-19 pandemic and to assess asthma management during the pandemic.

Methodology

A community-based observational study was carried out in different regions of Dakshina Kannada, from February 2023 to July 2023. Study sample consisted of 151 participants. Ethical clearance for this study protocol was obtained from the Ethics Committee of Srinivas Institute of Medical Science and Research Centre (SIMS&RC). Written informed consent was obtained from the participants. The inclusion criteria for the study were patients aged 18 years or older, of both sexes, who were clinically diagnosed with asthma and prescribed inhalers for continuous use, and those willing to participate in the study. Patients who were terminally ill, bedridden, unconscious, or unwilling to participate were excluded.

The data collection form consisted of 3 sections, with the first section consisting of patient name, gender and age. The second section consisted of questions regarding asthma management and adherence during and post pandemic. The final section assessed inhaler adherence.

Asthma Management:

This section consisted of validated questions that gathered information on how the COVID-19 lockdown affected asthma management, healthcare access, and emergency medical care utilization among the study participants. [1,8]

Inhaler adherence:

Adherence to treatment was assessed using a 10-item Test of Adherence to Inhaler (TAI) questionnaire with a scale of 1 (worst compliance) to 5 (best compliance). TAI categorizes patient's adherence into good (TAI = 50), intermediate (TAI = 46–49) and poor (TAI ≤ 45). The same questionnaire was administered twice to check their adherence during and after lockdown. Mean scores were used compare adherence during and after the COVID-19 pandemic.[9]

Data Analysis: Statistical analysis involves collecting and scrutinizing every data sample in a set of items from which samples were drawn, and a suitable statistical test, such as Student's t-test and Chi square test, was applied. Statistical significance was set at $p < 0.05$. The collected data were analyzed using Microsoft Excel and SPSS.

Results

Among 151 participants who completed the questionnaire, 51.65% were male and the mean age was 49.06 ±12.2 years. During the lockdown, 43.7% of the 151 participants reported using inhaler more than usual. Further, 49.66% reported that they had been managing their asthma during the pandemic. This could be due to asthma patients taking proactive measures by increasing their inhaler use to reduce the risk of COVID-19. However, a significant proportion (31.78%) reported that their asthma was worse than usual. This could be due to stress and anxiety. Only 37.08% had visited the emergency department or hospital due to asthma symptoms post pandemic, while only 23.84% had such visits during the pandemic. (Fig 2) The majority of the participants (70.86%) had their routine healthcare appointments postponed or cancelled. (Table 2).

Table 1: Asthma management characteristic during COVID-19 pandemic

Characteristics	**Response N=151 n(%)**
During lockdown, how has your inhaler use changed?	
I have used it more than usual	66(43.7)
I have used it at about the same rate	56(37.08)
I have used it less than usual	29(19.2)
Since the start of lockdown, how have you been managing your asthma?	
Much better than usual	8(5.29)
A bit better than usual	20(13.24)
About the same	75(49.66)
A bit worse than usual	36(23.84)

Much Worse than usual	12(7.94)
Had any routine health care appointments postponed or cancelled during lockdown?	
Yes	107(70.86)
No	44(29.13)

In the COVID-19 period, 51.65% of the participants had good adherence, 28.49% had intermediate adherence, and 19.86% had poor adherence. In the post-pandemic period, only 29.8% of participants had good adherence, 19.3% had intermediate adherence and 50.9% had poor adherence. The mean TAI score during COVID-19 was 46.7±17.8 and decreased to 39.19±10.6 post-COVID-19 pandemic, which was statistically significant (p<0.001). (Fig1).

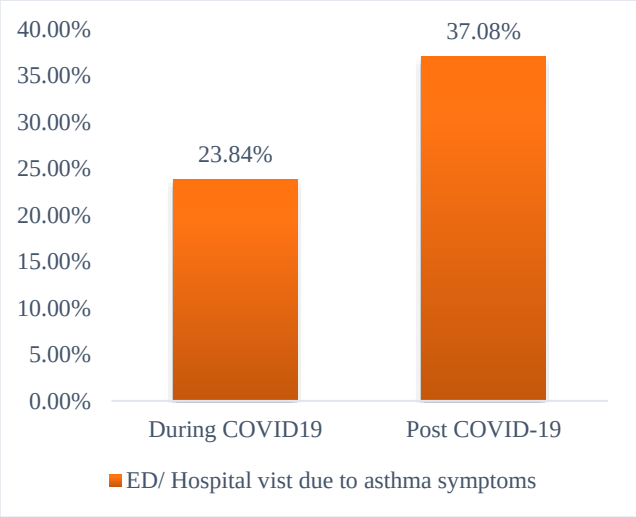

Fig-1Reduction in percentage of patients who had an ED/ Hospital visit during and Post COVID-19, Abbreviations used: ED = emergency department;

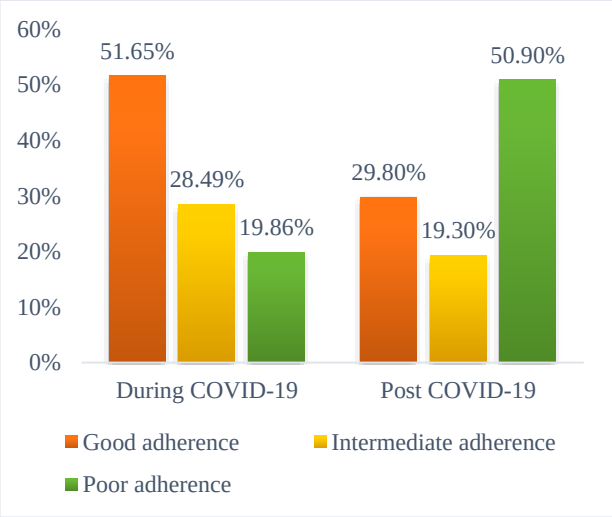

Fig 2: Reduction in percentage of patients with good adherence from during to Post COVID-19 pandemic was significant (p<0.05).

Discussion

The current study highlights the change in inhaler adherence among asthma patients during and after the lockdown period. It is noteworthy that during the lockdown, asthma patients exhibited a high level of inhaler adherence, which aligns with the findings of Kaye *et al.*, who found that the lockdown period played a significant role in influencing adherence behaviors. [8] Although the definite cause of the improvement in adherence cannot be stated, the trend may be reflective of patients responding to national COVID-19 guidelines and their concern about controlling their primary respiratory illness with their inhalers. However, it is essential to acknowledge that there was a decline in adherence post-pandemic. Several factors, such as reduced fear and stress related to the COVID-19 infection post-pandemic, may have led patients to become more laxer in their adherence to asthma inhalers.[9]

This study indicated that forgetfulness, treatment beliefs, and costs were the most common barriers to adherence to patient-reported asthma controllers. A study by Makhinova *et al.*, reported similar barriers to inhaler adherence, but very few patients experienced cost-related issues. The main reason for this deviation is that the majority of the patients were using an inhaler covered by their insurance and therefore, had no issues affording it.[10]

A recent study found that asthma ED/hospital visits decreased during the COVID-19 pandemic.[11] Similarly, in the present study, during the pandemic, few participants had hospital visits, likely due to public health measures such as social distancing, mask-wearing, better adherence and asthma control. However, after the end of the lockdown, more participants had ED visits, which may be linked to reduced masking behavior and increased outdoor allergen exposure. Additionally, decreased adherence and management may have also played a role in the increased ED visits after the lockdown.

The present study revealed an increase in inhaler use during the pandemic. Despite varying responses, most people managed their asthma effectively, demonstrating adaptability and resilience in the face of external health concerns, and a significant number reported that their asthma was worse than usual during the lockdown, likely due to reduced access to health care and pandemic-related stress. Similarly, Philip *et al.*, showed asthma patients reported increased inhaler use and poorer management.[1] This suggests that, regardless of adherence rate, patients were perhaps overutilizing their inhaler therapy. Overuse of inhalers can lead to receptor downregulation, causing a decreased response to treatment. In turn, this causes patients to consume more treatment as its effectiveness decreases.[12]

However, the present study had certain limitations. The data collected may be subject to recall bias, potentially resulting in the misclassification of participants and an overestimation of the obtained results. Also, the study may have faced selection bias with participants being recruited based on ease

of approachability, which could impact the representativeness of the sample. Furthermore, individuals under the age of 18 were not included in the study, which could limit the generalizability of the findings to pediatric populations. Future research should aim to address these limitations and further elucidate the complex determinants of asthma management in diverse patient populations.

Conclusion

The study concluded that higher inhaler adherence was observed during the COVID-19 pandemic, with the majority of participants using their inhaler more than usual. This could be attributed to the increased concern about their health during the pandemic. However, inhaler adherence declined after the end of the COVID-19 pandemic, possibly because the patients became less vigilant regarding asthma management. This emphasizes the need for caregivers to be prepared for similar future circumstances and ensure optimal management of asthma patients. The observed shift from good to poor adherence post-pandemic raises questions about the lasting effects of lockdown measures on adherence. Future research should explore whether inhaler adherence changes during other pandemics**.**

Acknowledgements:

The authors would like to extend their deepest gratitude to Srinivas College of Pharmacy and would like to extend their gratitude and appreciation to the study participants for their smooth completion.

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