Asthma and COVID-19: review of evidence on risks and management considerations

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Abstract

Background Respiratory illnesses typically present increased risks to people with asthma (PWA). However, data on the risks of COVID-19 to PWA have presented contradictory findings, with implications for asthma management.

Objective To assess the risks and management considerations of COVID-19 in people with asthma (PWA).

Method We conducted a rapid literature review. We searched PubMed, medRxiv, LitCovid, TRIP, Google and Google Scholar for terms relating to asthma and COVID-19, and for systematic reviews related to specific management questions within our review, in April 2020. References were screened and data were extracted by one reviewer.

Results We extracted data from 139 references. The evidence available is limited, with some sources suggesting an under-representation of PWA in hospitalised cases and others showing an increased risk of worse outcomes in PWA, which may be associated with disease severity. Consensus broadly holds that asthma medications should be continued as usual. Almost all aspects of asthma care will be disrupted during the pandemic due not only to limits in face-to-face care but also to the fact that many of the diagnostic tools used in asthma are considered aerosol-generating procedures. Self-management and remote interventions may be of benefit for asthma care during this time but have not been tested in this context.

Conclusions Evidence on COVID-19 and asthma is limited and continuing to emerge. More research is needed on the possible associations between asthma and COVID-19 infection and severity, as well as on interventions to support asthma care in light of constraints and disruptions to healthcare systems. We found no evidence regarding health inequalities, and this urgently needs to be addressed in the literature as the burdens of asthma and of COVID-19 are not equally distributed across the population.

Summary box

What is already known about this subject?

- Respiratory illnesses typically present an increased risk to people with asthma (PWA).
- However, some studies have reported lower rates of COVID-19 in PWA cohorts.[2]

What are the new findings?

- Data are inconsistent regarding the representation of PWAs in people hospitalised with COVID-19.
- Guidelines consistently suggest that asthma medications be continued as usual.
- Emerging evidence, as well as evidence from other national disasters, shows that asthma care has been and will be substantially disrupted during the COVID-19 pandemic.

How might it impact clinical practice in the foreseeable future?

- Inconsistencies between studies regarding risks that COVID-19 pose to PWAs will likely impact decisions regarding individual risk during the pandemic.
- Self-management interventions and remote care will be increasingly relied on in the treatment of PWA during the COVID-19 pandemic, but the evidence on these is of limited generalisability to current circumstances.

Introduction

When COVID-19 first emerged at the start of 2020, the assumption was that, like with any respiratory illness, people with asthma (PWAs) would be at increased risk of severe disease and death; as a result, PWA were identified as being at increased risk with advice put in place to protect them.[1] However, as with many things about COVID-19, as the disease progressed, more questions began to be asked. As noted in an April editorial in the *Lancet*, the risk of infection and of severe disease once infected grew into an unexpected topic of debate among PWAs and their clinicians. Some studies reported lower prevalence of patients with asthma among COVID-19 cohorts than would be expected, but whether this was genuine or just due to misreporting was unclear.[2] To further complicate the picture, asthma was typically reported in

a binary fashion in early COVID-19 studies (asthma or no asthma), which led to uncertainty regarding whether people with mild asthma were at increased risk or if this applied only to people with moderate or severe asthma.

Previous coronaviruses have had differential effects on PWA. Despite bronchial asthma being one of the most commonly observed comorbidities in cases of Middle East respiratory syndrome (MERS) coronavirus, it remains unclear whether asthma was over-represented in patients with MERS, though MERS morbidity was generally higher in people with comorbidities.[3 4] In the SARS coronavirus outbreak of 2003–2004, SARS did not appear to induce bronchial hyper-reactivity or eosinophilic inflammation to an extent to induce asthma attacks, though other non-SARS coronaviruses have been linked to asthma exacerbations.[5]

To date, COVID-19 research has overwhelmingly focused on the acute and direct impact of the new virus. Of course, infection poses a risk to everyone, including PWAs, but focus on this particular risk has diverted attention from another pressing issue with the potential to affect PWAs long after the acute phase of the pandemic has ended, namely, disruptions to care. Evidence from other national emergencies, including pandemics, shows that these disruptions have the potential to lead to worse outcomes in people with long-term conditions.[6]

Understanding both the direct and indirect risks COVID-19 poses to PWAs, as well as the best ways to mitigate these risks, is key to enabling patients, carers and healthcare professionals to make informed choices about ways to manage asthma during the COVID-19 pandemic. In this review, we set out to review existing publications, preprints and national guidelines to answer the following questions:

- Are PWA at increased risk of contracting COVID-19?
- Are PWA at increased risk of worse outcomes from COVID-19?
- Are PWA at risk from COVID-19-related disruptions?
- How should PWA be managed when presenting with COVID-19?
- How should asthma be managed during the COVID-19 pandemic?

Methods

The aforementioned questions were generated in the author team before initiating the review. To answer these questions, we searched PubMed, medRxiv, LitCovid, TRIP, Google and Google Scholar on 28 April 2020 for terms relating to asthma and COVID-19 and for systematic reviews related to specific management questions within our review (eg, self-management interventions). The full search strategy is available online.[7] One reviewer (from JH-B, JD, JG, AO, JS, ES and JK) screened studies and extracted relevant data. Data were then narratively synthesised by research question.

Due to the emerging nature of evidence in this field, we took a broad approach to inclusion and did not restrict by study type. We included any reference judged to have relevant information pertaining to our prespecified questions and used the definition of asthma as provided by the study authors from the original publications. In the vast majority of papers, no definition of asthma was provided. Some studies broke down data by severity of asthma, most commonly by medication use; where reported in original publications, we describe this further. Where search results indicated areas where more contextual information would be useful, we ran additional searches for information on particular topics (ie, with regard to the potential impact of school closures on children with asthma, we did a supplemental search for information related to the role of schools in asthma care outside of the pandemic context).

Though phenotypically and end-typically very different, there are very little data on COVID-19 as it relates to paediatric asthma compared with adults with asthma. This is because COVID-19 disproportionately affects older people. Therefore, most of the information presented as follows relates to the adult population. Where data or considerations are specific to paediatric populations, these are highlighted in the text.

Results

Our main search returned 226 results. We screened full texts of all results and extracted relevant data from 139 references. Data are summarised by the research question.

Are PWA at increased risk of contracting COVID-19?

As community testing for COVID-19 remains limited in many parts of the world, it is impossible to say with any certainty if any groups are more or less likely to contract the disease. This remains the case even as testing is rolled out more widely, as very mild or asymptomatic cases are still unlikely to be picked up when only people presenting with symptoms are tested. Antibody testing may shed some light, but that testing—and those studies—are still in their infancy.

Currently, most data on disease prevalence and outcomes come from people hospitalised with COVID-19. These likely represent the 'tip of the iceberg' when it comes to COVID-19 cases and are very narrow and specific samples on which to try to draw conclusions about who is contracting COVID-19. Here we interpret these limited data as best we can, focusing on reports which amalgamate data from multiple cohorts.

In early data on COVID-19 cases (November–February, mainly from China), chronic pulmonary diseases appeared under-represented.[8] This pattern continued over time; a narrative review[2] published on 1 May 2020 noted that the prevalence of asthma in patients with COVID-19 may be lower than expected from population levels, based on both US data[9] and data from China.[10] Whether this was a genuine pattern is unclear: it has been speculated that this may be due to underdiagnosis, poor coding, different immune responses in those with asthma or a protective effect of inhaled corticosteroids. Differences in ACE2 expression have also been a topic of debate, with some arguing that ACE2 expression is lower in PWA, which may protect against COVID-19, but others finding no difference in ACE2 expression between PWA and healthy controls.[11–13]

More recent data have suggested that PWA may be neither more nor less likely to be hospitalised with COVID-19. In a prospective observational cohort study of 166 UK hospitals (preprint, n=16 749), 14% of patients hospitalised with COVID-19 had asthma[14]; the rate of asthma in the UK population is estimated to be 12%.[15] In a prospective cohort study of 1150 adults admitted to the hospital with COVID-19 from two sites in the USA, asthma was found in 8% of cases, approximately equivalent to the national prevalence (7.7% in adults).[16 17] This is in contrast with other US data, which suggest over-representation of PWA in people testing positive for COVID-19; in a cohort with data across 14 states in March (n=178), PWAs represented 17% of the sample, with the highest percentage of PWA observed in those aged 18–49 years (27.3%), though this sample was small and could be due to chance (n=44).[18] As COVID-19 disproportionately affects older people, the risk of COVID-19 in children with asthma is unclear.[19]

Data relating to the prevalence of asthma in COVID-19 cohorts have been interpreted differently by different bodies. The

Canadian Thoracic Society has issued a position statement that there does not appear to be an increased risk for PWA to acquire COVID-19 infection.[20] The British Thoracic Society states that it remains unclear whether asthma is a risk factor for COVID-19 and COVID-19-related complications.[21]

Difficulty in interpreting data on infection rates in PWA are not unique to the current pandemic. Data on outcomes in PWA from previous pandemics are also difficult to interpret. PWA appeared under-represented in a review of 473 cases of H1N1 hospitalisations during the 2009 influenza pandemic.[22] In a cohort study (preprint) from the USA and South Korea comparing patients hospitalised with COVID-19 and those hospitalised with influenza from previous years, those hospitalised with COVID-19 had a lower prevalence of asthma compared with those hospitalised with influenza in the US data sources, but higher in the data from South Korea.[23]

Are PWA at increased risk of worse outcomes from COVID-19?

It is unclear whether PWA in general are at increased risk, given the aforementioned data showing some instances of under-representation of PWA in those hospitalised with COVID-19. It may be difficult to differentiate between COVID-19 symptoms and asthma exacerbations,[24] and beyond the direct risk of infection itself, there is also a risk of experiencing asthma exacerbations triggered by the virus.[25]

A large English cohort study (preprint, n=17 425 445) found that asthma was associated with an increased risk of in-hospital death from COVID-19 in both age-adjusted and sex-adjusted and 'fully adjusted' (for comorbidities) models, with risks higher in those with recent oral corticosteroid use (age-adjusted and sex-adjusted HR 1.70, 95% CI 1.48 to 1.96) compared with those without recent use (age-adjusted and sex-adjusted HR 1.23, 95% CI 1.14 to 1.33.[26] Corticosteroid use can be considered a proxy for disease severity in asthma, so it is unclear if corticosteroid use itself impacts risks from COVID-19 (as discussed further).[27]

Despite the notable paucity of data in this area, numerous bodies have identified people with moderate to severe asthma as being at increased risk: the Centers for Disease Control and Prevention state people with moderate to severe asthma are at increased risk of getting very sick from COVID-19[28]; Asthma UK notes that PWA would be considered at very high risk if they are taking extra controller medicines, as well as a preventer inhaler and continuous or frequent oral steroids[29]; and the British Thoracic Society notes that people taking biological therapies for severe asthma are considered at very high risk.[21]

Are PWA at risk from COVID-19-related disruptions?

Pandemics and national emergencies pose risks to people with long-term conditions because of disruptions in care and disease management.[6] The extent of these disruptions will depend on healthcare systems and individual contextual factors. The possibility that access/adherence to asthma medications may be affected by the current pandemic has been identified as a particular area of concern; exacerbation events and subsequent need for hospitalisation could increase patient exposure to healthcare settings and hence increase risk of infection.[2 25] A systematic review of 56 studies found the most common themes relating to barriers to asthma self-management included mood disorders and anxiety, social support and access to healthcare, all of which may be disrupted in the current context.[30]

Certain populations are likely to be at greater risk from these disruptions. COVID-19 rates are higher in less-advantaged populations, and social determinants of health also play an important role in asthma management.[31 32] People from less advantaged backgrounds may have less access to healthcare, particularly in countries like the USA, which do not have universal healthcare systems. In such systems, this problem will increase as unemployment rises and people lose employer-provided health coverage. With more time spent in the home, exposure to secondhand smoke will increase for some groups, risking increasing morbidity in children and adults with asthma, particularly in less advantaged communities. Systematic review evidence shows children with asthma exposed to secondhand smoke are twice as likely as those without regular secondhand smoke exposure to be hospitalised for their condition.[33]

In paediatric populations, the impact of school closures on children with asthma remains to be seen. Schools often have a role in administering asthma medications, and school closures are speculated to increase the risk of childhood obesity, which is a risk factor for worsening asthma.[19] Family routine typologies have been found to be associated with asthma treatment adherence in children, and school closures may disrupt such routines.[34] School closures may also pose additional risks to children with asthma with attention disorders, as attention disorders are associated with worse asthma morbidity, and this group may be particularly vulnerable to the closure of schools.[35] Children from less advantaged populations may also be impacted by disruptions to provision of school lunch programmes, with some evidence linking nutrition to respiratory outcomes in PWA.[36]

How should PWA be managed when presenting with COVID-19?

Guidance has been issued to PWA who suspect they may have COVID-19.[37] Most guidance is general and is the same given to the rest of the population. A specific concern for PWA is whether a cough is due to asthma or a symptom of COVID-19. In the early stages of COVID-19, there may be an overlap with asthma and COVID-19 symptoms that only later may progress to more clearly defined COVID-19 symptoms.[25] It is suggested that PWA with cough contact healthcare providers (HCPs) if unsure.[37] Box 1 summarises available advice regarding differentiating COVID-19 and asthma symptoms.

PWA with suspected or confirmed COVID-19 are advised to keep following their asthma action plans, take asthma medications as usual and call emergency services if having an asthma attack, making sure the first responders are informed that the individual has COVID-19 symptoms.[37] An algorithm has been created to guide HCPs as to when face-to-face (as opposed to telehealth) evaluation is needed based on COVID-19 risk (high/low) and asthma severity (high/low) or uncertain diagnosis.[25]

With regard to HCP exposure, there is some advice circulating (not referenced) that ambulance services are advising when assessing peak expiratory flow rate (PEFR) in suspected COVID-19 in PWA in their own home, crews should be at least 6 ft away and ideally in another room. For hospitalised patients, strategies for aerosol drug delivery to reduce infection risk have been proposed.[38] The British Thoracic Society suggests the Sharing Patient Assessments Cuts Exposure for Staff (SPACES) approach for delivering ward care, based on the principles of 'maximum patient contact–minimum staff exposure'.[21]

How should asthma be managed during the COVID-19 pandemic?

Diagnosis

Prior to the pandemic, the diagnosis of asthma was made from a combination of history, examination and supportive tests. Over time, guidelines have placed greater emphasis on objective tests in the diagnostic pathway; a diagnostic algorithm from the National

Box 1 Available guidance on differentiating COVID-19 and asthma symptoms

- The British Thoracic Society suggests healthcare providers let patients know that it is uncommon to get a high *temperature*, *tiredness*, and *changes in taste or smell* with an asthma attack, so the presence of those symptoms are more likely to suggest COVID-19 infection.[21]
- The Allergic Rhinitis and Its Impact on Asthma and the European Academy of Allergy and Clinical Immunology have issued a joint statement, noting that patients are struggling to differentiate symptoms between asthma flare-ups and COVID-19 and that a lack of clarity on this remains, which may cause people to delay seeking care. They warn that clinicians tend to prescribe antibiotics to people who they believe are having asthma exacerbations 'just to be safe' and caution against this behaviour.[90]
- A recent article in the *Journal of Paediatrics* notes *fever* may help differentiate between asthma exacerbations and COVID-19 in paediatric and adult populations, but caution should still be taken as fever may be present in other virus-triggered asthma exacerbations. They note other symptoms that may help differentiate between COVID-19 and asthma are better described in adult populations and include *myalgia*, *confusion headache*, *pharyngitis*, *rhinorrhoea*, *loss of sense of smell and taste*, *diarrhoea*, *nausea* and *vomiting*. They suggest *travel history*, *close contact* with someone infected with COVID-19 and *absence of prior atopic history* in a child may also help differentiate the two. They recommend COVID-19 screening for any child with asthma with worsening cough or shortness of breath.[19]

Institute for Health and Care Excellence (NICE) requires multiple tests to establish asthma diagnosis.[39 40] These changes are important to reduce overdiagnosis and underdiagnosis and to look for overlap diseases, for example, chronic obstructive pulmonary disease (COPD).

This is likely to cause difficulties in the current pandemic. The Association for Respiratory Technology & Physiology (ARTP) guidance suggests all respiratory testing is likely to be considered an aerosol-generating procedure (AGP) due to its potential to generate coughing and to assume all patients may have COVID-19.[41] As such, full personal protective equipment needs to be worn, with appropriate infection control/air changes.

The capacity to perform testing will be vastly reduced, due to the aforementioned measures, combined with reduced staff availability, backlog of tests which have arisen and ARTP guidance that testing should no longer occur in routine primary care practice (unless part of a coordinated hub). Consultations will also be performed virtually to a much greater degree. Of concern, this has the potential to lead to misdiagnosis, forcing clinicians to rely on history alone to a much greater degree than they would have otherwise.

Box 2 Advice for people with asthma on managing asthma during the COVID-19 pandemic

- Restart or continue prescribed medications.[20]
- Avoid known triggers.[19]
- Review inhaler techniques.[24]
- Use asthma action plans (note weak evidence for these from a 2017 Cochrane review[91]; evidence more positive from a 2017 review specifically looking at written action plans in children).[92]
- Use peak flow diaries and consider getting peak flow metre from a general practitioner/pharmacist if there is no current access.[42] Note that ARTP guidance suggests all respiratory testing is likely to be an aerosol-generating procedure; this should be borne in mind when using peak flow metres.[41]
- Follow standard advice for looking after asthma when unwell.[42]
- Quit smoking/avoid exposure to secondhand smoke[19] (note that the role of smoking in COVID-19 infection is unclear, but smoking is uniquely deadly and poses a particular risk to PWA[93]).
- For patients with 'a good understanding of their self-management plan', have a short course of steroids at home (rescue pack)[21] (note that it is unclear how 'good understanding' might be objectively assessed).

Control and monitoring

A reduction in face-to-face appointments is common across countries experiencing COVID-19 pandemics, which will affect asthma care.[25] Asthma UK states people should still be getting their same asthma care, but some elements 'might look different' (ie, might be delivered remotely, see further).[42] They suggest emergency care proceed as normal, general pactitioner (GP) and specialist care will most likely be via remote means or postponed, and some annual asthma reviews will be postponed.

Asthma UK, the Asthma and Allergy Foundation of America, the British Thoracic Society and the Canadian Thoracic Society, among others, suggest people manage their asthma as well as possible to reduce risk from COVID-19.[20 21 24 42 43] It is unclear what this advice is based on; given the paucity of detailed data on asthma and COVID-19, recommendations are likely made based on knowledge from other infections and on good practice generally. Suggestions for PWA can be found in box 2.

Monitoring asthma will be a challenge during the pandemic. PEFR, typically a mainstay of monitoring, can generate a cough and hence become an AGP. The Royal College of Emergency Medicine (RCEM) guidance in acute exacerbations is only to perform after nebulisation, in those cases where discharge is considered.[44] As mentioned earlier, ARTP guidance suggests all respiratory testing should be considered an AGP.[41] We did not find any guidance on measurement of exhaled nitric oxide. NICE has issued rapid guidance on severe asthma during the COVID-19 pandemic (box 3).[45]

Multiple questionnaires have been developed to help clinicians in monitoring asthma and related comorbidities, such as the Royal College of Physicians' three questions,[46] Asthma Control Questionnaire,[47] and Asthma Control Test,[48] among many others. These are often distributed in print; as care moves to virtual consultations, access to these may be an issue for some patients and

Box 3 National Institute for Health and Care Excellence recommendations for providing care for people with severe asthma during the pandemic[45]

- Communicating with patients and minimising risk by decreasing face-to-face contact where possible.
- Only carrying out bronchoscopy and most pulmonary function tests for urgent cases where results will have a direct impact on patient care (as these tests may spread COVID-19).
- Use of continued and new medications where necessary, with consideration given to training to self-administer and remote monitoring.
- Advising people with asthma not to share inhalers or devices and to wash their hands and clean equipment regularly.
- Local policies to address modifying usual care at the organisational level.

HCPs. Some of these questionnaires are more readily available online than others, in part to prevent misuse where the format of the questionnaire has been mistranscribed. Patients may lack technical skills/resources to access these online even where available, necessitating posting of questionnaires (which may lead to non-return/missing data) or verbal/virtual 'run-throughs' of the questionnaires (which may not have been validated for the questionnaire involved).

Medication considerations

All sources reviewed (including NICE in the UK and the CDC in the USA) agreed that, on the whole, medications for asthma should continue to be taken as normal.[28 45] This includes biologics.[45] Prednisone is recommended for treating severe asthma exacerbations.[20]

There is mixed advice on nebulisers with NICE guidance encouraging continued use, a position supported by Public Health England and Health Protection Scotland.[21 45] A narrative review of managing asthma in children during the pandemic suggests that, in most cases, children should be switched to other inhaler types,[19] but it is unclear what this advice is based on. A broader narrative review makes the same recommendation, and the Canadian Thoracic Society also warns against their use in certain settings.[20 25] Concerns with nebulisers relate to the possibility of the devices aerosolising SARS-CoV-2 if the PWA using the device is infected, therefore increasing risk of contagion. NICE states this is not a concern as the aerosol comes from the fluid in the nebuliser chamber and will not carry virus particles from the patient[45]; the British Thoracic Society echoes this.[21] In acute asthma exacerbations, the RCEM suggests consideration of usage of metered dose inhalers/spacers for mild/moderate exacerbations, rather than nebulisation, and where nebulisation is used, using the minimal flow rate of oxygen required to drive the nebuliser.[49]

Though there has been some debate over the use of inhaled corticosteroids during the COVID-19 pandemic, there is general consensus that their use should not be discontinued (and little evidence of a benefit from introducing them in people in the acute phase of the virus who do not otherwise use them).[50] Some evidence suggests inhaled corticosteroids may be of use in treating COVID-19, but this is currently unclear.[8 27]

Smart inhalers (inhalers with digital features enabling linkage to mobile phone apps) are in development for asthma and COPD; the early evidence is mixed, but they may allow remote monitoring of compliance.[51]

Accessing medications may also be an issue for some people during the pandemic. Asthma UK has noted that some PWA have reported issues and suggest if pharmacists cannot provide or source alternatives, patients ring around other pharmacies or get in touch with their GP.[42] To avoid possible supply issues, NICE recommends medications be prescribed for no more than 30 days; the CDC recommends 30-day supplies of non-prescription medications and supplies.[28 45] In countries without universal health insurance, job losses leading to loss of employer sponsored healthcare may present unique challenges to medication supply.

Remote care

As noted earlier, face-to-face appointments have been widely replaced by routine care during the pandemic. We are not aware of any studies evaluating remote care in the current pandemic context. Existing studies of remote asthma care are limited in their generalisability, as in these remote care is often tested in addition as opposed to face-to-face contact with HCPs. We briefly review this evidence further.

Evidence on remote asthma care in adults is mixed but generally does not point to harm. A 2019 systematic review and meta-analysis of telemedicine for asthma (22 studies, 10 281 participants) found telecase management could significantly improve asthma control compared with usual care (standardised mean difference (SMD) 0.78, 95% CI 0.56 to 1.01).[52] A 2011 systematic review and meta-analysis of telehealth interventions involving HCPs in the care of PWA (21 randomised controlled trials) did not find clinically important improvements in quality of life or number of visits to the emergency department over 12 months, but did find a significant reduction in the number of patients admitted to hospital once or more over 12 months.[53] The authors concluded telehealth was no better or worse than normal care. This is consistent with a 2016 Cochrane review which found no important differences between face-to-face and remote asthma check-ups in terms of asthma outcomes; however, a lack of information and wide CIs meant the authors could not rule out clinically important differences.[54] A 2015 systematic review found telemedicine interventions did not appear to improve asthma function scores but concluded 'other benefits may be present'.[55] It has been speculated that telehealthcare interventions may be more likely to result in significant benefit in people with severe disease compared with those with relatively mild asthma.[56]

In children and young people, a systematic review (15 studies) found personalised text messaging was the most commonly used digital intervention for asthma care and that nearly all of the included interventions significantly improved adherence; most also improved health outcomes.[57] In contrast, another systematic review found mixed results for telemedicine in school-aged children, with no evidence of harm, but some studies found no effect and others found improvements in health outcomes and adherence.[58] A 2018 review found eHealth tools may be particularly useful for self-monitoring in children and adolescents with asthma.[59]

None of the studies were conducted in the context of reduced healthcare capacity, so their relevance to the current pandemic context is unclear.

Self-management

Self-management and self-education interventions may play a role in asthma control in the context of diminished access to

HCPs. However, most evidence on self-management in asthma comes from interventions that also involve support from HCPs; though this evidence is broadly positive in showing some benefits and no evidence of harms, its relevance to the current pandemic context is unclear.[60] A 2015 review found that, to increase the value of self-management plans in asthma, patients, professionals and organisations all needed to be targeted.[61] We briefly review evidence on a range of self-management interventions for PWA .

Interventions targeting asthma self-care in adults generally show promise. A 2014 systematic review and meta-analysis (38 trials, 7883 participants) found that interventions targeting asthma self-care reduced symptoms (SMD −0.38, 95% CI −0.52 to −0.24) and unscheduled healthcare use (OR 0.71, 95% CI 0.56 to 0.90) and increased adherence to preventive medication (OR 2.55, 95% CI 2.11 to 3.10).[62] The authors were unable to identify what the optimal components of these interventions were, though active involvement of participants was associated with increased effectiveness. Educational programmes have also been found to be effective in children and adolescents.[63 64] Without being able to identify which components of these interventions are effective, it is difficult to make recommendations as to which tools people may wish to use. Culturally tailored online asthma self-management programmes appear to show promise in difficult-to-reach populations.[65]

Increasingly, self-management tools come in the form of digital interventions; access to these may be easier for some groups of people than others, with less advantaged and older age groups perhaps less likely to access these tools.[66] Mobile health interventions appear the most commonly tested; results in adults generally show potential for mobile health interventions to improve asthma control and medication adherence compared with routine care, but results across reviews are mixed, and, as with previous reviews, it has been difficult to discern which components contribute to effectiveness.[67–69] A 2018 review found limited evidence that mobile phone apps had a positive effect on asthma self-management in adolescents.[70]

Self-care interventions which have shown promise for asthma control also include decreasing exposure to allergens and pollutants, though there are some issues with study quality in this area.[71] Systematic reviews differ regarding the effectiveness of air filtration systems.[71 72] Weight loss in PWA with overweight or obesity may also improve asthma control in adults[73] and children,[74] though issues with the evidence have been noted.[75] Of note, obesity has also been identified as a risk factor for COVID-19 severity.[26] Physical activity has been linked with better asthma control in both children and adults[76–78]; in people with stable asthma, physical activity interventions of at least 20 min, two times a week, do not seem to exacerbate symptoms.[79]

Well-being

As noted previously, mood disorders and anxiety are barriers to effective asthma control.[30] PWA have a higher prevalence of anxiety and depression than the general population, which is associated with poorer asthma control, medication adherence and health outcomes.[80] The pandemic may exacerbate existing and introduce new mental health issues, with the potential of profound impacts on well-being. To manage this, Asthma UK recommends that PWA stay active, look after their physical health, stay social and request support.[81] Several systematic reviews have suggested yoga may improve quality of life in asthma, but evidence here is very limited.[82 83] Systematic reviews of cognitive–behavioural therapy (CBT) in both adults and children found CBT may improve mental health outcomes in PWA, but there were issues with study quality.[80 84] Systematic reviews have found generally low-quality evidence (due to issues with study quality and heterogeneity) for mindfulness-based stress reduction interventions,[85] written emotional disclosure interventions[86] and relaxation-based therapies in improving well-being in PWA, including both adults and children.[87] In-person psychological therapies will be difficult to access at the current time.

Discussion

This rapid review highlights key evidence as it relates to asthma and the COVID-19 pandemic. This is an area where considerable uncertainty exists and where, in the absence of clear evidence, guidelines vary in their advice. Evidence regarding COVID-19 and asthma will continue to emerge over the course of the pandemic, at which point a full systematic review of the literature will be warranted, restricting to particular study types and using formal critical appraisal tools to evaluate evidence. Given the paucity of evidence at this stage in the pandemic, our approach was to include literature regardless of study type and to present what is known so far, bringing particular attention to areas of inconsistency within the emerging evidence and guidance.

As with most evidence generated during the COVID-19 pandemic, the literature currently seems to provide more questions than answers. Whether PWA—especially those with mild asthma—are at greater risk of infection or, when infected, of more severe outcomes—warrants particular attention. At the start of the pandemic, PWA, regardless of severity of asthma, were identified as being of higher risk. Given COVID-19 is a respiratory illness, and following the precautionary principle, at face value this seems an obvious judgement. However, as the pandemic continues, it is also important to acknowledge that being labelled as a vulnerable group will affect people's understanding of and relationship to risk; well-conducted research quantifying the risks of COVID-19 infection in PWA, and the various clinical and demographic factors that may contribute to that risk, is urgently needed.

Despite the prevailing uncertainties regarding the direct risks of COVID-19 to PWA, it is clear that, if not managed well, COVID-19 may pose indirect risks to all PWA due to disruptions in care. This includes possible issues with access and adherence to medications, changes in contact with HCPs and challenges to mental and physical well-being due to restrictions imposed to manage the spread of disease. Given these disruptions in care, self-management interventions and remote care are likely to be increasingly called on; the literature to date on these so far is broadly positive, but caution needs to be taken when assuming generalisability to the current pandemic context.

Finally, as with most things related to COVID-19, health inequalities should not and cannot be ignored. None of the literature identified during our searches explicitly addressed this issue, but asthma—like COVID-19—is not an 'equal opportunities' disease. Asthma is more prevalent in more deprived communities, and there is a significant variation in access to asthma care across geographies, age groups, and ethnicities.[88] COVID-19 also disproportionately affects more deprived communities, older people, and non-white ethnic groups.[89] Furthermore, disruptions caused by COVID-19 will likely disproportionately affect less advantaged groups. Consideration of these inequalities should be an integral part of responses to the pandemic.

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