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# Psychological impact of the COVID-19 pandemic on people with asthma: a co-produced mixed-methods study

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## ABSTRACT

**Objective:** When COVID-19 was declared a pandemic there was concern that people living with asthma were at high-risk of poor outcomes. We aimed to explore the psychological impact of living with asthma in the United Kingdom during the pandemic.

**Methods and measures:** Our mixed methods study, co-designed with patient and public involvement colleagues, included an online survey to detect anxiety/depression/post-traumatic stress disorder (PTSD) and health beliefs; and qualitative interviews. We recruited 849 participants for the survey and interviewed 26 between May and June 2020. Audio-recorded interviews were transcribed verbatim, and analysed thematically.

**Results:** The survey identified that 77% of respondents were experiencing symptoms of anxiety, 77% were experiencing symptoms of depression, and PTSD was of concern for 61%. Two-thirds of respondents felt the pandemic had changed how they managed their asthma ( $n=568$ , 66.9%), and over half felt that they had not been given adequate health information about COVID-19 ( $n=495$ , 58.3%). Qualitative interviews identified five themes (1) health communication, (2) interaction with healthcare, (3) COVID-19-related concerns, (4) impact on mental health, and (5) behaviour change.

**Conclusion:** Psychological distress was prevalent in people with asthma during the early stage of the pandemic. Understanding this may be useful to inform future healthcare/policy planning.

## ARTICLE HISTORY

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## KEYWORDS

COVID-19; coronavirus; asthma; anxiety; depression; mental health; lockdown; survey; qualitative; mixed methods; patient experience

## Background

The novel coronavirus disease 2019 (COVID-19), an acute respiratory disease, was declared a pandemic by the World Health Organisation (WHO) on 11 March 2020 (WHO, 2020a). By 23 March 2020, the Government of the United Kingdom (UK) had announced a stay-at-home order, restricting freedom of movement (GOV.UK,

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2020). Early findings suggested that the pandemic was having a negative impact on the mental and physical wellbeing of individuals in the UK (Office for National Statistics, 2020; Scottish Government, 2020), and an immediate priority was to collect high-quality data on the mental health effects of the COVID-19 pandemic across the whole population and vulnerable groups (Holmes et al., 2020). Of particular concern, was the wellbeing of those with non-communicable diseases (NCDs), such as those with chronic respiratory diseases, who were categorised as having an increased risk of severe COVID-19, and therefore associated disease-related anxiety. Rapid evidence found that around a quarter of adults with NCDs surveyed in the United States were 'very worried' about contracting coronavirus (Wolf et al., 2020). Similarly, in a UK-based survey, having a chronic physical health problem was associated with disease-related anxiety (McElroy et al., 2020).

People living with asthma have previously been at risk of hospitalisation or severe disease during recent past pandemics (e.g. H1N1) (Nguyen-Van-Tam et al., 2010; O'Riordan et al., 2010; Ward et al., 2011), so unsurprisingly, asthma was initially hypothesised as a likely significant risk factor for COVID-19 severity (Johnston, 2020). In the UK, people who were identified as being at high risk of severe illness from COVID-19 were advised to 'shield' by the UK Government. As more information emerged, people diagnosed with severe asthma were advised to shield and minimise contact with others, and people with mild and/or well-controlled asthma were determined not to be at greater risk from COVID-19 and could follow general social distancing guidelines. By 2022, it was clear that the risk was in adults with a history of an asthma attack in the preceding 24 months (Shi et al., 2022). As such, people with asthma were concerned about the impact that COVID-19 may have on their health, which may subsequently impact their mental wellbeing. Additionally, asthma itself is associated with an increased frequency of depression and anxiety (Oh et al., 2019; Scott et al., 2007), and poorer mental health in people with asthma is associated with poorer asthma control (Di Marco et al., 2010; Grosso et al., 2019). Together this association between asthma, COVID-19, and mental health thus warrants further exploration as it has the potential to worsen pre-existing asthma, and worsen mental health and wellbeing.

We therefore aimed to assess the psychological impact of the COVID-19 pandemic on people living with asthma. In addition, we explored the impact the pandemic had on asthma (self-) management, and views on health information provision and COVID-19 health beliefs in this group.

## Methods

### Design

The study employed a concurrent triangulation mixed-method design consisting of an online survey and semi-structured interviews. Ethical approval was granted by the Usher Research Ethics Group, The University of Edinburgh. The 32-item COREQ checklist (Tong et al., 2007) was used to guide reporting of the qualitative research.

## Online survey instrument and measures

The survey was newly developed with a multidisciplinary team (academia, health psychologists, primary care clinicians, pharmacy, and Patient and Public Involvement (PPI) representation), and utilised literature from prior pandemic research e.g. the severe acute respiratory syndrome (SARS) pandemic (Hawryluck et al., 2004). The survey collected data on participant characteristics (e.g. age, gender, education), participant asthma (e.g. time since diagnosis, perception of asthma, and asthma management), whether participants knew anyone who had tested positive for COVID-19, to what extent participants had followed the COVID-19 control measures, and whether they had changed the way they managed their asthma day-to-day in response to the pandemic. To assess the psychological impact of the COVID-19 pandemic, several psychological measures were used.

- Generalised Anxiety Disorder 7 (GAD-7), a 7-item self-report scale, investigated the severity of generalised anxiety by assessing how often in the past 2 weeks respondents have experienced symptoms (Spitzer et al., 2006). Levels of anxiety are categorised into four categories: by scores 0–4 (none/minimal), 5–9 (mild), 10–14 (moderate), 15–21 (severe).
- Patient Health Questionnaire 9 (PHQ-9), assessed the presence and severity of depression using a 9-item self-report scale which assesses how often in the past 2 weeks participants have been bothered by a range of problems (Kroenke et al., 2001). Levels of depression are categorised into five categories: by scores 0–4 (none/minimal), 5–9 (mild), 10–14 (moderate), 15–19 (moderately severe), and 20–27 (severe).
- The Impact of Event Scale-Revised (IES-R), is a 22-item self-report scale to assess current subjective distress caused by traumatic events (Weiss & Marmar, 1997). Scores range from 0–88, with a score of 24 or above indicating a clinically significant stress response (Roberts et al., 2020), with a score of 33 or more representing the best cut-off for a probable diagnosis of posttraumatic stress disorder (PTSD) (Creamer, 2003).
- Additionally, in an open response question, participants were asked to describe how the pandemic had affected their wellbeing.

To understand participants' health beliefs of the COVID-19 pandemic, the survey assessed the following beliefs as informed by the Health Belief Model (Rosenstock et al., 1988): perceived susceptibility (e.g. whether participants thought it was likely they will contract COVID-19), perceived severity (e.g. whether participants believe that COVID-19 is a severe illness), barriers (e.g. whether following the government advice to stay at home would be difficult), and benefits (e.g. whether managing their asthma could reduce the severity of COVID-19), cues to action (e.g. whether the pandemic made participants think about their overall health), and self-efficacy (e.g. whether participants felt confident that they have the tools/ability to manage their asthma during the pandemic).

Finally, the survey explored how participants received information about COVID-19, and whether participants thought they had been given adequate health information about COVID-19.

### ***Semi-structured interviews***

Following qualitative design guidance (Creswell & Creswell, 2017), a semi-structured interview schedule consisting of 19-items was developed by the multidisciplinary team, including the Asthma UK Centre for Applied Research (AUKCAR) PPI members. Questions explored asthma management, current concerns and coping, and health communication during the pandemic.

### ***Patient and public involvement***

The AUKCAR PPI group were involved during all stages of the research according to the AUKCAR PPI strategy (Jackson et al., 2020), and PPI work was guided by the NIHR UK Standards for Public Involvement in Research (NIHR, 2022). PPI members worked with researchers to develop the survey, information sheet, consent form, and interview topic guide. Further, PPI members were involved in the interpretation of the quantitative data, analysis of qualitative data, and in the dissemination of results.

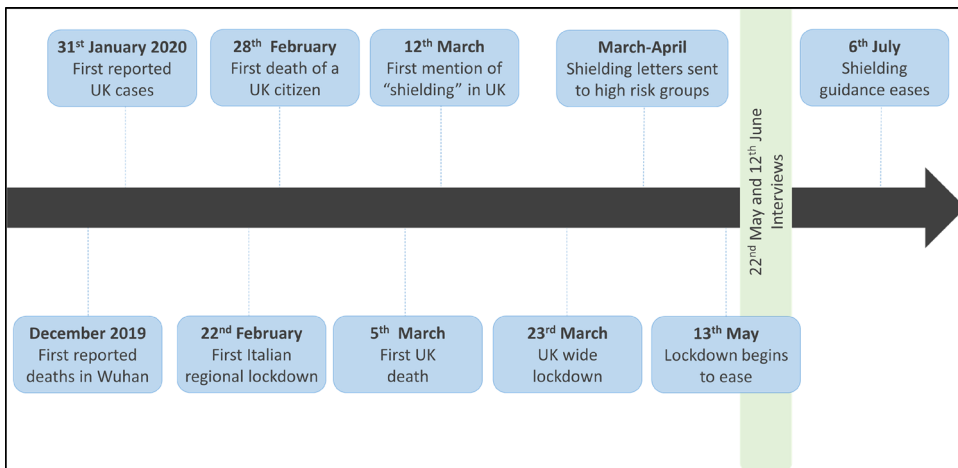
### ***Participants and recruitment***

Participants were eligible to take part in the survey and/or interview if they were aged 18 years or over, were a UK resident, had a diagnosis of asthma, and had prescribed asthma medication in the previous 12 months. Participants were recruited to participate in the survey through the AUKCAR Patient Advisory Group, Asthma UK online mailing list and social media accounts, and the REgister for Asthma research (REACH) database, a secure database for people in the UK who have been diagnosed with asthma and who are interested in participating in asthma-related research (Jackson, 2020; Nwaru et al., 2016). At the end of the survey, participants were asked to register their interest in taking part in a semi-structured interview. Interview participants were purposively sampled by demographics. Participants were unknown to the researcher conducting their interview and did not receive any incentives for taking part in the survey or interview.

### ***Data collection***

By 19 May 2020, the time at which the data for this study had started collection, 315,471 COVID-19 deaths had occurred globally, with 34,796 of these occurring the UK (WHO, 2020b). A COVID-19 vaccine had not yet been developed by the time this study took place. Figure 1 displays the COVID-19 pandemic timeline relevant to the data collection period.

Data were collected over five weeks between 19 May and 23 June 2020. The survey was available via Online Survey ([www.onlinesurveys.ac.uk](http://www.onlinesurveys.ac.uk)), a web-based survey tool. Participants were required to complete an online consent form prior to participating, and all survey responses were anonymous. The section to register interest in being interviewed was closed on 8 June after we reached 149 potential participants. Interviews were conducted between 22 May and 12 June 2020. All interviews were conducted by telephone by two researchers (TJ; KM). Consent was obtained before



**Figure 1.** COVID-19 pandemic timeline.

interviews and confirmed again at the start of the interviews. All participants were reminded of their rights to withdraw at any point. Interviews were audio-recorded, transcribed verbatim and anonymised. All participants were asked if they would like to review their transcript after the interview.

### **Data analysis**

The survey data were analysed using descriptive statistics. A content analysis was performed on open response questions by three authors (TJ; KM; EK), and validated by members of the AUKCAR PPI group to agree that the final categorisations were accurate. Two researchers (TJ; KM) independently analysed approximately 25% of the interview transcripts using thematic analysis (Braun & Clarke, 2006) and NVivo 11, then discussed identified themes and produced a coding framework for the remaining transcripts. The key themes were discussed and agreed within the wider multidisciplinary team and people living with asthma.

## **Results**

### **Survey**

#### **Participant characteristics**

A total of 849 people with asthma completed the survey. Participant characteristics can be found in Table 1. Most participants were aged between 36–45 years ( $n=254$ , 29.9%), and were female ( $n=753$ , 88.7%). Most perceived their asthma as moderate in severity ( $n=390$ , 45.9%), and most had an asthma action plan ( $n=621$ , 73.1%). Just over half of respondents knew someone who had tested positive for COVID-19 ( $n=471$ , 55.5%). When assessing adherence to COVID-19 control measures, respondents reported to have followed the measures: all of the time ( $n=627$ , 73.9%), most of the time ( $n=201$ , 23.7%), some of the time ( $n=17$ , 2.0%), none of the time ( $n=4$ , 0.5%).

**Table 1.** Survey participant characteristics (N=849).

	n (%)
Age in years	
18–20	11 (1.3)
21–25	46 (5.4)
26–35	194 (22.9)
36–45	254 (29.9)
46–55	201 (23.7)
56–65	108 (12.7)
≥66	35 (4.1)
Gender	
Female	753 (88.7)
Male	93 (11.0)
Non-binary	3 (0.4)
Perception of asthma severity	
Very mild	25 (2.9)
Mild	105 (12.4)
Moderate	390 (45.9)
Severe	279 (32.9)
Very severe	50 (5.9)
Length of time since asthma diagnosis	
<1 year	12 (1.4)
1–10 years	172 (20.3)
>10 years	665 (78.3)
Highest educational level	
Secondary school	352 (41.5)
Undergraduate degree	266 (31.3)
Postgraduate degree	231 (27.2)
Current employment	
Student	29 (3.4)
Employed	556 (65.5)
Unable to work due to:	
Current pandemic	112 (13.2)
Health (prior pandemic)	68 (8.0)
Unemployed	18 (2.1)
Retired	66 (7.8)
Location	
England	611 (72.0)
Northern Ireland	19 (2.2)
Scotland	165 (19.4)
Wales	54 (6.4)

Of the survey respondents, 149 registered their interest in taking part in a follow-up interview. We purposively selected 26 participants based on when they had received their asthma diagnosis (as a child or adult), age, gender (male, female), country (England, Northern Ireland, Scotland, Wales), and whether they were shielding or distancing (individuals with a ‘severe asthma’ diagnosis should have been provided a letter advising them to ‘shield’) (Table 2). Interviews ranged from 18 to 77 min. Sixteen participants requested to review their interview transcripts and two provided updates; these were minor changes including rewording of statements and clarifying medical information provided in the interview. We identified five themes with underlying subthemes that explored the experiences of people living with asthma in the UK during the COVID-19 pandemic (Table 3).

### Health communication

Most survey respondents received their health information from mainstream media ( $n=432$ , 50.9%), followed by websites ( $n=225$ , 26.5%) e.g. Asthma UK, National Health Service (NHS), a healthcare professional ( $n=104$ , 12.2%), government sources ( $n=52$ ,

**Table 2.** Interview participant characteristics ( $N = 26$ ).

		n (%)
Age	18–25	2 (7.7)
	26–35	6 (23.1)
	36–45	3 (11.5)
	46–55	6 (23.1)
	56–65	4 (15.4)
	65+	5 (19.2)
Gender	Female	15 (57.7)
	Male	11 (42.3)
Country	England	15 (57.7)
	Northern Ireland	1 (3.8)
	Scotland	9 (34.6)
	Wales	1 (3.8)
'At risk' categories	Shielding	15 (57.7)
	Distancing	11 (42.3)
Age when diagnosed with asthma	Child	19 (73.1)
	Adult	7 (26.9)

**Table 3.** Interview themes.

Themes	Sub-themes
Health communication	Unclear messages from multiple sources Managing uncertainty vs confidence Online and social media When to shield (or not)
Interaction with healthcare	Contact with healthcare Remote consultations
COVID-19-related concerns	Contracting COVID-19 Understanding of COVID-19 Vaccines
Impact on mental health	Coping strategies Death and grieving Fear and uncertainty Receiving support from others
Behaviour change	Adapting to a new normal Asthma management Following guidelines

6.1%), or other sources ( $n = 36$ , 4.2%) e.g. a mixture of sources, academic/science publications, social media, or through their workplace (e.g. working for NHS). Over half of respondents felt that as someone with asthma, they had not been given adequate health information about COVID-19 ( $n = 495$ , 58.3%). Participants' thoughts on health information during COVID-19 and what they would recommend are displayed in [Table 4](#).

**Unclear messages from the government.** Within the interviews, people discussed the information that they had received from official and unofficial sources on the COVID-19 pandemic. Where participants accessed information differed depending on the type of information they were looking for (e.g. information on shielding or information specific to asthma). Information had been received from the UK Governments *via* daily briefings but many found this overwhelming. There were reports of mixed messages from the UK Government and lack of leadership. The amount of information available for COVID-19 had been overwhelming and created difficulties for people to understand what the most up-to-date and correct information was.



**Table 4.** Health information during the COVID-19 pandemic.

Theme	Sub-theme	Respondent examples*
Health information provision experience	Limited, unclear, or inconsistent	From healthcare professionals and healthcare services (n = 56) From government (n = 39) For people with asthma specifically (n = 46) Unclear shielding guidance (n = 85)
	Seeking information	Received additional contact and information from healthcare professionals (n = 4) Sought information from Asthma UK (n = 45)
Recommendations	Asthma and COVID-19 information	COVID-19 and asthma information (e.g. differences between symptoms, treatment for asthma and COVID-19) (n = 38) Asthma and COVID-19 risk information (n = 49) Managing asthma during COVID-19 information (n = 11) Information personalised for people with asthma (n = 47)
	Information from government and healthcare professionals	Additional, clear, and consistent shielding information (n = 49) Additional contact and information from healthcare professionals (n = 65) Clear, consistent, and timely updates from government and healthcare professionals (n = 42)

\*Respondents answers can be applicable to and included across multiple themes.

*I found the message definitely at the beginning quite confusing.... And often when you're confused, you don't really know what you can do and can't do....and that's kind of what causes anxiety. Because if you know what the rules are, you can abide by them, but if it's not clear, then you don't know if you're coming or going.*

**(P1, Female, 26-35, England, Distancing)**

*Every time I hear [government official] talk it makes me more worried if I'm honest. He just doesn't seem like he knows what he's talking about.*

**(P23, Male, 36-45, England, Distancing)**

**Government handling of COVID-19 pandemic.** Health is devolved in the UK, with the result that there were regional differences in advice and in how participants viewed their government's response to the pandemic. Participants in Scotland, Northern Ireland, and Wales were more positive about their governments than those in England. The majority of participants in England were not confident in the handling of the pandemic referring to their government's indecisiveness, lack of leadership and transparency, and placing economic issues ahead of public safety, health, and wellbeing, which led to confusion and concern.

*That's quite worrying that although [we're] getting all these messages and instructions from the [UK] government and you don't terribly feel they are actually in control very well or haven't been at the various points.*

**(P5, Female, 65+, England, Distancing)**

*In general, Scottish government I feel have been quite transparent. They say that actually we don't have all the answers, but we're not willing to jeopardise anyone's health, anyone's wellbeing.*

**(P14, Female, 26-35, Scotland, Distancing)**

**Online sources and social media.** Online and social media played an important role in feeling connected. Twitter and Facebook in particular were mentioned, although participants noted that they fact checked information on social media by looking at the government website, news sites, or Asthma UK. There were negative aspects to accessing information online such as the quality or the sensationalist nature of information. Many participants made conscious decisions to limit their use of the internet to preserve their mental health, and a number of participants confirmed they had seen positive results (such as improved mood, reduced anxiety) since 'logging off'.

*Every day when I first started shielding, I put TV on for, at 5 o'clock for the daily briefing. I try to avoid it like plague now cause it's just somebody else has died...a lot of people dying and a lot of people coming down with it.*

**(P7, Male, 46-55, England, Shielding)**

*I got rid of Facebook ...and I haven't missed it. So I've noticed that I am in a better mood as a result of that, just getting rid of social media.*

**(P17, Male, 46-55, England, Distancing)**

**When to shield (or not).** The extremely clinically vulnerable were issued letters by the UK Government/NHS advising them to 'shield'. Some participants had chosen to shield prior to receiving the official letter, and there were experiences of delays in receiving the letter. For some participants, there was confusion and concern surrounding shielding guidance, with some people choosing to shield despite not receiving a letter advising them to. New terminology such as self-isolating, shielding, and social-distancing was used by all participants, and were believed to be subjective and open to interpretation.

*I clearly wasn't considered severe asthmatic enough to be told to shield myself, but I decided I would do that anyway.*

**(P5, Female, 65+, England, Distancing)**

*I received contact from my GP saying that they have reviewed my case and that I could drop down [from the shielding category]... I'd say I'm somewhere in between, like a category that doesn't really exist.*

**(P22, Female, 18-25, England, Distancing)**

### **Interaction with healthcare**

**Contact with healthcare.** Most participants had spoken with a healthcare professional (mostly nurses or GPs), although many of these contacts had been initiated by the participant. Some participants had received conflicting advice from different healthcare professionals which resulted in confusion and uncertainty. While participants appreciated circumstances were constantly changing, they felt more support could have been provided, especially for one participant who waited 8 h on a call back from NHS 111 (an online and free phone service in the UK for urgent medical problems).

*Called [111] at 3 in the morning and apparently it was quiet time...I got a call back about 8 hours later... if people knew how difficult it was to get into 111, for somebody that again raises anxiety.*

**(P15, Female, 56-65, England, Distancing)**

*I got a phone call from my GP...calling to double check I was alright and that I had access to food and medication...who my next of kin was and...if I would want to be resuscitated.*

**(P20, Female, 26-35, Scotland, Shielding)**

**Remote consultations.** A number of participants had engaged in remote consultations with a healthcare professional during the COVID-19 pandemic, and a variety of communication methods were used including: video call, telephone call, email, and text. Reactions were mixed, with some participants preferring the convenience of an online appointment rather than travelling to a general practice, but the limitations of not being able to check breathing or inhaler technique were acknowledged.

*I mean obviously you can't listen to my chest or anything like that and it's yeah you lose the sort of subtle facial things as well but it was ok. It was, you know I didn't come off it thinking 'oh man that was awful'.*

**(P12, Male, 46-55, Scotland, Shielding)**

*It was, you know, a little bit more liberating the fact that you could access people remotely. Great way forward. Kind of been forced upon us really but I think the benefits are there.*

**(P17, Male, 46-55, England, Distancing)**

### **COVID-19 related concerns**

Most survey respondents stated they were unsure whether they would contract COVID-19 ( $n=402$ , 47.3%). Most agreed that COVID-19 is a severe illness ( $n=793$ , 93.4%), and that following government advice would reduce the likelihood of contracting COVID-19 ( $n=602$ , 70.9%). The majority disagreed that following the government advice to stay at home would be difficult ( $n=429$ , 50.5%). Most respondents agreed that managing their asthma would reduce the severity of COVID-19 if they were to contract it ( $n=412$ , 48.5%), though a third were unsure ( $n=278$ , 32.7%); and most agreed they felt confident that they have the tools and ability to manage their asthma during the pandemic ( $n=583$ , 68.7%). Finally, most respondents felt that the pandemic had made them think about and assess their overall health ( $n=680$ , 80.1%).

**Contracting COVID-19.** Contracting COVID-19 was a worry for all interview participants, with many believing that living with asthma made them more vulnerable to serious illness and long lasting symptoms, which would affect their asthma management long-term. While many were scared of COVID-19, one participant who had contracted it had found confidence in how their body could cope and recover with COVID-19.

*In a way, I wouldn't want it again in a hurry because I was so ill, but actually my confidence in my body's ability to fight infection has increased.*

**(P15, Female, 56-65, England, Distancing)**

*I can't get over this feeling that if I go out there I'm just going to die.*

**(P18, Female, 65+, Scotland, Shielding)**

**Understanding of COVID-19.** Living with a respiratory condition meant all participants had experienced feelings of breathlessness prior to the COVID-19 pandemic. The similarity of asthma and COVID-19 symptoms such as breathlessness and a cough meant many participants had to rely on their understanding of their own condition, past experiences of their asthma, and trust their instincts when determining which condition was causing their symptoms. For one participant, this meant a difficult remote consultation with a clinician about non-COVID causes of respiratory symptoms.

*My gut sense was it wasn't [COVID-19], I know what my asthma feels like when I was admitted. But obviously the trouble is you don't quite know what COVID feels like, do you?*

**(P7, Male, 46-55, England, Shielding)**

*It's [chest infection] harder to diagnose over the phone, and I know obviously my symptoms were similar to symptoms of the virus, but I just feel that my GP could have been a bit more aware, remembering that there are other conditions.*

**(P20, Female, 26-35, Scotland, Shielding)**

**Vaccines.** Vaccines were viewed as important for creating a safe way out of lockdown, as participants acknowledged that COVID-19 was not going to disappear, and they needed ways for living with the disease.

*Whenever I used to go out, I used to pick up infections a lot. So...if I didn't have a flu jab, I'd get into trouble. And when I'm not having a jab for this [COVID-19], it's a massive risk.*

**(P2, Male, 65+, England, Shielding)**

*If I get this virus, it's gonna be bad, you know. So as far as I can see, unless virus dies out, which it potentially won't do, it they are able to find the vaccine, that'll be my godsend I suppose.*

**(P13, Male, 46-55, England, Shielding)**

### **Impact on mental health**

The mean GAD-7 score was 10.08 (SD = 6.33; range = 0–21), which is just into the moderate range. Over a quarter (28%) reported severe anxiety. Mean PHQ-9 scores were similar at 10.62 (SD = 6.94; range = 0–27), with 13% scoring over the threshold for severe depression (Figure 2). Of concern, around a quarter of respondents ( $n=200$ , 23.6%) endorsed 'thoughts that you would be better off dead or of hurting yourself in some way' in the past 2 wk (PHQ-9 item 9). The psychological impact measures identified that PTSD was a clinical concern in 61.4% of the sample (IES-R:  $M=31.26$ ; SD = 18.40; range = 0–88).

Six themes were identified from the open responses to the question where participants were asked to describe how the pandemic had affected their wellbeing:

Emotions; Employment and Economy; COVID-19 Risk; Changing Routines; Impact on Health and Healthcare; Improving Wellbeing (Table 5).

**Coping strategies.** A wide range of coping strategies and techniques to care for mental health during the pandemic were discussed by interview participants. Being outside in a garden was a popular choice but for many participants who were shielding or without a garden, this was not an option. Taking back control as much as possible, and taking things one step at a time during a constantly changing environment by keeping up-to-date with information, limiting social media, and keeping safe by following guidelines helped people feel more secure.

*I kind of I can't control what's going on outside but I can stay in here and I can make life more comfortable...this is what I can control, I can't deal with, you know what's outside of my bubble basically, so let's focus on what's inside and make myself comfortable within that.*

**(P19, Female, 26-35, Scotland, Distancing)**

*Been really important for my health and my mental health to get outdoors and to get the fresh air and to see the sunlight.*

**(P22, Female, 18-25, England, Distancing)**

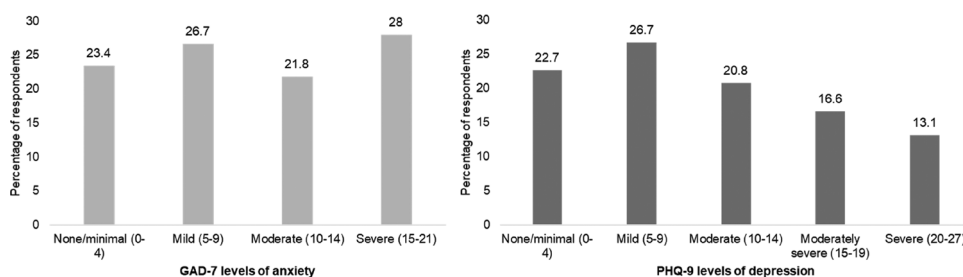
**Death and grieving.** For people living with asthma, the emergence of COVID-19 was terrifying and a number of interview participants discussed death and associated plans they had made, such as wills and resuscitation instructions, in case they died from COVID-19. Some participants experienced vivid dreams about dying. In addition, there was a sense of grieving for time lost while spent in lockdown: missing important life events, socialising with friends and family.

*Here's an indication of how concerned I was about whether or not I could survive... I produced a document called, "doom and gloom" statement.*

**(P15, Female, 56-65, England, Distancing)**

*I got into shock, panic, anger, depression and I realised that I was grieving. I feel like it's a bereavement, that I've kind of lost something in my life, I've lost a bit of control, I've, I'm in a danger zone and it's grieving for that life that I had.*

**(P18, Female, 65+, Scotland, Shielding)**



**Figure 2.** GAD-7 and PHQ-9 score frequencies (N=849).

**Table 5.** Impact of COVID-19 pandemic on wellbeing.

Theme	Sub-theme	Respondent examples*
Emotions	Negative emotions (self)	Stress, anxiety, worry ( <i>n</i> = 403) Depression or low mood ( <i>n</i> = 59) General negative impact ( <i>n</i> = 132) Lack of emotional control ( <i>n</i> = 29) Suicidal thoughts, loss, grief ( <i>n</i> = 21)
	Negative emotions (external)	Anxious and angry towards others ( <i>n</i> = 27) Feeling reliant on others ( <i>n</i> = 53) Isolated, lack of social contact ( <i>n</i> = 151) Family difficulties ( <i>n</i> = 28)
	Positive emotions	Supported by family and friends ( <i>n</i> = 9)
Employment and economy	Employment and economy impact	Impact on job and finances ( <i>n</i> = 94) Being a key worker with asthma ( <i>n</i> = 24)
COVID-19 risk	Fear of COVID-19 and health outcomes	Fear of contracting COVID-19 and serious illness ( <i>n</i> = 176) Fear of death ( <i>n</i> = 46)
Changing routines	The new normal	Restrictions on freedom ( <i>n</i> = 95) No impact or difference ( <i>n</i> = 25)
Impact on health and healthcare	Negative impact	Asthma worsened ( <i>n</i> = 36) Negative interactions with healthcare ( <i>n</i> = 22) Negative health behaviours ( <i>n</i> = 90)
	Positive impact	Asthma improved ( <i>n</i> = 8) Managing asthma improved ( <i>n</i> = 8) Positive health behaviours ( <i>n</i> = 13)
Improving wellbeing	Coping strategies	Utilising coping strategies ( <i>n</i> = 26)

\*Respondents answers can be applicable to and included across multiple themes.

**Fear and uncertainty.** The ever changing information about COVID-19 led to fear, loneliness, and uncertainty. Participants' everyday lives were affected, and some mentioned isolating from family members within their own house to avoid contracting COVID-19. Lack of beds within hospitals, and the impact of COVID-19 on people living with severe asthma reignited past fears of dying due to a respiratory condition. While there was fear and anxiety of living through lockdown, some participants were hesitant of what would happen after lockdown with the reintegration back into society in a safe manner. Non-health related fears included the impact of lockdown on current jobs e.g. how long would furlough last and prospects for people leaving university.

*One of my sons developed the symptoms. I must have not come out of [my room] until he was safely shut into his and I let the air in the room sort of disappear in the corridors.*

**(P9, Female 56-65, England, Shielding)**

*It's always kind of been the fear at the back of my mind that [pneumonia] might be kind of how I go.*

**(P23, Male, 36-45, England, Distancing)**

*It has been an anxious time, it's been a very lonely time.*

**(P25, Female, 36-45, Northern Ireland, Shielding)**

**Receiving support from others.** Support was provided from friends, family members, councils, and communities. It was often online due to shielding and social distancing measurements and involved checking in, offering to go grocery shopping, picking up and delivering prescriptions. Many participants mentioned that the frequency of contact with family and friends had increased through telephone calls and the online video platforms.

*I've got a group of friends that I chat to, with who have severe asthma. So, we've provided quite a lot of support to each other.*

**(P8, Female, 18-35, England, Shielding)**

*People being kind...the kindness has really meant something, little gestures from people I don't know mean so much.*

**(P18, Female, 65+, Scotland, Shielding)**

### **Behaviour Change**

Two-thirds felt that the pandemic had changed the way they managed their asthma day-to-day ( $n=568$ , 66.9%). In an open response question to how their asthma management has changed, answers were synthesised into two themes: Asthma Management, and Being Prepared (Table 6).

**Adapting to a new normal.** The pandemic and lockdown restrictions significantly changed people's lives and daily routines. For many, this meant working from home and being separated from friends, family, and support networks. Participants attempted to implement new routines, but there was often a sense of exhaustion, isolation, and lack of motivation that made the government enforced new 'normal' difficult to maintain.

*I'm probably fine for the time being. I don't know, this is a way of life now.*

**(P15, Female, 56-65, England, Distancing)**

*Huge restrictions on your life. Not being able to go to the shops, go out for a walk, not being able to see family and friends. Yea, so basically being confined to house and back garden.*

**(P25, Female, 36-45, Northern Ireland, Shielding)**

**Asthma management.** Lockdown had led to some participants noticing an improvement in their symptoms. The uncertainty around medicine availability had resulted in prescriptions being ordered sooner than usual, and participants were more vigilant in monitoring their symptoms to ensure their asthma was as well managed as possible.

*I pay a lot more attention to taking my brown inhalers. Actually making sure that I've got one waiting in the wings...I've actually been a lot better on that.*

**(P1, Female, 26-35, England, Distancing)**

**Table 6.** Changes to asthma management during the COVID-19 pandemic.

Theme	Sub-theme	Respondent examples*
Asthma management	Improvement in management	Monitoring symptoms e.g. peak flow ( <i>n</i> = 145) Adherence to treatment ( <i>n</i> = 228) Avoiding triggers ( <i>n</i> = 19) Improving inhaler technique ( <i>n</i> = 10) Sought asthma information ( <i>n</i> = 6) Asthma review ( <i>n</i> = 6) Contact with healthcare professional/or will if needed ( <i>n</i> = 3) Breathing exercises ( <i>n</i> = 2)
	Worsened asthma management	Management worsened, e.g. more difficult accessing medication ( <i>n</i> = 10)
Being prepared	Preparedness	Preparing for the pandemic, e.g. ordering medication ( <i>n</i> = 58) Shielding/socially distancing ( <i>n</i> = 33) Being more cautious/taking asthma more seriously ( <i>n</i> = 80)
	Improving health	Improving diet and exercise to improve asthma ( <i>n</i> = 19)

\*Respondents answers can be applicable to and included across multiple themes.

*I was never very, 100% on my inhalers or my tablets, I was quite regularly missing doses of my inhalers, so I'm a lot more vigilant...and I check my peak flow morning and night and I'm finding things a lot easier for me tracking how I'm feeling.*

**(P20, Female, 26-35, Scotland, Shielding)**

**Following guidelines.** Most participants were following government public health guidelines strictly and were frustrated at others breaking the rules. Those who had mentioned 'adapting' the rules to their own situation, had undertaken restricted activities in a safe manner e.g. walking very early in the morning when no-one else was out or including an extra family member in their 'bubble' to provide support for mental health or childcare. Participants were experiencing guilt when deliberating whether they should follow the guidance or engage in an activity which had positive implications for their mental or physical health, but may be against official public health guidance.

*You feel guilty about breaking shielding, then weighing up the risk benefit of doing it, going for a 10minute walk at 10pm when everyone else is indoors.*

**(P11, Female, 26-35, England, Shielding)**

*What people are doing breaking the lockdowns, and that makes me really angry and makes a lot of my friends that are shielding angry, that people were breaking the lockdowns and you know, it was so, after we've tried so hard to stay safe.*

**(P18, Female, 65+, Scotland, Shielding)**



## Discussion

This mixed-methods study was the first to explore the psychological impact of COVID-19 in people with asthma in the UK. We found that people living with asthma had concerns and fears about COVID-19. Survey and interview participants were experiencing increased levels of anxiety and depression, and often felt that they did not receive adequate information about COVID-19. On a positive note, asthma management seemed to have improved in participants, and the pandemic made people assess their overall health.

The current study corresponds with early evidence from the UK, which suggested that the COVID-19 pandemic was having a psychological impact on those living with respiratory conditions (Philip et al., 2020). Research assessing the UK general population during the pandemic using the GAD-7 and PHQ-9 with cut-off scores of 10, found rates of anxiety and depression to be 21.6% and 22.1% respectively (Shevlin et al., 2020). In comparison, around half of the current study sample met the cut-off scores of 10 on both the GAD-7 and the PHQ-9. This suggests that those with asthma are experiencing greater levels of anxiety and depression compared to the general population. However, these findings should be taken with caution as existing research shows that those living with asthma often have an increased frequency of depression and anxiety (Oh et al., 2019; Scott et al., 2007). Further, PTSD was a clinical concern in almost two-thirds of the current sample, whereas recent findings in a UK population during the pandemic found traumatic stress to be under 20% (Shevlin et al., 2020). However, the research measured PTSD using The International Trauma Questionnaire, rather than the IES-R. The findings of the current study indicate that the COVID-19 pandemic affected the mental wellbeing of those living with asthma, highlighting the need for focused attention on the mental health of people with asthma.

Both the survey and interviews of the current study recommended that clear, and transparent information should be provided. Additionally, participants recommended that the provision of specific COVID-19 and asthma information would be helpful. Information should follow the WHO emergency risk communication guidelines (WHO, 2017a), which promotes transparency, and additionally it should highlight asthma self-management strategies. This includes asthma action plan provision, intended to help people manage potential deteriorations in asthma control, which has been previously found to be omitted in prior COVID-19 and asthma information (McClatchey et al., 2021). The current study found that participants utilised coping strategies, such as social support, to improve their wellbeing. Participating in coping strategies should be encouraged, and this along with additional health information provision may help to lessen the psychological impact of those living with asthma in future waves/pandemics.

In terms of asthma self-management during the early stages of the pandemic, most participants in the current study felt that the pandemic had changed the way they managed their asthma day-to-day. This included, improving the management of asthma (e.g. adhering to treatment and monitoring symptoms) and preparedness (e.g. being more cautious and ordering medication). This is similar to findings that adherence to controller inhaler use increased as the COVID-19 pandemic emerged (Kaye et al., 2020). Some participants noted that the lockdown had led to an improvement in their symptoms. This aligns with findings from England that found a significant decrease in asthma exacerbations during the pandemic after the first lockdown was

introduced (Shah et al., 2021). A decrease that was statistically significant across all age groups, genders, and almost across all regions in England. It is unclear what led to a decrease in exacerbations, however, changes in behaviour and improvement in self-management was suggested. Although, the study only had access to primary care records and, it is likely that some patients might have attended an emergency department in hospital without referral.

### **Further research**

Findings show that the number of pandemics has increased over the past century and will likely continue (Madhav et al., 2017). Recent research has suggested an urgent need for research to address how mental health consequences for vulnerable groups can be mitigated under pandemic conditions (Holmes et al., 2020). Therefore, further exploration of the effect of pandemics in people with asthma would be of benefit, in particular exploring how vulnerable groups can reintegrate after shielding. In addition, it is important to explore the mechanisms behind these changes to inform interventions to prevent decline in wellbeing.

### **Strengths and limitations**

A major strength of the current study was that the views of those living with asthma during the COVID-19 pandemic were directly elicited from those living with asthma. The timing of data collection meant it was conducted in the midst of the pandemic, therefore providing rich data when people felt the full effects of COVID-19 with no ease of restrictions available. The multidisciplinary nature of the research team, in particular the inclusion of patient and public representation, also strengthened the study. The overwhelming majority of female respondents for the online survey was a major limitation, particularly as depression and anxiety disorders are more common among females than males (WHO, 2017b), and that females have a two to three times higher risk of developing PTSD (Olff, 2017). However, this was mitigated by the purposeful sampling for the qualitative interviews, where males made up almost half of the sample, and their experiences were explored in-depth. Further, living with asthma is associated with an increased frequency of depression and anxiety (Oh et al., 2019; Scott et al., 2007). Therefore, the results should be taken with caution.

All survey respondents and interview participants were recruited through REACH and Asthma UK, and it may be that this over represents those more engaged with their condition, or those who feel asthma has a greater impact on their life. Finally the study was conducted in the UK, which may not be transferrable to other countries where there are differences in asthma care delivery, as findings have shown disparities across European healthcare systems in NCD care during the pandemic (Kardas et al., 2021).

### **Conclusions**

This study highlights that people living with asthma experienced psychological distress in response to the COVID-19 pandemic. Clearer guidelines and support from

governments and healthcare providers, and the provision of asthma specific COVID-19 information may help to alleviate distress in individuals with respiratory conditions in the event of further waves of COVID-19 and/or future pandemics. In addition, guidelines should take a preventative approach with regards to mental health and wellbeing to recommend practitioners to look after mental health during a pandemic.

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## Data availability statement

The data that support the findings of this study are available on request from the corresponding author upon reasonable request. The data are not publicly available due to privacy or ethical restrictions.

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