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The potential impact of COVID-19 on psychosis: A rapid review of contemporary epidemic and pandemic research

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ABSTRACT

The COVID-19 outbreak may profoundly impact population mental health because of exposure to substantial psychosocial stress. An increase in incident cases of psychosis may be predicted. Clinical advice on the management of psychosis during the outbreak needs to be based on the best available evidence. We undertook a rapid review of the impact of epidemic and pandemics on psychosis. Fourteen papers met inclusion criteria. Included studies reported incident cases of psychosis in people infected with a virus of a range of 0.9% to 4%. Psychosis diagnosis was associated with viral exposure, treatments used to manage the infection, and psychosocial stress. Clinical management of these patients, where adherence with infection control procedures is paramount, was challenging. Increased vigilance for psychosis symptoms in patients with COVID-19 is warranted. How to support adherence to physical distancing requirements and engagement with services in patients with existing psychosis requires careful consideration.

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1. Introduction

The Corona Virus Disease 2019 (COVID-19) outbreak started in China in December 2019, and by March 2020 had spread across the globe. While the development of a vaccine continues, public health strategies to contain the spread of the disease have been put in place in nearly every country (World Health Organization, 2020). These include quarantine (self-isolation) of people potentially exposed to the virus, and social distancing (more accurately termed 'physical distancing') of the general population (World Health Organization, 2020). While physical distancing may be the most effective way of preventing the spread of the virus (Center for Disease Control et al., 2003), this measure may be associated with a range of adverse psychological effects, including fear, anxiety, and worry (Brooks et al., 2020; Gardner and Moallem, 2015), in addition to the physical effects of decreased motor activity, changes to diet, and exposure to sunlight (Lippi et al., 2020). Such impacts are likely to differ across pandemics and populations, for example, Wang et al. (2011) reported no immediate negative

psychological effect of quarantine in their sample of University students in China during the H1N1 flu outbreak. The incidence of depression and anxiety in populations where physical distancing is enforced may be impacted (Brooks et al., 2020) and there has been media speculation around this issue, with some Governments actively recognising and funding mental health services to respond to this potential surge in mental ill-health (Zhou et al., 2020). The implications for wellbeing are likely to be complex, however. Potential positives arising from the situation have also been speculated on, for example, a renewed sense of shared social purpose (Fransen et al., 2015), such as, 'everyone is in this together', and 'we must all act to protect the vulnerable and the healthcare system'. There may also be short term benefits for individuals who experience social anxiety, with the expectation to stay at home, reducing typical stresses they experience from having to attend school or work, for example.

Psychosis is one mental health condition that requires specific attention. For one, the association between influenza infection and psychosis has been reported since the Spanish Flu pandemic in the eighteenth century and subsequent acute "psychoses of influenza" have been documented during multiple pandemics (Kępińska et al., 2020). A further point is that this population may be particularly at risk from the stress associated with physical distancing measures. While the use of mobile phones and technology continues to increase for people with psychosis,

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rates are still lower than in the general population (Firth et al., 2015). This may mean that physical distancing and reduction in social connectedness has a substantial effect on this group of individuals as they do not compensate as much with other methods of communication.

Another impact the COVID-19 pandemic may have is on the nature and content of the psychotic pathology of people with psychosis or at risk of psychosis. Clinicians working in mental health services have given anecdotal reports of increased paranoia [content] around contamination from being in close contact with other people. The association between psychosis and a range of psychosocial factors, including stressful life events, has been extensively explored, suggesting it is an important risk factor for both the onset and exacerbation of symptoms (Fusar-Poli et al., 2017).

The medium- and long-term social effects of COVID-19 may disproportionately impact people with psychosis or at risk of psychotic disorder. For example, social isolation, unemployment, homelessness, relationship breakdown (divorce/separation), domestic violence, and worsening physical health, may all particularly affect people with psychosis given their vulnerability to social determinants of health (Anglin et al., 2020). Again, the direction of this impact is not known as there is the potential for pandemics to strengthen social inequities and thus impact associated risk factors. There is also the potential for an increase in the number of people with psychosis who suicide or attempt suicide, with some evidence of more suicides occurring after previous pandemics (Chan et al., 2006). What may complicate the interaction between psychosis and COVID-19 further is that the treatment of COVID-19 may involve the use of high doses of steroids to modulate the inflammatory response (Russell et al., 2020); steroids have been known to trigger psychotic symptoms (Wada et al., 2001).

How the specific psychosocial factors associated with an epidemic or pandemic affect people with psychosis, including their use of health services, is unlikely to be well understood by policymakers or clinicians who have not previously lived and worked through such an outbreak. There may be valuable lessons about the impact an epidemic or pandemic can have on psychosis that can be learned from other virus outbreaks, including the recent SARS (Severe Acute Respiratory Syndrome), MERS (Middle East Respiratory Syndrome), and Ebola epidemics.

2. Why is this review needed?

Social distancing and other public health interventions to combat the spread of COVID-19 may have immediate and longer-term effects on people with, or who are at risk of, psychosis. Statutory (health and social care) and non-government services that support and treat people with psychosis need guidance on how COVID-19 may impact on their services and the people that use them, and how they may respond accordingly. The World Health Organization (Tricco et al., 2017) advocates that rapid reviews are essential in providing informative summaries of these issues in such circumstances. We, therefore, aimed to undertake a rapid review of research on the impact of epidemics and pandemics on people with psychosis and the mental health services they use. Our review aimed to address the following questions related to living in a community exposed to an epidemic or pandemic:

1. Is there a change in the incident cases of psychosis/being identified as ultra-high-risk (Yung et al., 2004) of psychosis?
2. Are changes reported in the form and content of psychotic symptoms (i.e., do people incorporate beliefs about the virus into their symptoms)?
3. Is there a change in demand for inpatient and community-based crisis services by people with psychosis?
4. Is there a deterioration in the physical health of people with psychosis?
5. Does the number of people with psychosis suiciding or attempting suicide change?

6. Is there an increase in the number of people with psychosis who experience social issues such as homelessness, unemployment, domestic violence, and loneliness?
7. How do people with psychosis experience the preventative measures put in place in pandemics (e.g. social distancing, increased handwashing)?

3. Methods

3.1. Protocol and registration

While we did not produce a detailed protocol for this rapid review, the study was registered with the Open Science Framework on the 23rd March 2020 (<https://osf.io/29pm4>).

3.2. Eligibility criteria

We included studies that reported primary research; included participants that had a psychotic disorder (e.g., first-episode psychosis, schizophrenia, bipolar disorder) or were considered to be at high risk of psychosis; and had been exposed to an epidemic or pandemic (e.g., SARS, MERS). We excluded studies that tested the association between maternal influenza and adult schizophrenia, in part because this has been extensively reviewed previously (Kępińska et al., 2020).

We searched MEDLINE, PsycINFO and Web of Science on 23 March 2020. No date limits were applied. We limited our search to papers written in English and published in a peer-review journal. Our search strategy for MEDLINE was:

- 1 (psychos* or psychotic or schizophre* or delusion* or hallucination* or paranoi* or schizoaffective).ti,ab.
- 2 (pandemic or epidemic or SARS or MERS or influenza or HIV or malaria or tuberculosis or leprosy or smallpox or swine flu or ebola or COVID-19 or coronavirus).ti,ab.
- 3 (psychiatric inpatient* or psychiatric service* or mental health service* or crisis care).ti,ab.
- 4 1 and 2
- 5 2 and 3
- 6 4 or 5.

In addition, a search of Google Scholar was conducted to identify any additional relevant publications. The results of our search were uploaded into COVIDENCE, a web-based systematic review management package. Title and abstract and full-text screening were completed by two members of the research team (EB, RG), any discrepancies were resolved by a third (SLM).

3.3. Data charting

The following data were extracted from included studies: country, design, participants, epidemic/pandemic, measures/outcomes (i.e. incident cases, use of psychiatric services, physical health/wellbeing, behaviours towards preventative measures put in place, or functional outcomes). One researcher (RG) undertook data extraction; this was justified because of the rapid nature of the review and the desire to complete promptly.

3.4. Quality assessment

Quality of included studies was assessed using the Effective Public Health Practice Project Quality Assessment Tool (EPHPP) tool (Thomas et al., 2004). This tool facilitates the rating of the quality of each paper across six domains: selection bias, study design, confounders, blinding, data collection method, and withdrawals and dropouts. These component ratings are then used to make a global rating, with strong equating

to “no weak ratings”, moderate to “one weak rating” and a global rating of weak if there are “two or more weak ratings”.

3.5. Amendments

Following our initial search, we made the following amendments to our study protocol. We excluded papers that related to the HIV/AIDS pandemic for two main reasons: the mode of transmission is different (i.e. it is not an airborne transmission), and psychosis related to HIV/AIDS is comparatively well understood and unlikely to be relevant to the COVID-19 pandemic (Gray et al., 2002). We also restricted our search to articles published after 2000 (just before the SARS outbreak). Post hoc we also decided to check the reference lists and citations of included papers.

4. Results

Fig. 1 shows the flow of papers through the review and reasons for exclusion. Our search identified 2989 papers, of which 2954 were removed at title and abstract and 21 at the full-text screening. In total, 14 papers from 13 studies met our inclusion criteria, contained relevant data and were included in the review. The characteristics of the included studies are shown in Table 1. Included studies were published between 2004 and 2020 and were undertaken across nine countries, mostly Hong Kong. Included studies were a mix of surveys (5), case reports (3), chart reviews (3), a service evaluation (1), and a cohort study (1). The epidemics/pandemics under investigation were SARS (6 studies), Ebola (1), MERS (1), the 2009–2010 H1N1 (swine) influenza pandemic (2), coronaviruses (1) and COVID-19 (2).

4.1. Incident cases of psychosis (patients not infected with a virus)

One observational study (Hu et al., 2020) and a single case report (Zulkifli et al., 2020) examined incident cases of psychosis in people living in a geographical area where COVID-19 was prevalent. Hu reported a 25% increase - compared to previous years - in incident cases of schizophrenia in January 2020, which the authors attributed to the psychosocial stress and physical distancing measures associated with the COVID-19 outbreak (Hu et al., 2020). The authors extracted data from 13,783 outpatients (of which 1210 presented for the first time) attending the Xuzhou Oriental People's (psychiatric) hospital in January 2020, the start of the COVID-19 outbreak. The authors adjusted for a limited number of potential covariates - age, gender and place of residence - in their analysis. The absolute number of new cases of schizophrenia is comparatively small and may be explained by simple random variation. No data are reported in terms of the difference in presentation - other than that patients were seemingly older, with median age increased from 39 to 50. At the time of writing, these data were published on a Chinese open science platform, rather than a peer-reviewed journal. Additionally, of concern is the use of the diagnosis 'schizophrenia' when typically symptoms are required to be present for six months before this diagnosis to be reached.

We identified a single case report from Malaysia, of an acute episode of psychosis seemingly precipitated by fear and distress associated with COVID-19 (Zulkifli et al., 2020). The 31-year-old male patient had no previous history of mental disorder and did not use illicit substances. He responded well to a low dose antipsychotic. However, causality cannot be implied, as there are usually several aetiological factors that lead to the development of a psychotic

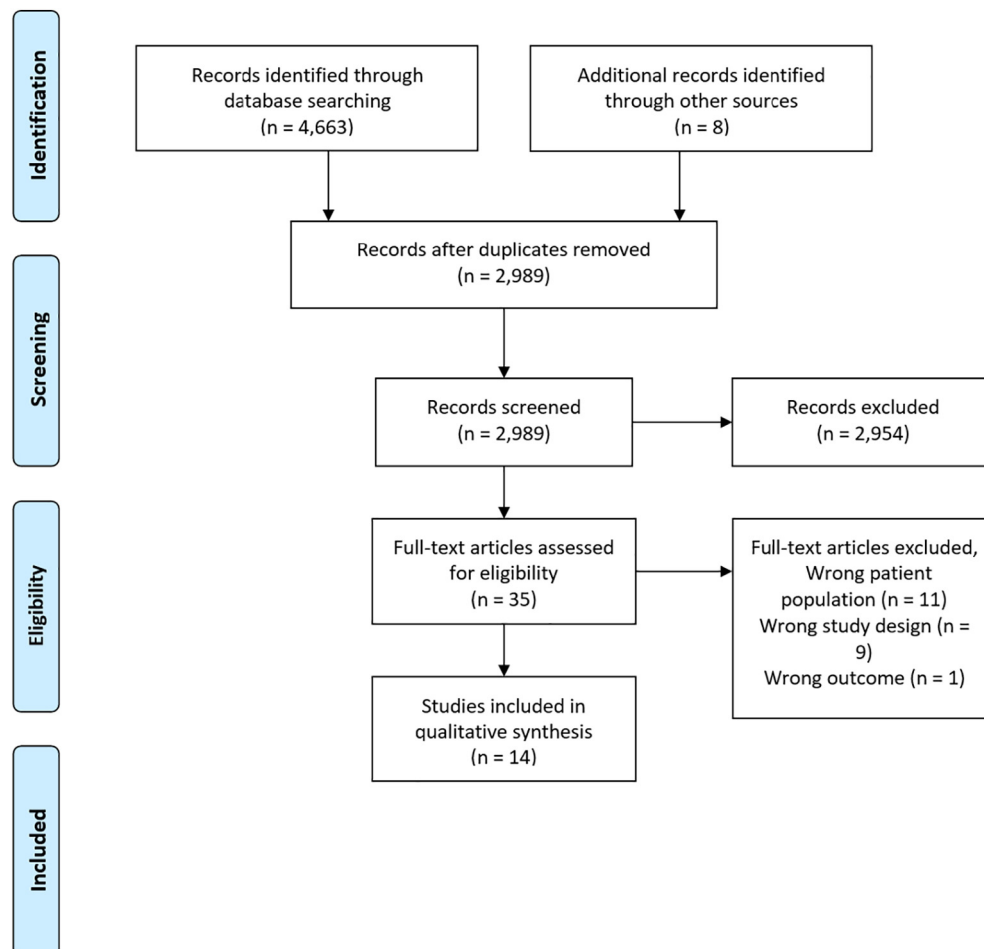


Fig. 1. PRISMA flow diagram.

Table 1
Characteristics of included studies.

	Country	Design	Participants	Epidemic/pandemic	Measures	Observations
Chang et al. (2015)	Taiwan	Case report	2 cases of transient childhood psychosis	H1N1 influenza	None reported	Case 1, 14-year-old girl experienced eight days of schizophrenia-like symptoms following five days of antiviral therapy with oseltamivir. Patient treated with 5 mg/day aripiprazole and 20 mg/day fluoxetine. Case 2, recurrent influenza infections (H1N1) with co-occurring psychosis-like symptoms. Treated with 5 mg/day aripiprazole, symptoms ameliorated after four days. These case studies demonstrate an association between H1N1 influenza and psychosis. Four pathomechanisms proposed; maternal infection, viral-induced auto-antibody production, cytokine dysregulation, other immune-related genetic polymorphisms.
Cheng et al. (2004)	Hong Kong	Case report	Ten patients with SARS with psychiatric complications	SARS	None reported	6/10 referrals = mild psychiatric problems (adjustment disorders), received telephone interviews, 4/10 = severe problems (hallucinatory/manic features), received face-to-face interviews. The adjustment disorder patients reported distress to be related to the specific effects of SARS. Three had distress due to total social isolation. Those experiencing hallucinations/mania experienced increased symptoms when steroid therapy was stepped down at the end of acute treatment (3/4), one after a high initial dose of pulsed steroid treatment. Steroid-induced psychiatric disturbances were successfully prescribed low dose haloperidol. Behavioural disturbances and psychotic symptoms led to non-compliance with infection control measures. Clinicians (non-psych) were wary about non-essential personnel visiting bedside - challenging to get psychiatrists and psychologists face-to-face access.
Hu et al. (2020)	China	Retrospective chart review	13,783 psychiatric patients attending Xuzhou Oriental People's (psychiatric) Hospital in January 2020, 35,909 control patients	COVID-19	Data extracted from hospital administrative data (January 2020), clinical diagnosis based on ICD-10 criteria. Data on diagnostics results, age, gender and address also extracted. Control data were extracted from a comparable period in 2017, 2018 and 2019	Among patients attending outpatients for the first time a 25% in incident cases of schizophrenia was reported. In returning outpatients, a slight decrease in incident cases of schizophrenia was reported. Increase in median age from 39 to 50 for those diagnosed with FEP.
Iancu et al. (2005)	Israel	Survey	30 people with schizophrenia, 30 staff members working in a psychiatric hospital	SARS	A questionnaire developed to assess perceptions and fears of possible contagion of inpatients and staff members. Modified Spielberger Anxiety Scale Score used to assess whether this threat had any effect on the clinical state of psychiatric inpatients	83% of inpatients had heard of the SARS epidemic. 33% of inpatients were worried about the threat compared to 50% of staff controls. Psychological reactions to SARS (anxious, depressed, frightened) were similar to a staff control group. Inpatients were significantly more likely to attribute SARS to their actions or as a message from God, than staff controls.
Kamara et al., 2017	Sierra Leone	Cross-sectional study	143 patients referred to psychiatric services	Ebola	Reporting the referrals to a new mental health service developed subsequent to the Ebola outbreak in Sierra Leone	One hundred forty-three patients seen in the first year of a new nurse-led mental health and psychosocial support service with inpatient liaison service and an outpatient clinic, developed in response to the Ebola outbreak that forced the closure of the psychiatric hospital to prevent disease transmission. 21% (30 patients) presented with psychosis requiring medication. During the Ebola outbreak, there were challenges getting affordable medication to those in need; as a

Table 1 (continued)

	Country	Design	Participants	Epidemic/pandemic	Measures	Observations
Kim et al. (2018)	South Korea	Retrospective chart review	40 patients admitted to the MERS inpatient unit at the National Medical Centre	MERS	On admission to the quarantine ward, patients were administered the Patient Health Questionnaire-9 (PHQ-9), the Impact of Event Scale-Revised (IES-R), the Korean National Health and Nutrition Examination Survey (KNHANES), and the Peritraumatic Dissociation-Posttraumatic Negative Beliefs-Posttraumatic Social Support (PTD-PTNB-PTSS) scale.	result, "some" service users reported accessing alternative treatment such as traditional and faith healing. Of 40 admitted patients, 30 were confirmed MERS patients, of which six died. 17/24 MERS survivors had psychiatric symptoms. 2/17 patients experienced "hallucinations" and 2 "aggressive outbursts" but were not given a psychosis diagnosis. 3/17 patients had "severe psychiatric disorder." None of the ten patients that did not have confirmed MERS experienced psychiatric symptoms. The authors proposed that a biopsychosocial model may explain the development of psychiatric symptoms in MERS patients.
Lee et al. (2004)	Hong Kong	Retrospective chart review, matched case-control study	15 patients with SARS-related psychosis, 30 nonpsychotic control patients with SARS, matched on age and sex	SARS	The medical records of case-patients and controls were reviewed for information on socio-demographics, past medical history, and SARS development and treatment history	Of 1744 patients with SARS, 15 with psychotic disorders were identified (incidence rate of 0.9%). 10/15 were diagnosed as a steroid-induced manic episode, 3/15 as steroid-induced psychotic disorder, 1/15 major depressive episode with psychotic features, 1/15 as psychotic disorder NOS. Patients with SARS related psychosis received higher total doses of steroids and had higher rates of family history of psychiatric illness.
Maguire et al. (2018) ^a	Australia	Cross-sectional survey	71 adults with schizophrenia, 238 adults without schizophrenia	2009 swine influenza pandemic	A new questionnaire explored: 1. Willingness to vaccinate, socially isolate, wear facial masks, hand wash; 2. Perceived effectiveness of protective measures; 3. Risk perceptions and feelings of vulnerability	Compared to controls, people with schizophrenia were less willing to receive a vaccine and more concerned about adverse reactions from vaccination; they were also less willing to be isolated. No differences between willingness to wear a face mask or wash hands more regularly.
Maguire et al. (2019) ^a	Australia	Cross-sectional survey	71 adults with schizophrenia, 238 adults without schizophrenia	2009 swine influenza pandemic	Mood measured with K10, an additional questionnaire asked: 'if you caught swine flu how afraid/depressed would it make you feel?' 'Do you feel at risk of swine flu?'	Those with schizophrenia trended towards perceiving themselves as less likely to contract swine flu than controls, no differences in other risk perception variables. Higher K10 anxiety subscale score associated with a reduced likelihood of perceived substantive risk from swine flu in the schizophrenia group. Higher levels of predicted fear associated with an increased likelihood of perceived substantive risk from swine flu.
Mak et al. (2009)	Hong Kong	Cohort study	90 SARS survivors assessed 30mths after the outbreak	SARS	Psychiatric diagnosis as per SCID-IV	4.4% of the cohort experienced post-SARS psychotic symptoms. Other diagnoses included 44.4% major depression, 47.8% PTSD, 13.3% panic disorder.
Pang (2004)	Hong Kong	Service evaluation	Psychiatric services	SARS	The authors do not specify how data were obtained	A reduction in the use of psychiatric services following the SARS outbreak. Authors questioned mental health clinicians understanding of the signs and symptoms of SARS. Measures were put in place to prevent SARS transmission in psychiatric inpatient units. Newly admitted patients closely screened and monitored (for respiratory symptoms and temperature), leave was cancelled, mixing of patients was restricted, patients that do not comply with infection control measures (e.g., mask-wearing) were placed in compulsory quarantine.
Severance et al. (2011)	Baltimore USA	Cross-sectional survey	106 adults recent-onset psychotic symptoms and 196 healthy controls	Corona-viruses	Coronavirus immunoglobulin G antibody levels in recent-onset psychosis compared to controls to determine the extent that coronavirus exposure may correlate with the onset	Recent onset psychotic symptoms significantly associated with coronavirus exposure - in antibody levels and seroprevalence. Increased rates of immunoreactivity for certain

(continued on next page)

Table 1 (continued)

	Country	Design	Participants	Epidemic/pandemic	Measures of SMI	Observations
Sheng et al. (2005)	Hong Kong	Cross-sectional survey	103 SARS patients after discharge from hospital.	SARS	Frequency of neuropsychiatric symptoms (e.g. auditory hallucinations), measured using the SARS Neuropsychiatric Symptoms Checklist, completed by recovered SARS patients	coronavirus strains in the psychosis group. Coronavirus exposure may be a comorbid risk factor in SMI. 3.9%, 2% 3.9% recalled experiencing auditory, visual and/or persecutory ideas in the acute phase of SARS. SARS severity and higher doses of corticosteroids were associated with an increase in psychosis symptoms in the acute phase of the illness
Zulkifli et al. (2020)	Malaysia	Case report	31-year-old male, no previous history of psychosis	COVID-19	None reported	First presentation. Had been expressing extreme concern about novel coronavirus outbreak, was causing a public "nuisance," brandishing a knife, talking irreverently, and expressing the belief that the world is going to end. The patient was a non-smoker, did not use illicit drugs or alcohol. The patient responded quickly to low dose antipsychotic medication. Returned to the premorbid state after three days in the hospital.

FEP = first-episode psychosis, MERS = Middle East Respiratory Syndrome, PTSD = Post Traumatic Stress Disorder, SARS = Severe Acute Respiratory Syndrome, SCID-IV = Structured Clinical Interview for DSM-IV,

^a Papers are from the same survey.

disorder and the anxiety that precipitated the episode may have just been the most proximal factor.

Both Hu and Zulkifli postulate that frequent media reporting of COVID-19, particularly potentially sensationalist news found on social media platforms, may amplify psychosocial stress in novel and potentially more damaging ways.

4.2. Incident cases of psychosis (patients infected with a virus)

In total, we identified seven papers addressing incident cases of psychosis linked to a virus. This included four observational studies (Kim et al., 2018; Lee et al., 2004; Mak et al., 2009; Sheng et al., 2005), of which three were associated with exposure to SARS (Lee et al., 2004; Mak et al., 2009; Sheng et al., 2005), and one MERS (Kim et al., 2018). Additionally, we identified two case reports of patients with the H1N1 (Chang et al., 2015) and SARS (Cheng et al., 2004) and one study examined coronavirus immunoreactivity in people with recent-onset psychosis (Severance et al., 2011). All of the studies included in the review indicated a link between exposure to the virus and psychosis.

In the first observational study, Sheng et al. (2005) surveyed 308 SARS patients discharged from hospital, and identified psychiatric symptoms using the Neuropsychiatric Symptoms Checklist (NPSC) developed by the authors for this study. Auditory hallucinations, visual hallucinations and persecutory ideas were reported by 3.9%, 2% and 3.9% of patients respectively (although it is unclear from the data

presented if these are unique participants or if single participants were reporting multiple symptoms) and declined at follow-up. The severity of SARS symptoms and higher doses of corticosteroid were significantly associated with an increased risk of experiencing psychosis symptoms.

In the second observational study following the SARS outbreak, Mak et al. (2009) administered the SCID (Structured Clinical Interview for DSM-IV, Validity, 2004) to 90 SARS survivors 30 months after the outbreak. Four (4.4%) participants were identified as experiencing post-SARS psychotic symptoms, with three other participants reporting transient auditory and visual hallucinations during admission for SARS treatment but did not meet diagnostic criteria. The authors report no details about the treatment and response. Lee et al. (2004) undertook a retrospective chart review of SARS survivors in Hong Kong to test the hypothesis that post-SARS psychosis was associated with treatment with steroids. An incident rate of 0.9% ($n = 15$) was reported in the 1744 SARS patients reviewed for the study. They subsequently matched these to 30 control patients who had SARS but did not experience psychosis. All participants in the study were treated with steroids. Patients in the psychosis group received significantly higher doses of steroids while inpatient than controls (median dose in hydrocortisone equivalent, 10,975 mg v. 6780 mg). The authors also suggest that a family history of mental illness and psychosocial stressor may have been associated with an increased risk of psychosis in their sample.

In the final observational study, we identified, Kim et al. (2018) completed a retrospective chart analysis of all patients admitted to an acute

Table 2

Quality assessment of quantitative studies.^a

	Selection bias	Study design	Confounders	Blinding	Data collection method	Withdrawals and dropouts	Global rating
Iancu et al. (2005)	Moderate	Weak	Weak	Weak	Weak	Strong	Weak
Hu et al. (2020)	Strong	Moderate	Weak	Moderate	Strong	Weak	Weak
Sheng et al. (2005)	Weak	Weak	Moderate	Moderate	Strong	Weak	Weak
Kim et al. (2018)	Moderate	Weak	Weak	Weak	Strong	Strong	Weak
Lee et al. (2004)	Moderate	Moderate	Weak	Weak	Strong	Moderate	Weak
Maguire et al. (2018, 2019) ^b	Strong	Weak	Weak	Moderate	Weak	Moderate	Weak
Severance et al. (2011)	Moderate	Moderate	Strong	Moderate	Strong	Strong	Strong
Mak et al. (2009)	Strong	Moderate	Moderate	Moderate	Strong	Strong	Strong
Kamara et al. (2017)	Weak	Weak	Weak	Weak	Weak	Weak	Weak

^a The Quality Assessment Tool for Quantitative Studies was not completed for the following case reports (Zulkifli et al., 2020; Chang et al., 2015; Cheng et al., 2004) and the following service evaluation (Pang, 2004).

^b Two included papers were sliced from a single study.

MERS inpatient unit in Seoul, South Korea. Of the 24 MERS survivors, 17 (70.8%) exhibited psychiatric symptoms, of which 2 (11.8%) experienced auditory hallucinations.

In the two case reports where psychosis followed virus infection, one reported two patients infected with the H1N1 (Chang et al., 2015) and the other, three patients who had the SARS virus (Cheng et al., 2004). In both reports, authors observed that psychotic symptoms seemed to be attributable to a combination of virus symptom severity, the isolation during treatment, and administration of steroids. Of the three patients in the Chang case series, it was noted that hallucinations seemingly worsened in two patients when steroid treatment was stepped down at the end of acute treatment. Both of the patients in the Chang H1N1 case series were young (girl 14, and boy 13, years old) and were treated with an antiviral agent (oseltamivir) but not steroids. Both patients responded well to treatment with low dose antipsychotic medication (aripiprazole, 5 mg/day). The authors concluded that exposure to antiviral treatment induced the psychosis (Chang et al., 2015).

In a cross-sectional survey, the association between four coronaviruses (229E, HKU1, NL63 and OC43) and psychosis was examined in a study involving 106 people with recent-onset psychosis and 196 non-psychiatric controls (Severance et al., 2011). All four coronaviruses were more common in people with psychosis compared to controls. After adjusting for confounding variables (age, gender, socioeconomic status and smoking status), the odds of the HKU1 and NL63 coronavirus were associated with a 32% and 142% increase in the odds of psychosis suggesting that coronavirus' may be important risk factors for psychosis.

4.3. Adherence with protective measures

Three included studies considered psychotic patient adherence with protective measures (Cheng et al., 2004; Maguire et al., 2018; Pang, 2004). There was a consistent conclusion that adherence was markedly more problematic in people with psychosis, although included studies had important methodological limitations.

A single cross-sectional study examined willingness and perceived barriers to adopting protective measures in 71 adults with and 238 without schizophrenia attending primary care (Maguire et al., 2018). People with schizophrenia were less willing to receive a vaccination and were more concerned about vaccination side effects. People with schizophrenia were also less willing to be isolated compared to those without schizophrenia. There was no difference in willingness to hand wash or perceptions of the effectiveness of handwashing between people with and without schizophrenia.

Pang (2004) reports a service evaluation of the impact of SARS on psychiatric services; however, the author does not provide any empirical data within the publication. They reported that while psychiatric inpatients were taught self-hygiene measures and provided with face masks, their adherence to these measures was inadequate. In the Cheng et al. (2004) case series, it was noted that psychotic symptoms were linked to poor adherence with infection control measures. Clinicians working on the SARS unit were concerned about mental health clinicians visiting the ward unless necessary, which they reported complicated access to treatment.

4.4. Risk perception in people with psychosis

Two papers were identified that examined perception of the risk of infection in people with psychosis (Iancu et al., 2005; Maguire et al., 2019). One study examined if the SARS epidemic caused anxiety and worry in 30 inpatients with a diagnosis of schizophrenia compared to a control group of 30 staff members in Israel where the virus was not endemic (Iancu et al., 2005). Most patients were aware of the SARS epidemic. Compared to the control group, patients reported they were more protected from SARS in hospital, perceived that staff did all they

could to protect them, and believed that there would be no SARS cases in Israel. Patients were also more likely to accept psychotic explanations for the SARS virus, such as it is a punishment, a sign the world is coming to an end, and a sign for humankind.

In a second paper (Maguire et al., 2019) – derived from the Maguire et al. (2018) survey – the authors reported that in participants with schizophrenia, affect seems to play a role in risk perception of swine flu infection and willingness to adhere with protective measures. For example, they reported that higher levels of reported anxiety in those with schizophrenia were associated with a reduced likelihood of perceiving they were at substantive risk from swine flu. Maguire also reported a trend in perception towards people with schizophrenia – compared to controls – being less likely to get swine flu (Maguire et al., 2019).

4.5. Impact on psychiatric services

Two studies examined the impact of an outbreak of a virus on psychiatric services (Kamara et al., 2017; Pang, 2004). In both studies, services were impacted. Pang (2004) reported a significant reduction in demand for psychiatric services in Hong Kong following the SARS outbreak. There was a 6% reduction in the number of acute admissions from the emergency department, a 14% reduction in the length of hospitalisation, and a 5% drop in outpatient attendance. Community visits reduced by 50% seemingly because home visits to patients were suspended. Clinicians compensated by making telephone contact. The long-term implications of the scaling back of community services were not reported, and it is unclear if this was done to protect clinicians or patients.

Kamara et al. (2017) described the outcomes of 143 patients (of whom 30 had psychosis) attending nurse-led mental health services during the Ebola outbreak in Sierra Leone. The epidemic had a substantial impact on the provision of already fragile health services in the country. While the authors noted an increase in numbers of people attending mental health services during the outbreak, no primary evidence is reported to support this claim. Accessing medication was one of the major challenges reported in this paper.

4.6. Research questions not answered

We found no evidence of changes in the form and content of psychotic symptoms, impact on the physical health of people with psychosis, rates of suicide or attempted suicide, nor incidence of homelessness, unemployment, and domestic violence.

4.7. Study quality

The results of the quality assessment of included studies are presented in Table 2. Eight included papers received the rating of 'weak' and two of 'strong'. It was not possible to undertake quality assessment for the three case reports and the one service evaluation included in the paper.

5. Discussion and clinical considerations

There has been considerable media speculation about how COVID-19 will impact global mental health. Predictions have focused on an increase in common mental disorders such as depression and anxiety and PTSD (Post Traumatic Stress Disorder) (Brooks et al., 2020). Consequently, it is anticipated that there will be an increase in the number of people who die by suicide, with evidence from the MERS and SARS outbreaks that this is likely (Barbisch et al., 2015; Chan et al., 2006). Less has been made of the impact on those experiencing more severe and enduring mental illnesses, such as psychosis, despite these vulnerable individuals being at the highest risk (Druss, 2020). The aim of this rapid review was therefore to explore the potential effect the COVID-

19 pandemic may have on people experiencing, or at risk of experiencing, psychosis given what we know from previous contemporary epidemics and pandemics. We broadly aimed to synthesize the existing evidence on; 1. how viruses have impacted the number of people experiencing psychosis, and 2. what effect viruses have on people with psychosis.

5.1. Clinical management of infection control

There was evidence that people with psychosis may be less motivated to comply with infection control/physical distancing measures that are likely to raise some practical and ethical issues, particularly for clinicians running inpatient psychiatric units (Iancu et al., 2005). In Hong Kong, during the SARS epidemic – a notably less contagious virus – patients who did not comply with required infection control practices were placed in enforced quarantine (Pang, 2004). In some countries, such practices may be considered unethical and potentially incompatible with mental health laws. Helping people with psychosis maintain physical distancing and infection control requirements may be challenging, particularly while they are inpatients. For clinicians working in mental health services where personal protective equipment (PPE) may be limited, this may cause concern in the longer term. Tailored patient education about the importance of complying with infection control measures was recommended by Pang (2004). In the absence of any high-quality evidence about how to ensure compliance with infection control behaviours, clinicians may need to consider applying other psychoeducation techniques (Xia et al., 2011), particularly for individuals with prominent disorganisation symptoms.

5.2. Clinical management of patients with virus-induced psychosis

Behavioural issues have been reported as challenging and timely recognition and initiation of treatment may be helpful. Notably, reports are emerging of new incident cases of psychosis – seemingly in an older group of people – associated with exposure to the psychosocial stress of COVID-19 (Hu et al., 2020; Zulkifli et al., 2020). While extreme caution should be applied in inferring an association given the limited amount of available data, increased awareness and vigilance may be justified.

The increased risk of psychosis in people exposed to a virus during an epi- or pandemic is more compelling. Between 0.9% and 4% of people exposed develop psychosis or psychotic symptoms (hallucinations and/or delusions). This is in contrast to a median incident rate of 15.2 in 100,000 (McGrath et al., 2004). In some cases the psychosis seemed to be associated with treatment with steroids used to treat the infection, e.g. Mak et al. (2009). Treatment with low doses of antipsychotic medication – notably aripiprazole – seems to have been effective in patients with an emerging infectious disease and those associated with psychosocial stress associated with an emerging infectious disease.

5.3. Scaling back of community services

During the SARS outbreak in Hong Kong, community services were suspended (Pang, 2004). Policymakers and service managers may consider that the protection of their staff is paramount, and it should be possible to provide some form of community support using telehealth technology. People with psychosis do – at least in advanced economies – have access to online and mobile-based technologies that seem to be acceptable and feasible in this population (Alvarez-Jimenez et al., 2014; Firth et al., 2015). The safety, effectiveness and acceptability of telephone/internet-based delivery of community-based mental health services for people with psychosis need to be carefully monitored, as will their potential use of other medical services (for example, emergency departments).

5.4. Gaps in the evidence

We found no studies or case series of people with existing psychosis that had been infected by a virus during an epi- or pandemic. Presumably, this is because infection is a comparatively rare occurrence in this group of patients in pandemics to date. Given that we identified that people with psychosis are seemingly less adherent with protective measures it seems reasonable to hypothesise that during the COVID-19 outbreak – where a large number of people can expect to be infected – mental health clinicians will likely be in a position where they need to encourage patients to physically distance and self-isolate. There was little evidence to guide how best to address this issue clinically.

Inevitably patients with psychosis and COVID-19 will require admission to medical wards. Studies of patients with coronavirus induced psychosis have reported that this is a complex and extremely challenging group of people to treat. It may be reasonable to suggest that consideration will need to be given at a hospital and Government level about how best to support these individuals accessing medical facilities.

5.5. Considerations in emerging economies

There was limited evidence from emerging economies, with only one study (Kamara et al., 2017) reporting on the impact the Ebola epidemic had on mental health service delivery. In contrast to the relatively contained outbreaks of SARS, MERS and Ebola, COVID-19 is spreading across the globe. Mental health care in these economies tend to already be neglected services and Governments and hospitals may have to be creative in their treatment delivery, perhaps expediting a move away from hospital-based care that can still dominate in these economies. Another novel shift in service provision could be making use of a peer-based workforce (Stastny, 2012) to reinforce infection control measures.

5.6. Limitations

There are some important limitations to this rapid review that should be considered when appraising our findings. Amendments were made to our registration entry after we had undertaken our initial search. This could be interpreted as a post hoc effort to amend the aims of the study after we had started to read the available studies. Our search strategy was not externally peer-reviewed. While it would have been helpful to have our search further scrutinized, it was felt that this would have delayed the review process and we decided to omit this step. Only three databases were searched. We did not search key databases such as CINAHL that indexes research not covered by the databases we used. The decision to restrict the databases we searched was based on our experience of the likely relevance of studies indexed in CINAHL (primarily focused on nursing) and other candidate databases. That said, there may be relevant studies that we omitted as a consequence. Finally, data extraction was undertaken by a single researcher; although this was done carefully, there is a possibility that errors may have occurred. Because this was a rapid review that we aimed to complete in a timely way to inform policymakers, we judged that the time saved by only having a single researcher undertake data extraction was warranted.

6. Conclusions

The main finding from our rapid review is that there is moderate (if low quality) evidence to suggest a small but important number of patients will develop coronavirus related psychosis that is likely associated with steroid or viral exposure, pre-existing vulnerability and psychosocial stress. Psychosis in patients with coronavirus may present a major challenge and potential infection control risk to clinical teams. There was limited evidence to suggest that patients that developed psychosis responded well to low dose antipsychotics such as aripiprazole. In

addition to steroid-induced psychosis, there was some limited and poor-quality evidence which suggested that extreme psychosocial stress-triggered incident cases in people previously unaffected. Of importance to current mental health service provision, patients with existing psychosis may be less likely to comply with physical distancing and personal hygiene requirements required during an outbreak of an infectious disease, representing a potential risk to the community and mental health clinicians. The current COVID-19 pandemic offers a global opportunity to explore the findings of this rapid review in greater depth and quality.

There is much to speculate upon regarding the consequences of the COVID-19 pandemic on individuals with psychosis. Our review highlights that, within the current literature at least, minimal consideration has been given to this disadvantaged population and proactive research is required.

Contributions

EB and RG conceived the study, completed the screening and completed the first draft. SLM completed the search, and screening. AT, BN, BOD, PM, SF contributed to the final paper.

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Declaration of competing interest

AT has received honoraria and support for meetings from Janssen Cilag, Sunovion and Otsuka Pharmaceuticals and has been an investigator on unrestricted investigator-initiated trials funded by Janssen-Cilag. He has also previously held a Pfizer Neurosciences Research Grant.

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