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Short Communication

Outbreak of SARS-CoV-2 in a teenage discotheque in Northern Ireland—November 2021



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ABSTRACT

Objectives: To report key findings associated with an outbreak of SARS-CoV-2 following a teenage disco in Northern Ireland.

Study design: Observational case series.

Methods: A case was defined as an individual who attended the event with a positive SARS-CoV-2 result between 6th and 20th November 2021. Demographic and clinical information, including symptom status, date of onset and school attended, were recorded during contact tracing. Vaccination status was derived from the COVID-19 Vaccine Management System. Forty-five samples associated with the outbreak were sequenced as part of the NI Whole Genome Sequencing (WGS) programme.

Results: Only 2.4% (5/205) of cases received a COVID-19 vaccine more than 14 days before the event. 84.9% (174/205) had received no vaccine at the time of the event and 12.7% (26/205) had been vaccinated within 14 days, offering only limited disease protection. The AY4.2.2 lineage of two cases who attended the event after symptom onset was found in 69% of sequenced outbreak cases.

Conclusions: This study demonstrates extensive COVID-19 transmission in largely unvaccinated teenagers in an indoor venue with limited social distancing, close social contact and mixing, limited ventilation and singing and shouting. Public Health authorities developing COVID-19 entertainment regulations should consider congregations of teenagers in these settings, especially if vaccination rates are low in this group or they are not eligible for vaccination at that time. Public communications should be developed to ensure young people with COVID-19 symptoms follow public guidance regarding self-isolation and in particular avoid indoor events with larger numbers.

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Introduction

On 8th November 2021, the Public Health Agency (PHA) became aware of an outbreak of SARS-CoV-2 associated with an under-18s disco held on 5th November 2021 in a nightclub in County Antrim, Northern Ireland (NI). The closed ticketed teenage disco was held in a nightclub complex in the Mid-Ulster Local Government District (LGD) from 8 pm to midnight on 5th November 2021. Event organisers reported that attendees were not required to wear face masks or provide COVID-19 vaccination status or evidence of

negative antigen tests before entry. This study reports the key characteristics associated with this outbreak, which is the largest COVID-19 point source event in a non-workplace setting in NI to date.

Methods

The outbreak was first identified on 9th November 2021 (4 days after the event) with seven cases associated by a member of the Contact Tracing (CT) clinical team, using the CT data capture software system, which allows for rapid establishment of new outbreaks and clusters in real time. A common name and a unique ID were assigned to the venue and this information was immediately circulated among all Contact Tracers and the CT surveillance team. Cases were then actively associated with the outbreak both by

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tracers and by the CT surveillance team as soon they became known. Tracers could actively associate cases with the outbreak in real time while on the CT call, and this was supported by CT surveillance staff who examine all reported data on settings attended daily. Although cases were not specifically asked about attendance at the venue, extensive media coverage at the time likely raised public awareness and may have led to increased case ascertainment. The Incident Management Team confirmed that 1000 tickets were sold online and that the event was fully attended. Although it would have been desirable to obtain detailed exposure histories from all attendees and to develop an analytical epidemiological study, this was not possible because of very limited staff resources and confidentiality concerns related to obtaining a full list of teenage attendees.

An observational case series study design was used with routinely collected COVID-19 contact tracing data. A case was defined as an individual who attended the event with a real-time polymerase chain reaction (RT-PCR) SARS-CoV-2 positive result between 6th and 20th November 2021. The episode start date was defined as the date of onset of symptoms, or date of first positive test in the asymptomatic. All RT-PCR confirmed cases are reported to the Contact Tracing Service (CTS) via the National Testing Initiative Laboratory Network and Health and Social Care (HSC) Trust Laboratories.

Case demographic, potential exposure settings and clinical information, including symptom status, date of onset, vaccination status and school attended, were recorded. Vaccination status for cases was derived from the COVID-19 Vaccine Management System.¹ In addition, 45 samples associated with the outbreak were sequenced as part of the NI Whole Genome Sequencing (WGS) programme. The incubation period was determined as the time, in days, between the event and the date of reported symptoms onset.

Results

Demographic and clinical information

Two hundred and six cases were associated with the outbreak of whom 59.9% were female ($n = 124$). The median age was 14 years, ranging from 10 to 21 years. Ninety-six percent of cases (197/206) were aged between 12 and 15 years. Although cases travelled up to 40 miles to the event, case residences were clustered in towns close to the venue in Mid-Ulster (MU) and Causeway Coast and Glens (CCG) LGDs and along arterial roads to Derry City/Limavady and Coleraine. Forty-six percent of cases ($n = 96$) resided in Mid-Ulster LGD and 29% ($n = 59$) in Causeway Coast and Glens LGD.

Microbiological analysis

Forty-five samples associated with the outbreak were sequenced as part of the NI WGS programme, with all cases identified as Delta variant, the dominant variant in NI at this time. Six lineages were identified as AY 4.2.2 accounting for 69% of samples (31/45) and AY4.2 accounting for 22% (10/45). The two cases who attended the event after symptom onset were both sequenced as AY 4.2.2 (Fig. 1) and had an epidemiological link outside the venue.

Owing to constraints in the local sequencing laboratory system, only a proportion of positive samples (22% (45/206)) associated with the outbreak had WGS undertaken. This was in line with WGS testing in NI at the time. However, no selection of cases occurred and the 45 cases could be considered a random sample from the 206 cases. The mean age for those sequenced ($n = 45$) was 14.4 years (SD = 3.5 years) and for those not sequenced ($n = 161$) was 13.7 years (SD = 1.1 years), while the female:male ratio was 1.4:1 and 1.5:1 for those sequenced and non-sequenced, respectively.

Incubation period

Table 1 shows information on the incubation period. For the 171 cases with a reported date of onset (171/204), the mean incubation period was 4.1 days (SD = 2.4 days, median = 3 days, range = 1–13 days). The mean incubation period for females was 4.0 days (SD = 2.6 days, median = 3 days) and 4.4 days for males (SD = 2.2 days, median = 4 days). The mean incubation period for different age cohorts is shown in Table 1 and ranged from 2.8 days in those aged 16 years to 4.6 in those aged 15 years, but with no obvious pattern by age. The median incubation period was 3 days for all cohorts except those aged 13 years, where it was 4 days. The mean incubation period for cases with no vaccine was 4.2 days (SD = 2.4 days, median = 3 days) and for those who have had any dose of vaccine ($n = 31$) was 3.6 days (SD = 2.3 days, median = 3 days).

Vaccination status

Vaccination status, which required the cases' Health and Care Number (HCN) for linkage, was available for 205 cases.¹ There was one case where HCN was not available. Only 2.4% of cases (5/205) had one dose more than 14 days before 5th November, with 12.7% (26/205) having had one dose within 14 days and 84.9% (174/205) having no vaccination at the time of the event.

Associated schools

Of the 201 cases associated with 20 secondary schools, 43% (87/201) reported attending three schools in the Mid Ulster LGD area and 57% (115/201) attending schools located in MU and CCG area. Case numbers in each school ranged from 1 to 35, with an average of 10 cases per school (SD = 10 cases, median = 5 cases).

Background disease rate

In the 4 weeks before the event case numbers in the 12- to 16-year group across Northern Ireland declined with 7 day cumulative case rates per 100,000 of 1551, 1306, 1044 and 990 for the 7 days up to 15/10/21, 22/10/21, 29/10/21 and 5/11/21 (date of event), respectively.

Discussion

Transmission of COVID-19 is a function of biological, behavioural and environmental factors.² Our initial investigation suggests rapid and extensive transmission in a largely unvaccinated group of teenagers in a crowded indoor venue where conditions conducive to transmission prevailed including limited social distancing, close social contact and mixing, limited ventilation and likely singing and shouting. As the vaccination programme in Northern Ireland for 12- to 15-year-olds only began on 27th November 2021,³ the majority of those who attended the event on 5th November 2021 would not have been eligible for COVID-19 vaccination. Indeed, only 2.4% had their first vaccination dose at least 14 days previously. Whole genome sequencing of 45 cases identified the majority as AY4.2.2, including both cases who attended the event after symptom onset. If we assume non-sequenced case samples would follow these WGS findings, the pattern is suggestive of super-spreading type transmission of SARS-CoV-2 in a largely unvaccinated cohort.

As part of the relaxation of COVID restrictions in NI, nightclubs were permitted to reopen on 31st October 2021.⁴ COVID restrictions in entertainment settings such as nightclubs were probably designed with adults consuming alcohol in mind and the opening of the vaccination programme to over 18s from May 2021 (and for 16- and 17-year-olds from August 2021)^{5–7} coupled with high adult

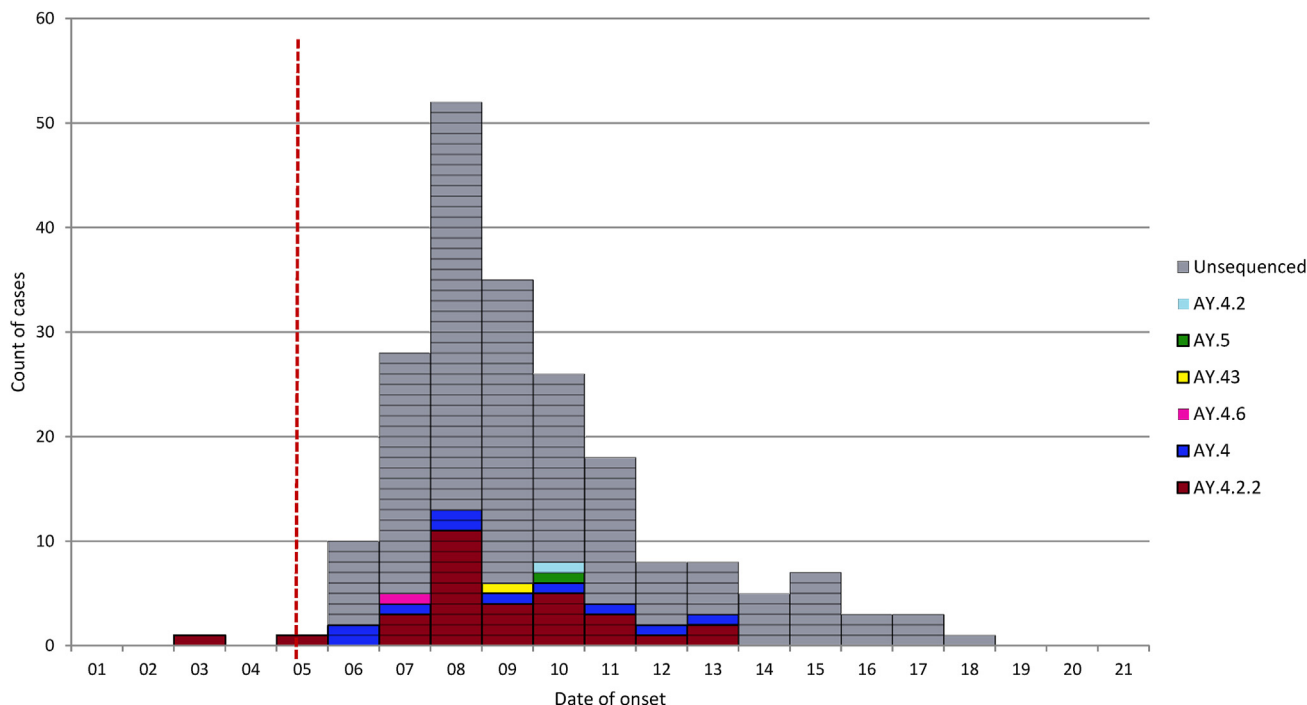


Fig. 1. Cases of SARS-CoV-2 associated with teenage nightclub outbreak, Northern Ireland, November 2021, by WGS lineage (Excel file.)

vaccination uptake by the start of November 2021 would have informed decisions to relax restrictions. By 6th November 2021, good vaccination rates had been achieved by adults in NI with 18-24-year-olds having uptake rates of 77% (first dose) and 70% (second dose) and 25-29-year-olds having uptake rates of 70% (first dose) and 68% (second dose) uptake, with higher vaccination rates among older age cohorts.⁸ Between 8th and 22nd November 2021, 12 clusters associated with nightclubs and bars across NI were identified by the CTC. For the two nightclubs identified, there were seven total associated cases (mean = 4 cases, median = 4 cases, range = 3–4 cases). For the 10 bars, there were 52 total associated cases (mean = 5 cases, median 4 cases, range 2–11 cases). These licensed premises are generally attended by adults over 18 years of age, who at the time of the teenage disco (5th November 2021) had good vaccination uptake rates with 71%, 78%, 87% and 93% of 18–29, 30–39, 40–49 and 50–59 years, respectively, having had two doses of vaccine, at least 14 days previously.⁸ During this

period, large outbreaks and clusters associated with nightclubs and bars were not reported, which may have been due to the high levels of vaccination in the adult population.

However, the nightclub event organised for 5th November was targeted at teenagers who at this time had much lower vaccination rates, especially as the general vaccination programme for 12- to 15-year-olds had not opened at the time of the event and only began on 27th November 2021.³ By 6th November 2021, only 16% of all 12- to 15-year-olds in NI had received the first vaccine, with 3% having received their second vaccine.⁸ As the general vaccination program only opened for this group on 27th November 2021, the majority of these children were likely to be either in a high-risk group or in a household of close contact of a Clinically Extremely Vulnerable (CEV) person.

In our study, case vaccination rates were very similar to regional rates with 16.4% of cases having received one vaccine by November 5th. Also, at the time of the event, 14% of the outbreak cases were less than 14 days postvaccination and thus had only limited disease protection, which again highlights the need to co-ordinate lifting of restrictions with vaccine eligibility and uptake. Congregation of teenagers in these settings, with no licence to serve alcohol, was probably not considered by authorities and represents a gap in COVID mitigation planning at entertainment venues. Norwegian authorities banned or restricted alcohol sales in bars and restaurants during the pandemic and in December 2021 could only remain open if not serving alcohol, a measure introduced in response to a super-spreading event involving a group of vaccinated adults in an Oslo entertainment venue.^{9,10} Our report demonstrates why public health authorities must also consider younger people who congregate in entertainment venues, especially if vaccination rates are low in this group or they are not eligible for vaccination at that time. Our study also found at least two cases who attended the event after their date of reported symptoms, which illustrates the need to reinforce public messaging regarding the importance of self-isolation when symptomatic and in particular not attending large indoor events.

Table 1
Incubation period for cases with recorded date of symptom onset by age, gender and vaccination status.

	Mean incubation period (SD) [days]	Median incubation period (range) [days]
Total (n = 171)	4.1 (2.4)	3 (1–13)
Age range (years)		
10–12 (n = 26)	3.7 (1.9)	3 (1–9)
13 (n = 45)	4.5 (2.3)	4 (1–11)
14 (n = 53)	3.9 (2.3)	3 (1–12)
15 (n = 40)	4.6 (3.1)	3 (1–13)
16 (n = 4)	2.8 (1.3)	3 (1–4)
≥18 (n = 2)	3.0 (1.4)	3 (2–4)
Gender		
Female (n = 97)	4.0 (2.6)	3 (1–13)
Male (n = 69)	4.4 (2.2)	4 (1–11)
Vaccination status		
Vaccinated (n = 29)	3.6 (2.3)	3 (1–10)
Not vaccinated (n = 142)	4.2 (2.4)	3 (1–13)

The under-18s disco is traditionally attended by pre-GCSE (General Certificate of Secondary Education) secondary school-aged teenagers from the wider local area. Indeed, we found that the vast majority of cases (94%) were aged between 12 and 15 years, correlating with four discrete school year groups (year 9 to year 12). Cases were associated with 20 different secondary schools, with 43% of cases associated with just three schools. Initial investigation suggests possible onward transmission to other school-aged children, but further work is required to investigate this.

The incubation period of COVID-19 has been reported as averaging 5–6 days, ranging from 2 to 14 days, but shorter incubation periods have been reported for both Delta (4 days) and Omicron variants (3 days).¹¹ The mean incubation period in this study was 4.1 days (median = 3 days, range 1–13 days), which is similar to that reported for the Delta variant, which was the main lineage found in this study.

Limitations of this study include the inability to offer testing or to undertake enhanced questionnaires regarding exposures to all attendees. Also, only a proportion of positive samples associated with the outbreak had WGS undertaken (22% (45/206)), but this was in line with WGS testing in NI at the time.

Conclusion

Initial investigations found that SARS-CoV-2 was highly transmissible among unvaccinated young people in a crowded indoor nightclub venue with limited social distancing, close social contact and mixing, limited ventilation and associated singing and shouting. Further investigation to assess onward/secondary transmission is ongoing. Governments and public health authorities should consider the possible congregation of younger people in entertainment settings, when alcohol is not being served, especially if vaccination rates in this group are low or they are not eligible for vaccination at that time. Cases were found to have attended the event after they had developed symptoms, which illustrates the need to develop public communication reinforcing the importance of self-isolation when symptomatic and to ensure young people with COVID symptoms follow public health guidance regarding self-isolation and avoid indoor events with large numbers.

Author statements

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Ethical approval

This study was undertaken using routine COVID-19 contact tracing data collected for the purpose of public health outbreak response. Research ethics approval was not required.

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Competing interests

None declared.

Authors' contributions

DB, PS, PMcA, ER, CR, CMcK, CT, CA and MD designed the study. PMcA, DB, ER, CR, CMcK, CT, CA, MD, EDK, HS and PS implemented the study and collated data in collaboration with the CT service. PMcA, DB, ER, CR, CMcK, CT, CA, MD, EDK, HS and PS analysed and interpreted the data. DB, PMcA, ER, CR, CMcK, CT and CA wrote the first draft of the manuscript. All authors revised the manuscript and approved the final version.

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