

## ORIGINAL ARTICLE

# Ten-year prevalence of acute hospital ENT infections and the impact of COVID: A large population study

Bassem Mettias  | David Jenkins  | Peter Rea 

Leicester Royal Infirmary, Leicester, UK

**Correspondence**

Bassem Mettias, ENT Department, Leicester Royal Infirmary Hospital, Leicester LE15WW, UK.

Email: [bassemadel@hotmail.com](mailto:bassemadel@hotmail.com)**Abstract**

**Background:** Acute ear, nose and throat (ENT) infections were the commonest referrals from accident and emergency to ENT services. The referral rate changed dramatically with season, year, national outbreaks and during the COVID pandemic.

**Method:** Retrospective longitudinal study of the epidemiology of seven acute ENT infections in secondary care over 10 years. A mixed city and rural population of over 650 000 in central England was studied. The risk factors for each wave of infection during the surge of infection were sought. A statistical analysis of their significance was undertaken. This included analysis and correlation of group A-beta haemolytic streptococcus (GABHS) in hospital and community. Seasonal variations, hospital admissions and the impact of the COVID were analysed.

**Results:** There were 16 883 reported cases of the seven index ENT infections during the 10-year period. Great seasonal and year-to-year variations were recorded. There was an incremental rise in 2018. Spring had the highest season of acute ENT infections. An outbreak of GABHS was noted in the community in 2014. The mean duration of hospital admission was 1.5 days. There was no statistical ethnic or gender predominance. A dramatically lower number of acute ENT infections were recorded during the COVID-19 pandemic, and this continued after lifting of lockdown restrictions.

**Conclusion:** A resurgence in scarlet fever directly and indirectly contributed to an incremental rise in acute ENT infections in the following years. Both hospital and community B-haemolytic cultures have declined during the COVID-19 pandemic due to a reduction in infections as opposed to reduced case ascertainment.

**KEYWORDS**

COVID, infection, prevalence, streptococci

## 1 | INTRODUCTION

Emergency ear, nose, and throat (ENT) conditions have been reported to contribute to over 11% of the total cases in an accident and emergency department (A&E).<sup>1</sup> Acute ENT infections account for many of these presentations.<sup>2</sup> Hospital admissions have increased for tonsillitis, peritonsillar abscess (quinsy) and deep neck space infection in the last decade.<sup>3</sup> Group A-beta

haemolytic streptococcus (GABHS) was the commonest isolate in previous microbiology studies on admitted acute ENT infections.<sup>2,3</sup> GABHS outbreak was noted in England in 2014.<sup>4</sup> No previous longitudinal study has explored the epidemiology of acute ENT infections in secondary healthcare centres. This is the first study to demonstrate the changes in GABHS epidemiology and the impact of the COVID pandemic on acute ENT infections in secondary care.

## 2 | METHODS

A retrospective observational longitudinal study was conducted at a large healthcare centre, an 1800-bed organisation in Leicester England and the only provider of secondary care for Leicester and Leicestershire, a mixed urban and rural population of just over one million, over a 10-year period between July 2010 and January 2021. Patients with one or more of seven acute ENT infections that commonly present to the emergency department were included in the study (tonsillitis, quinsy, acute otitis media [AOM], periorbital cellulitis, supraglottitis, deep neck space infection and acute mastoiditis with or without other complications of otitis media) whether admitted or not to the three sites of University Hospitals of Leicester. Acute sinusitis without complications was excluded as it was generally managed in a primary care setting. Cases were identified from ICD-10 from hospital episode statistics. Temporal variations of the prevalence rate of the seven ENT infections were documented. SPSS was used for statistical analysis. The hospital admission in each of these infections was analysed. Medical microbiology laboratory primary and secondary data for the same population were searched for GABHS positive cultures. Patients who had a positive culture from the UHL specimen were counted in each group. The annual infection prevention report from the county of Leicestershire was used to identify any community outbreaks.

## 3 | RESULTS

There were 16 883 reported cases of the seven index ENT infections during the 10-year period with 8786(52%) males and 8087(48%) females. The average number of cases every month was 133 patients (interquartile range [IQR] = 20–262). Figure 1 shows the prevalence of the seven ENT infections presenting to UHL over 10 years. There was an incremental monthly rise above the average from mid-2016 with the highest peak in

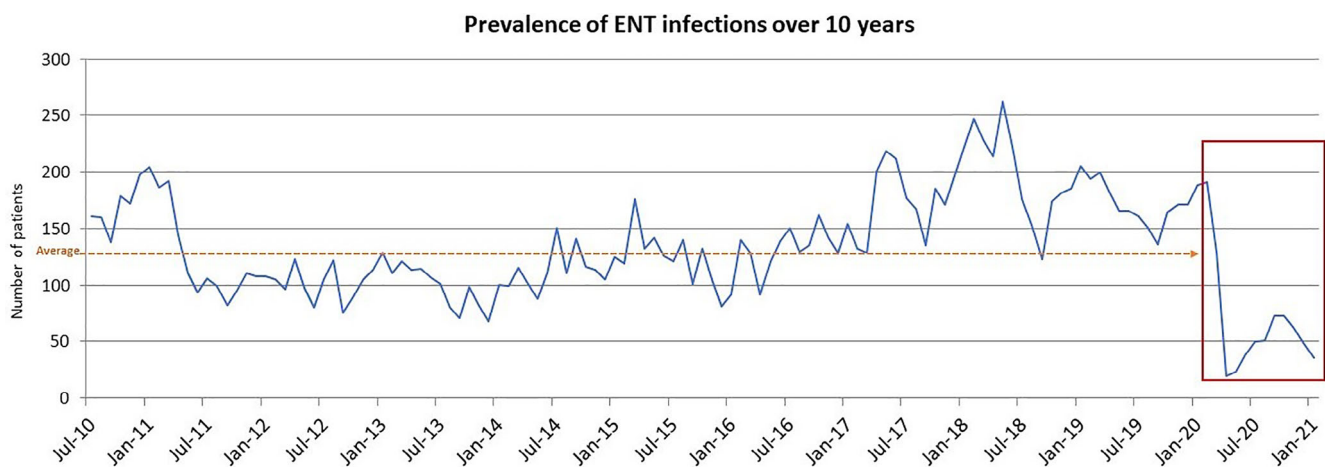
### Key points

- A resurgence in scarlet fever is seen to be correlated with an incremental rise in acute ENT infections in the following years.
- The infection rate showed a trough with the peak in Spring.
- Deep neck space infections increased during GABHS outbreak.
- There was significant drop-in hospital presentation rate for acute ENT infection during COVID pandemic.
- Cultures of GABHS from specimens collected in both the community and hospital have declined dramatically in the same period.

May 2018 (262 patients). This was primarily attributed to a surge in tonsillitis and peritonsillar abscess presentations in this period (Table 1).

The combined seasonal variations of all seven ENT infection groups showed overall, the highest season of infection was spring (total 4180, mean 418 patients every year), then winter (4491, mean 408), summer (total 4117, mean 374) and the least season of reported cases was autumn (total 4095, mean 372). The *p* value between four seasons using one-way ANOVA was 0.83 (not significant at  $p < 0.05$ ).

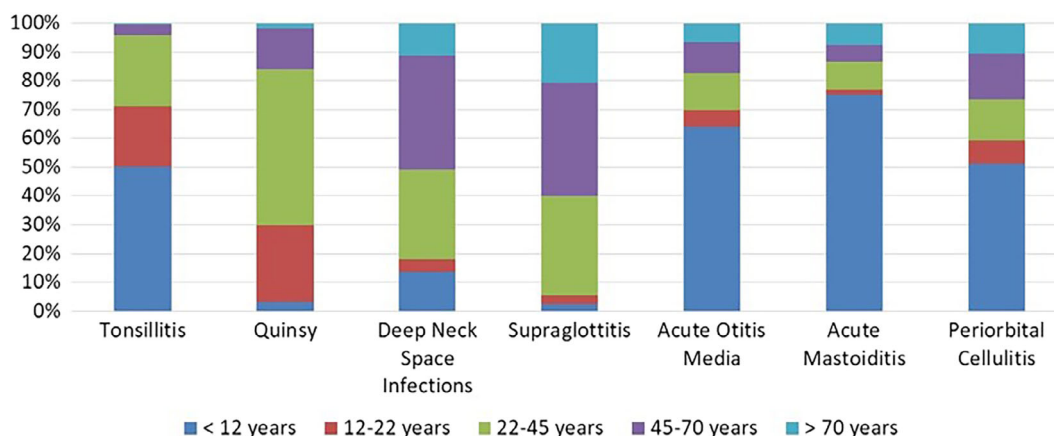
The age at presentation for the seven ENT infection groups was different. Fifty percent (5838 patients) of tonsillitis, 64% (1523 patients) of AOM, 75% (39 patients) of acute mastoiditis and 51% (279 patients) of periorbital cellulitis patients presented under the age of 12 years old. Quinsy is frequently reported (54%) between 22 and 45 years of age. Of total, 39.2% in each of deep neck space infection and supraglottitis patients were diagnosed between 45 and 70 years. Over 70 years of age, acute ENT infections (2.3%) were hardly seen in the emergency (Figure 2).



**FIGURE 1** Prevalence of acute ENT infections over 10 years

**TABLE 1** Distribution of seven ENT infections over 10 years

	Tonsillitis	Quinsy	AOM	Periorbital cellulitis	Supraglottitis	Deep neck space	Acute mastoiditis
2010 (1/2 y)	740	54	166	35	3	9	1
2011	1147	88	242	31	5	11	8
2012	861	110	176	57	11	3	1
2013	800	167	138	62	14	14	0
2014	864	149	225	53	33	18	8
2015	1067	160	196	33	36	5	3
2016	1105	167	186	54	30	14	5
2017	1460	229	300	48	20	19	3
2018	1595	330	311	74	48	21	9
2019	1382	291	251	54	63	17	9
2020	585	112	179	44	15	9	4
Total	11 624	1867	2375	547	278	140	52
Percentage	68.9%	11%	14%	3.2%	1.6%	0.8%	0.3%
Mean/month	92	15	19	4	2	1	0



**FIGURE 2** Age distribution of acute ENT infections

**TABLE 2** Comparison of GABHS tested individual in each of the ENT infections

Reported ENT infection	GABHS tested	Positive test of tested individual's group	Percentage of positive in all 784 tested	Percentage of positive from all +ve (%)
Tonsillitis (N = 11 624)	485 (4.2%)	16 (3.3%)	61.9%	31%
Quinsy (N = 1867)	91 (4.9%)	17 (18.7%)	11.6%	33%
AOM (N = 2375)	157 (6.6%)	9 (5.7%)	20%	17%
Periorbital cellulitis (N = 547)	34 (6.2%)	5 (14.7%)	43.4%	10%
Supraglottitis (N = 278)	4 (1.4%)	0 (0%)	0.5%	0%
Deep neck space (N = 140)	5 (3.6%)	3 (60%)	0.6%	6%
Acute mastoiditis (N = 52)	8 (15.4%)	2 (25%)	1%	4%
Total (N = 16 883)	784	52		

There was no specific ethnic predominance to most of the acute ENT infections. Sixty-seven percent of the infections were noted in the British white and 12% in Asian British Indian groups. These were the largest two ethnic groups in the Leicestershire population (651179) from the last census in 2011, contributing 45% for White British and 28% for Indian populations.<sup>5</sup>

### 3.1 | Analysis of GABHS patients

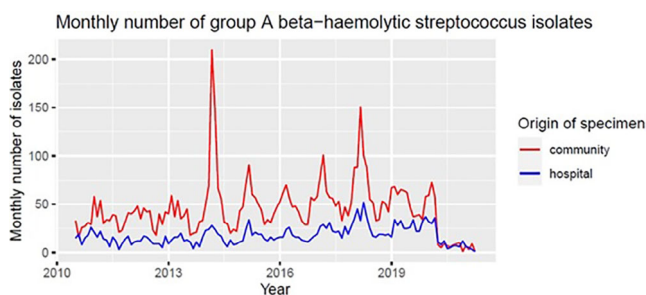
There were 784 (4.6%) cultures obtained from patients with acute ENT infections in the hospital in this period (Table 2). Thirty-five patients (4.5%) tested positive for GABHS with 52 linked acute ENT infections (due to the presence of more than

one diagnosis in 17 patients). The annual peak (15 patients per year) was in 2017 and 2018. The deep neck space infection and acute mastoiditis samples showed higher positive cultures from tested individuals in their groups (60% and 25%, respectively). There was no positive culture in supraglottitis from tested individuals.

Laboratory isolates of GABHS are shown in Figure 3. Since the outbreak of community scarlet fever in 2014, there has been a regular annual cycle consisting of a rapid increase in the monthly number of cases from a trough in September, peaking in March and decreasing over the summer to September. A second relatively high peak of 150 positive tests is noted in the community in March 2018, which coincided with the hospital peak of 2018. Hospital GABHS affected mainly the age group 22–45 years (19 patients, 37%) whereas the community was predominately positive in less than 12 years old ( $\approx 300$  patients). There were slightly higher isolates in girls than boys during puberty and early adult life. There was a significant drop in GABHS during COVID epidemic 2020–2021 for hospital and community settings.

### 3.2 | Analysis of each ENT infection

The annual prevalence of each group of acute ENT infections during the 10-year period is shown in Table 1. The average number of each infection per month is illustrated. The lowest monthly rate



**FIGURE 3** Distribution of GABHS over 10 years in UHL and community of Leicestershire

was noted during the first wave of the COVID-19 epidemic (20 patients) after national lockdown measures on 14th April 2020. Since the easing of lockdown in September 2020, the number remained relatively low.

There was a constant high monthly peak for tonsillitis at the end of 2010 and early 2011. A similar rise was reported in May 2018 with the highest peak (180 patients). The monthly peak in quinsy was noted equally in June and July 2018 (44 patients). There was a steep drop of both infections in 2020 (10 patients in May 2020 for tonsillitis and no quinsy in April 2020).

AOM included both suppurative and non-suppurative cases. Two winter peaks were identified, the first was in January 2011 (47 patients) and the second was in January 2020 (49 patients) before the COVID-19 pandemic in the United Kingdom on 31st January 2020.

The monthly peak in periorbital cellulitis was noted in February 2013 (13 patients) followed by December 2019 (11 patients). High figures of supraglottitis were recorded between 2017 and 2019 (peak was 10 patients in January 2018).

Deep neck space infections included all patients diagnosed with retropharyngeal and parapharyngeal abscesses. The average rate was one patient every month. The peak was in July 2014 (five patients); coincides with GABHS outbreak in the community.

There were no specific peaks in acute mastoiditis and no significant rise during the COVID-19 epidemic. A moderate positive correlation is noted between AOM and mastoiditis ( $R$  value is 0.68 on Pearson correlation test),  $p$  value is 0.021. The result was significant at  $p < 0.05$ .

### 3.3 | Hospital admission

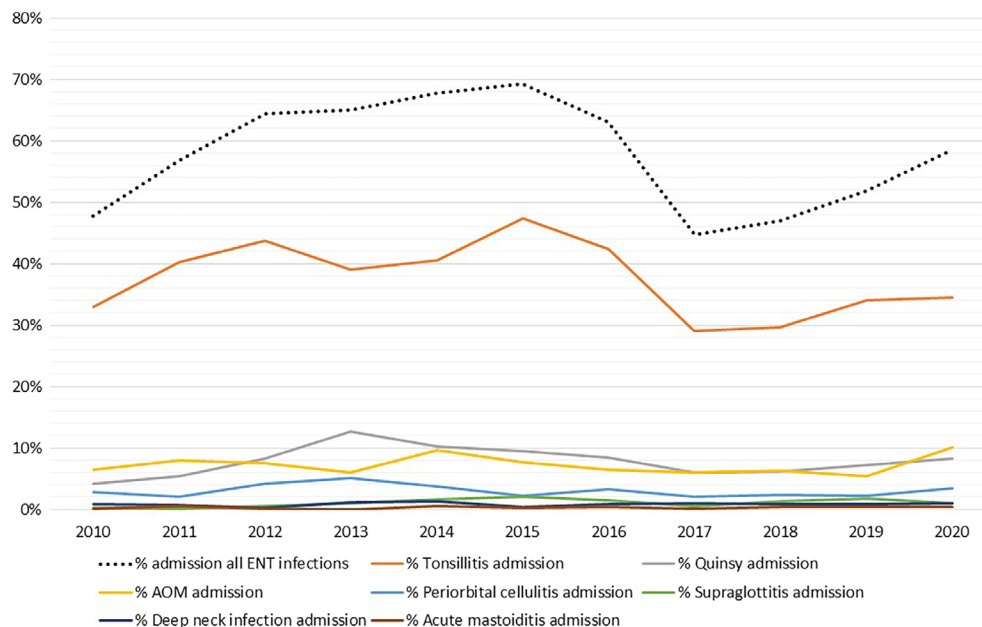
There were 7333 (43%) patients who did not require hospital admission. Seventy-four percent in this group were diagnosed with tonsillitis, followed by 16% with AOM, 8% with quinsy. One percent in each of periorbital cellulitis and supraglottitis did not require admission. All acute mastoiditis or deep neck space infection required hospital admission. The mean hospital stay for all ENT infections was 1.5 days (IQR 1.0–12.2). Thirty-three percent of presented patients (59% of

**TABLE 3** Rate, length and percentage of hospital admission in each ENT infection group

	Tonsillitis	Quinsy	AOM	Periorbital cellulitis	Supraglottitis	Deep neck space infection	Acute mastoiditis	Total
No admission	5405 (46%)	573 (31%)	1197 (50%)	61 (11%)	90 (32%)	2 (1%)	5 (10%)	7333 (43.4%)
1 day	4206 (36%)	<b>821 (44%)</b>	507 (21%)	54 (10%)	35 (13%)	4 (3%)	3 (6%)	5630 (33.3%)
<1 week	1859 (16%)	458 (25%)	493 (21%)	<b>339 (62%)</b>	<b>117 (42%)</b>	<b>62 (44%)</b>	<b>32 (62%)</b>	3360 (20%)
1–2 weeks	101 (1%)	9 (0%)	92 (4%)	62 (11%)	22 (8%)	39 (28%)	9 (17%)	334 (2%)
>2 weeks	53 (0.5%)	6 (0%)	86 (4%)	31 (6%)	14 (5%)	33 (24%)	3 (6%)	226 (1.3%)
Mean (days)	1.0	1.2	2.7	4.4	3.8	12.2	5.2	1.5

Note: The bold value for each ENT infection represent the highest patients in that hospital admission event.

**FIGURE 4** Plot % hospital admission for each ENT infections over 10 years from presented cases (solid colour lines) and all total annual ENT admission rates (dotted line)



admitted ones) stayed less than 1 day. Of total patients, 94.1% (8990 of 9550) required admission less than 1 week. The highest rate was 69% in 2015. The duration of hospital admission for each group of the seven ENT infections was variable. Forty-four percent of all quinsy patients were discharged within 1 day of admission. Up to a week was required for the majority of supraglottitis (42%), acute mastoiditis and periorbital cellulitis (62% each) (Table 3; Figure 4).

## 4 | DISCUSSION

Tonsillitis and quinsy account for the largest group of ENT emergencies seen in hospital A&E up to 39.8%,<sup>1,2,6</sup> followed by ear infections.<sup>2</sup> A previous study in Scotland showed an increased frequency of hospital admissions for tonsillitis, quinsy and deep neck space infection following SIGN guidelines for tonsillectomy in 2010.<sup>3</sup> The mean hospital stay was 1.1, 1.5 and 6.4 days, respectively. Early in this study, there was a similar rise in the hospital presentation for tonsillitis in 2010 which was attributed to change in the management of sore throat.<sup>3</sup> The hospital admission for acute ENT infections was noticeable in the Leicestershire area till 2015. The pattern was following the temporal variation in tonsillitis admission. From 2015, the admission rate dropped and fluctuated around a mean of 54%. The mean hospital stay for tonsillitis and quinsy was equivalent to previous study of 1.0 and 1.2 days, respectively.

### 4.1 | Microbiology/acute ENT infections

The most frequently isolated bacteria in acute ENT infections from previous reports were GABHS (13.7%), *Fusobacterium necrophorum* (13.6%) and *Staphylococcus aureus* (8.0%).<sup>2</sup> *F. necrophorum* was

commonly isolated in cases of peritonsillar abscess.<sup>2</sup> GABHS was the most frequent aerobe in tonsillitis, AOM and acute mastoiditis.<sup>2</sup> Management protocols in our healthcare centre do not routinely involve cultures from tonsillitis or acute otitis media. The high positive cultures in tested individuals for deep neck space infection and mastoiditis is likely attributed to the availability of pus sample.

The community peak of GABHS in 2014 was consistent with the non-invasive national scarlet fever outbreak in England (3.5 times the year before).<sup>4</sup> The highest densities were seen in two areas, Cumbria and Leicestershire.<sup>4</sup> There was an absence of clearly defined microbial characteristics that can explain the scarlet fever epidemic although a hypothesis of the natural cyclical pattern of the disease was suggested.<sup>4</sup> The annual rise of scarlet fever in the community continued in the subsequent years between 2014 and 2018 with the peak in March 2016.<sup>4</sup> This study illustrated this community outbreak in 2014 with its impact on acute ENT infections in secondary care. There were non-proportional hospital isolates in the same year (four positive cultures out of 1350 tested patients). The lack of proportional impact of community scarlet fever outbreaks on Hospital tonsillitis and quinsy in 2014 might be attributed to the difference in the M-protein of Group A streptococci with different phenotypes of the disease which presented with more rash and fever (221/656) but less sore throat (128/656 tonsillitis, 4/656 quinsy).<sup>4</sup> Another ENT infection associated with Scarlet fever is mastoiditis (1/656) but no reported mortality complication.<sup>4</sup> It is noted that emm3 was the common type (43%) during the outbreak.<sup>4</sup> The frequency of national outbreaks of scarlet fever followed a seasonal pattern between 2014 and 2016 with the highest recorded numbers in March each year.<sup>4</sup> The spring peaks were consistent with this study's seasonal peak. The low positive rates in GABHS (4.5%) in the current study may suggest that the observed increase in ENT infections in the following years was multifactorial and might not be solely caused by a specific pathogen.

Anaerobic organisms in a previous study have been most seen in adolescents (age groups 10–29 years old).<sup>2</sup> Beta-haemolytic group A streptococci were found in 20% of pharyngeal samples and in 5% of saliva samples of otherwise healthy young schoolchildren in one study.<sup>7</sup> Asymptomatic carriers were detected in 10% of adults, rising to 60% during the outbreak of streptococcal pharyngotonsillitis.<sup>7</sup> A hypothesis of hormonal changes linked to infection rate in puberty was considered as females were infected at a slightly younger age coinciding with their earlier puberty than males.<sup>2</sup> Behavioural changes leading to increased exposure at this time were also suggested.<sup>2</sup> The current study has shown a slight increase in GABHS in late teenage girls than boys.

## 4.2 | ENT infections and impact of COVID

During the COVID-19 epidemic, this study has shown a steep drop in hospital presentations and admissions for all seven acute ENT infections which reached the lowest level (20 patients) in April 2020 at the start of the national lockdown measures ‘Stay at home, protect the NHS, and save lives’. Triage of most patients in general practice was conducted through telephone or video consultations. These remote consultations showed unexpectedly high rates of prescribing antibiotic that reflect the greater diagnostic uncertainty.<sup>8</sup> It has been reported that antibiotics before hospital presentation could explain some of the lack of growth on culture in up to 30%.<sup>2,8</sup> The real decrease in disease rather than a drop in case ascertainment is due to loss of opportunity for transmission of pathogens, especially group A streptococcus. Social distancing, face masks and standard hand hygiene might have limited the transmission of air-borne ENT infections after lifting the lockdown rules in September and October 2020.

Acute otitis media is the commonest (75%) bacterial infection in children.<sup>9</sup> The highest rate of reported cases to the medical practices in Europe was noted in Spain. UK accounted for 12.3% of all European cases.<sup>10</sup> The infection is generally higher during the winter period.<sup>9</sup> This study has shown two specific high winter peaks in AOM. The first peak was noted in 2011 following the restrictions on routine antibiotic prescription in primary care for early AOM after implementation of NICE guidelines.<sup>11</sup> The hospital high flow could represent unresolved infections in primary care or anxious parents about the change in practice. The second peak occurred prior to the emergence of the COVID-19 pandemic in UK in early 2020. Although there was no COVID screening at that time, only limited case-series (nine patients) suggested AOM as a manifestation of COVID-19.<sup>12</sup>

There was not an equivalent rise in acute mastoiditis during the winter peak of AOM in January 2020. In addition, a national UK observation study of acute paediatric mastoiditis during COVID-19 showed only one positive patient (0.9%).<sup>13</sup> This suggests a low risk of otological complications from AOM in COVID-19 patients.

Periorbital cellulitis had two peaks that were encountered during winter. It is clearly related to the rise in upper respiratory tract viral infections during the winter.

The annual rate of supraglottitis has been rising since 2014 although there was no reported positive culture in this study. It is generally difficult

to swab the site of infection when antibiotic treatment should start immediately based on clinical diagnosis. Blood cultures could also miss any microorganisms if the patients were already on antibiotics at time of the culture.<sup>2</sup> The 90 patients in the supraglottitis group who did not require hospital admission were believed to represent coding problems as there was no index coding for supraglottitis in HES so the code J04.0 for acute laryngitis and tracheitis was alternatively used.

Deep neck space infection was rising in 2014 at the same time as the outbreak of GABHS.<sup>5</sup>

## 4.3 | Strength and limitation

This study represents the first longitudinal observational study in large population for the epidemiology of acute ENT infections in hospital emergency. The large sample size for each infection helped to understand the epidemiology of the disease. The study illustrated the impact of two important microbiology epidemic of GABHS and SARS-COV-2. The geographic location of the healthcare centre provided a real reflection of associated ENT emergency infections from a highest GABHS outbreak area. The study has large database over a decade that could enrich future research work on epidemiology, microbiology changes over years. To date, there were limited studies measuring the impact of national guidelines in treatment of acute ENT infections in primary care on hospital presentations. The first limitation of the study includes single site database. The microbiology analysis for organisms other than GABHS in tested individuals or the absence of growth was beyond the spectrum of this study. Another limitation was the absence of comparative data from primary care for tonsillitis and acute otitis media, especially during the outbreak of GABHS and pandemic of SARS-COV-2.

## 5 | CONCLUSION

A resurgence in scarlet fever is seen to be correlated with a non-proportional incremental rise in acute ENT infections in the following years. Deep neck space infections increased during the GABHS outbreak. There was significant drop-in hospital presentation rate for ENT infections during COVID pandemic. Cultures of GABHS from specimens collected in both the community and hospital have declined dramatically in the same period.

### AUTHOR CONTRIBUTION

Mr Bassem Mettias (ENT Specialty Registrar) is the corresponding author who collected data. He conducted the whole analysis and wrote first draft of the paper. Mr David Jenkins is the lead microbiology consultant who helped in extracting some of the graph and the revision of the draft. Professor Peter Rea suggested the topic and led the project till the completion.

### FUNDING INFORMATION

The authors received no specific funding for this work.



## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## PEER REVIEW

The peer review history for this article is available at <https://publons.com/publon/10.1111/coa.13978>.

## DATA AVAILABILITY STATEMENT

The data used to support the findings of this study are available from the corresponding author upon request, and the patients' data used to support these findings are included in the article.

## ETHICS STATEMENT

This was a local registered audit of clinical practice against national ENT survey in 2012. Analysis was based on existing, anonymised data and therefore did not require the approval of the ethics committee.

## ORCID

Bassem Mettias  <https://orcid.org/0000-0003-2799-0465>

David Jenkins  <https://orcid.org/0000-0001-9108-6126>

Peter Rea  <https://orcid.org/0000-0003-0376-2716>

## REFERENCES

- Merino-Galvez E, Gomez-Hervas J, Perez-Mestre D, Llamas-Peiro JM, Perez-Gil E, Belda-Palazon M. Epidemiology of otorhinolaryngologic emergencies in a secondary hospital: analysis of 64,054 cases. *Eur Arch Otorhinolaryngol*. 2019;276(3):911–7. <https://doi.org/10.1007/s00405-019-05331-w>
- Rusan M, Klug TE, Ovesen T. An overview of the microbiology of acute ear, nose and throat infections requiring hospitalisation. *Eur J Clin Microbiol Infect Dis*. 2009;28(3):243–51. <https://doi.org/10.1007/s10096-008-0619-y>
- Douglas CM, Altmyer U, Cottom L, Young D, Redding P, Clark LJ. A 20-year observational cohort of a 5 million patient population-tonsillectomy rates in the context of two national policy changes. *Clin Otolaryngol*. 2019;44(1):7–13. <https://doi.org/10.1111/coa.13233>
- Lamagni T, Guy R, Chand M, Henderson KL, Chalker V, Lewis J, et al. Resurgence of scarlet fever in England, 2014–16: a population-based surveillance study. *Lancet Infect Dis*. 2018;18(2):180–7. [https://doi.org/10.1016/S1473-3099\(17\)30693-X](https://doi.org/10.1016/S1473-3099(17)30693-X)
- Geographies of diversity in Leicestershire [cited 2013 Sep 30]. <http://hummedia.manchester.ac.uk/institutes/code/briefings/localdynamics/odiversity/geographies-of-diversity-in-leicestershire.pdf>.
- Lammens F, Lemkens N, Laureyns G, Lemmens W, Van Camp L, Lemkens P. Epidemiology of ENT emergencies. *B-ENT*. 2014;10(2):87–92.
- Slots J, Slots H. Bacterial and viral pathogens in saliva: disease relationship and infectious risk. *Periodontol* 2000. 2011;55(1):48–69. <https://doi.org/10.1111/j.1600-0757.2010.00361.x>
- Armitage R, Nellums LB. Antibiotic prescribing in general practice during COVID-19. *Lancet Infect Dis*. 2021;21(6):e144. [https://doi.org/10.1016/S1473-3099\(20\)30917-8](https://doi.org/10.1016/S1473-3099(20)30917-8)
- Liese JG, Silfverdal SA, Giaquinto C, Carmona A, Larcombe JH, Garcia-Sicilia J, et al. Incidence and clinical presentation of acute otitis media in children aged <6 years in European medical practices. *Epidemiol Infect*. 2014;142(8):1778–88. <https://doi.org/10.1017/S0950268813002744>
- Toolkit for managing carbapenemase-producing Enterobacteriaceae in non-acute and community settings, 2015 [cited 2020 Mar 3]. <https://www.gov.uk/government/publications/carbapenemase-producing-enterobacteriaceae-non-acute-and-community-toolkit>.
- Otitis media – acute changes, (last revised January 2021). <https://cks.nice.org.uk/topics/otitis-media-acute/how-up-to-date-is-this-topic/changes/>.
- Raad N, Ghorbani J, Mikaniki N, Haseli S, Karimi-Galougahi M. Otitis media in coronavirus disease 2019: a case series. *J Laryngol Otol*. 2021;135(1):10–3. <https://doi.org/10.1017/S002221512002741>
- Smith ME, Jones GH, Hardman JC, Nichani J, Khwaja S, INTEGRATE (The UK ENT Trainee Research Network) UK Acute Paediatric Mastoiditis Audit collaborators, et al. Acute paediatric mastoiditis in the UK before and during the COVID-19 pandemic: a national observational study. *Clin Otolaryngol*. 2022;47(1):120–30.

**How to cite this article:** Mettias B, Jenkins D, Rea P. Ten-year prevalence of acute hospital ENT infections and the impact of COVID: A large population study. *Clinical Otolaryngology*. 2022. <https://doi.org/10.1111/coa.13978>