

Evaluating the Appropriateness of Antibiotic Treatment of Tonsillitis during COVID-19 in the North Wales Primary Healthcare Setting

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Abstract

Background: The COVID-19 pandemic has changed the delivery of primary care in the NHS. Consultations have largely moved from face-to-face to remote, forcing practitioners to modify the ways in which they deliver care to patients. **Aim:** In this study, we aim to investigate the appropriateness of antibiotic prescribing in tonsillitis during the COVID-19 pandemic. **Design and Setting:** An observational quantitative analysis in the North Wales primary care setting. **Method:** Retrospective review of computer records across 5 GP centers from March 2020 until the end of October 2020. Data was extracted and analyzed using chi-square or Fisher's exact rank and Mann–Whitney test. **Results:** Our results have shown no significant difference in antibiotic prescribing behavior comparing face-to-face and remote consultations. **Conclusion:** Remote consultation is as effective as face-to-face consultation with regards to the assessment of tonsillitis and the appropriateness of antibiotic prescription in primary care.

Keywords

tonsillitis, antibiotic, primary healthcare, service evaluation, COVID-19

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Background

Acute tonsillitis (AT) is a common cause of sore throat frequently seen in primary care accounting for approximately 1.3% of total consultations.¹ AT is an inflammation of the tonsils that can either be caused by bacterial or viral infection. Viral tonsillitis can be caused by pathogens that are commonly associated with the common cold, including rhinovirus, respiratory syncytial virus (RSV), and adenovirus. Bacterial tonsillitis is most commonly caused by group A beta hemolytic streptococci (GABHS).²

Differentiating between viral and bacterial etiology is clinically important as the majority of viral tonsillitis cases are self-limiting. It is important to consider that treating patients with bacterial tonsillitis can confer benefits such as reduced symptom duration and incidence of complications.³ Current National Institute for Health and Care Excellence (NICE) guidance recommends using either the CENTOR or FeverPain scoring criteria to guide antibiotic prescription.⁴ The usage of a scoring system is crucial to

avoid inappropriate antibiotic prescriptions which further propagates antibiotic resistance.

During the COVID-19 pandemic, GPs have largely moved from face-to-face (F2F) to remote consultations, potentially making it more challenging for practitioners to use scoring systems to guide their antibiotic prescribing.⁵ As remote consultations are likely to continue for the foreseeable period, the sustainability and efficacy of remote consultations as compared to F2F is important to be determined.

This study therefore aims to evaluate the appropriateness of antibiotic prescription in tonsillitis during the COVID-19 pandemic in primary care. It is hypothesized that there is a

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Table 1. Demonstrates Characteristic of the Study Population.

Characteristic	Total	Face-to-face	Remotely	P value
Age: median (range)	21 (1-85)	18 (1-51)	23 (5-85)	.145
M:F	0.71:1	0.62:1	1.05:1	.188
Antibiotic given				
Yes (%)	89.4	92.3	88.5	.7671
No (%)	10.5	7.7	11.5	
FeverPain or CENTOR Scoring system described in the notes				
Yes (%)	8.2	0	10.6	.0415*
No (%)	91.8	100	89.4	
Parameters sufficiently* recorded in the notes (Y/N)				
Yes (%)	58.8	64.1	50	.1447
No (%)	41.2	35.9	50	
CENTOR/FEVERPain scores recommended (Y/N)				
Yes (%)	69.5	68	70.1	1.00
No (%)	30.5	32	29.9	

*Sufficiently recorded parameters were defined as either all parameters recorded in either scoring system or 4 out of 5 parameters recorded in FeverPain or 3 out of 4 parameters recorded in CENTOR scores.

significant difference in antibiotic prescriptions between the F2F and remote consultation groups.

How Does This Fit

GPs have been advised by policy makers to increase their use of remote consultation systems, including the electronic consultation system. We have seen an increase in remote consultation across all centers during the COVID-19 pandemic. However, there is limited research demonstrating the efficacy of an e-consultation system; in particular, with regards to antibiotic prescribing patterns in GP surgeries. This study highlighted the effectiveness of remote consultation in relation to antibiotic prescription for acute tonsillitis during the COVID-19 pandemic. This is particularly important in rural healthcare settings like North Wales where patients may need to travel long distances to reach their GP.

Method

Data Collection

This is a multicenter observational study which was performed in 5 general practice surgeries in North West Wales. Computer records of patients that had a confirmed diagnosis of acute tonsillitis were retrospectively reviewed from March 2020 until end October 2020. A 6-item questionnaire was produced and used to standardize the data collection across sites. Data was cross-checked by 2 independent reviewers prior to data input onto the database.

Quality Assessment

All patients presenting with a concurrent diagnosis of COVID-19 were excluded. Either the CENTOR or FeverPain criteria scores were used to assess the appropriateness of

antibiotic prescription.⁴ For any encounters that were not awarded a score at the time of consultation but had sufficient parameters recorded (which is defined as the minimum parameters enabling calculation of a retrospective score), a score was awarded to allow for analysis of antibiotic prescribing behaviors. For FeverPain, the parameters required were: (1) fever in the past 24h, (2) absence of cough or coryza, (3) Symptoms onset <3 days, (4) purulent tonsils, (5) Severe tonsil inflammation. For CENTOR, the parameters required were (1) age, (2) exudate or swelling on tonsils, (3) tender or swollen anterior cervical lymph nodes, (4) temperature noted >38°C, and (5) Presence of cough. Sufficiently recorded parameters were defined as either all parameters recorded in either scoring system or 4 out of 5 parameters recorded in FeverPain or 3 out of 4 parameters recorded in CENTOR scores.

Statistical

Chi-square, or fisher-exact rank and Man-Whitney tests were used to compare differences between remote and F2F consultations. A *P-value* of .05 was set to be statistically significant in this study.

Results

A total of 170 patients were enrolled (Table 1). 77.1% of all consultations were done remotely, 22.9% were done by F2F assessment. 89.4% of all patients were prescribed antibiotics. The median age of patients in remote consultation and F2F groups were 18 and 23 years old. The gender (M:F) ratio in remote consultation and F2F assessment groups were 1.05:1 and 0.62:1, respectively. These characteristics in both groups had no significant differences. Only 8.2% of all consultations described the use of either the CENTOR or

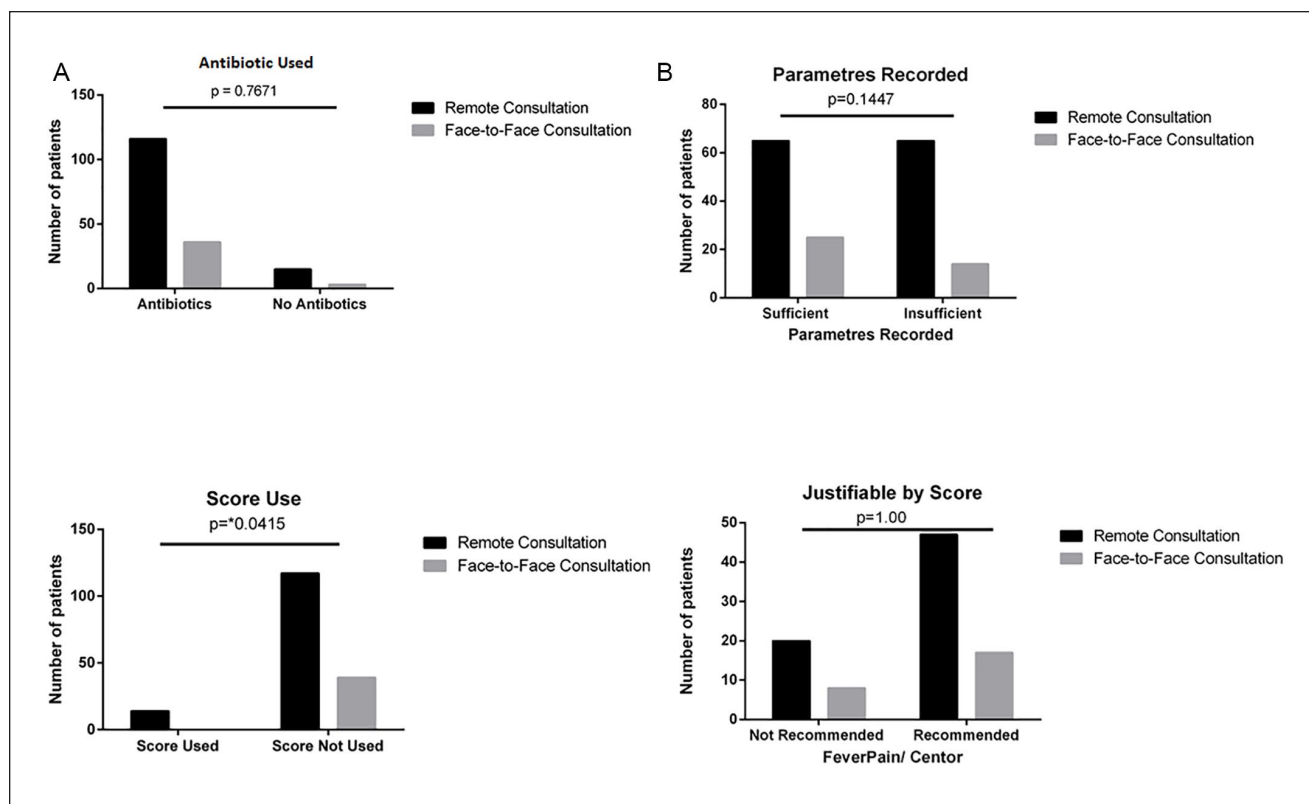


Figure 1. (A) Bar chart demonstrating the rate of antibiotic prescription and the use of scoring criteria between remote and face-to-face consultations. Score use refers to whether FeverPain or CENTOR scoring system has been described in the notes and (B) bar chart demonstrating the rate of sufficient parameters recorded and whether the use of antibiotics was justified by the scoring system between remote and face-to-face consultations.

Table 2. Is a Contingency Table that Compares the Correct and Incorrect Prescriptions among the Remote and F2F Consultation Modalities.

	Based on CENTOR/FeverPain scores		Marginal row totals
	Correct prescription	Incorrect prescription	
Remote	51	16	67
F2F	16	8	24
Marginal columns total	67	24	91 (grand total)

The chi-square statistic is .8131. The *P*-value is .527513. Not significant at $P < .05$.

FeverPain scoring system to guide antibiotic prescription. 58.8% of consultations contained sufficient information allowing us to retrospectively calculate a score. Of cases with retrospectively calculated scores, 69.5% supported antibiotic prescription (68.1% vs 70.1% in F2F and remote consultation respectively) (Table 1).

There was no significant difference ($P > .05$) between rates of antibiotic prescription (92.3%, 88.5%) between the F2F and remote consultation groups (Figure 1A). The scoring system usage rate of 10% was significantly higher ($P = .0415$) in the remote consultation group compared to 0% in the F2F group. The difference in rates of sufficiently

recorded parameters was not significant (64.1%, 50%) between both groups (Figure 1B). Amongst patients scored, 91 patients (67 from remote consultation and 24 from F2F) were able to calculate with CENTOR/FeverPain scoring criteria to determine whether an antibiotic prescription was appropriate or not. During remote consultation, 51 out of 67 prescriptions complied with the CENTOR/FeverPain recommendation and were deemed appropriate. However, during F2F consultation, 16 out of 24 prescriptions adhered to the recommendation (Table 2). The differences in appropriate prescriptions and inappropriate prescriptions between remote consultation and F2F groups were insignificant

($P > .05$) (Table 2). A post hoc sensitive analysis was performed to demonstrate their relationship (Appendix).

Discussion

Summary

This observational study has demonstrated that rates of antibiotic prescription did not differ significantly between remote and F2F consultation groups. This encouragingly suggests that the prescription of antibiotics in tonsillitis were similarly appropriate using both modalities, further supporting the role of remote consultation during the COVID-19 pandemic in the primary care setting.

Strengths and Limitations

We acknowledge that the findings of this study are limited to the North Wales primary healthcare community. However, the e-consultation system used in our centers is standardized across Wales, further expanding the external validity of this study. Other unmeasured confounders such as GP prescribing behavior and geographical variation could further impact the internal validity of the findings.^{6,7} Additionally, another limitation of this study is the consistency in coding, patients that were not electronically coded as “tonsillitis” by physicians would have been missed by our inclusion criteria. Although this number is low, it could further impact the results.

Nonetheless, this study employed standardized data collection across sites to minimize the effect of selection biases. Data was also further cross-checked with electronic and paper copies to ensure accuracy prior to data-entrance. This is also the first study that investigates the impact of remote consultation on antibiotic prescription in the primary care setting during the COVID-19 pandemic. We also highlighted the need to improve the usage of a tonsillitis scoring system in primary care to guide antibiotic prescription.

Comparing to Existing Literature

The antibiotic prescription rate in our centers averaged 89.2%, which is higher than the average antibiotic prescription rate in children less than 5 years old, which was demonstrated by Megan et al⁸ to be 71.6%. Our study demonstrated that overall, a calculated score supported antibiotic prescription in 69.5% of cases, which is similar to the 68.5% as found by Megan et al. This demonstrates the similarity in GP behavior with regards to their usage of a scoring system to guide antibiotic prescription. However, our study further demonstrated a lack of documentation in our practices, which was not explored by Megan et al. It remains unclear why some GPs did not document the CENTOR or FeverPain scores. Some GPs

might rely more on their clinical experience rather than the guidance for antibiotic prescriptions in tonsillitis, as poor adherence to antibiotic prescription guidelines has been demonstrated in the literature.⁹ Additionally, upfront antibiotic prescription is a common practice that helps reducing patient's visits to the GP.

There is limited literature on e-consultations, which are essentially web-based consultations, where patients input their presenting complaints and all their symptoms into a proforma, as well as attach a photo if required.^{5,6,10-12} Remote consultations were first introduced into the NHS in 2015 to reduce the primary workload^{13,14} and have been demonstrated to be associated with a 29% reduction in F2F contact.^{6,14} Studies have been performed to improve the uptake of e-consultations by practitioners. This modality of consultation became particularly useful during the COVID-19 pandemic, where physical examinations, including that of the throat, are not recommended across our centers. Additionally, telephone consultations can be combined with e-consultations and have been demonstrated to be an effective and efficient alternative to F2F consultations, reducing total time spent with patients as well as having similar levels of patient satisfaction.¹⁵

In our centers, remote consultations minimize patient contact and continue to prove an effective mode of consultations sustainable in GP practices. With these results, we foresee an increase in the prevalence of remote consultations, even after the COVID-19 pandemic.⁵

Interestingly, the usage of a scoring system, albeit low at 10.6% in the remote consultation group, was still higher than in the F2F consultation group which had a 0% documented scoring system rate. This could be because NHS physicians were discouraged from doing physical ENT examinations to guide their clinical judgment on antibiotic prescription, hence resulting in an increased usage of indirect assessments.¹⁶

Implication for Research/Practice

In the context of a pandemic, remote consultations have become the mainstream mode of patient contact with GPs. The results from our study provide reassurance that remote consultation is as effective as face-to-face consultation regarding to antibiotic prescription for tonsillitis. This demonstrates that remote consultations can be both timesaving, as well as prevent the need for the aerosol-generating examination into the throat.

A quality improvement project could be performed to investigate the reasoning behind why physicians did not use scoring systems, or document information on scoring system parameters within the electronic notes.⁶ Additionally, future studies could also investigate patient satisfaction with regards to remote consultations in the primary care setting.

Conclusion

Remote consultation is as effective as face-to-face consultation with regards to the assessment of tonsillitis and the appropriateness of antibiotic prescription in primary care. Total usage of the CENTOR and FeverPain scoring systems to guide clinical decision making was low in both modalities of consultation. There is a need for further research into antibiotic prescribing patterns in the primary care setting during the COVID-19 pandemic.

Appendix

Sensitivity Analysis

Appendix 1. Demonstrates the Confusion Matrix and Classification Statistics for F2F Consultations.

Antibiotics give during F2F consultation	Based on CENTOR/FeverPain recommendation	
	No	Yes
No	0	0
Yes	8	16

Accuracy : 0.64
 95% CI : (0.4252, 0.8203)
 Sensitivity : 0.9412
 Specificity : 0.0000
 Pos Pred Value : 0.6667
 Neg Pred Value : 0.0000
 Prevalence : 0.6800
 Detection Rate : 0.6400
 Detection Prevalence : 0.9600
 Balanced Accuracy : 0.4706
 'Positive' Class : Yes

Appendix 2. Demonstrates the Confusion Matrix and Classification Statistics for Remote Consultations.

Antibiotics give during remote consultation	Based on CENTOR/FeverPain recommendation	
	No	Yes
No	6	2
Yes	14	45

Accuracy : 0.7612
 95% CI : (0.6414, 0.8569)
 Sensitivity : 0.9574
 Specificity : 0.3000
 Pos Pred Value : 0.7627
 Neg Pred Value : 0.7500

Prevalence : 0.7015
 Detection Rate : 0.6716
 Detection Prevalence : 0.8806
 Balanced Accuracy : 0.6287
 'Positive' Class : Yes

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Author Contribution

CL and CO contributed in manuscript writing, data collection, analysis, graph-production and conceptualization. AM and IW contributed a significant amount in conceptualization, data collection and manuscript writing. AA and RJ contributed equally to data collection and conceptualisation.

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