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Original

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COVID-19

Impact of the COVID-19 pandemic on paediatric otolaryngology: a nationwide study

Impatto della pandemia COVID-19 sull'otorinolaringoiatria pediatrica

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SUMMARY

Objective. The COVID-19 pandemic profoundly modified the work routine in healthcare; however, its impact on the field of paediatric otorhinolaryngology (ORL) has been rarely investigated. The aim of this study was to assess the impact of COVID-19 on paediatric ORL.

Methods. A questionnaire was developed by the Young Otolaryngologists of the Italian Society of ORL-Head and Neck Surgery (GOS). The questionnaire consisted of 26 questions related to workplace and personal paediatric ORL activities. The link was advertised on the official social media platforms and sent by e-mail to 469 Italian otolaryngologists.

Results. The questionnaire was completed by 118 responders. During the pandemic, the main reduction was observed for surgical activity (78.8%), followed by outpatient service (16.9%). The conditions that were mostly impacted by a delayed diagnosis were respiratory infections in 45.8% of cases and sensorineural hearing loss in 37.3% of cases.

Conclusions. Paediatric ORL was highly impacted by the COVID-19 pandemic, with a significant reduction of surgical and outpatient activities and a delay in time-sensitive diagnosis. Therefore, the implementation of new strategies, such as telemedicine, is recommended.

KEY WORDS: children, paediatric otolaryngology, COVID-19, adenoidectomy, tonsillectomy

RIASSUNTO

Obiettivo. L'impatto della pandemia COVID-19 sul settore dell'otorinolaringoiatria (ORL) pediatrica è stato poco studiato. Lo scopo di questa ricerca è stato, pertanto, quello di valutare l'impatto del COVID-19 sull'ORL pediatrica, concentrandosi sulle differenze con il periodo precedente la pandemia.

Metodi. Un questionario composto da 26 domande relative alle attività lavorative è stato sviluppato dal Gruppo Giovani della Società Italiana di ORL e Chirurgia Cervico-facciale (GOS). Il link è stato diffuso sui social media della società e inviato via e-mail a 469 otorinolaringoiatri.

Risultati. Il questionario è stato compilato da 118 otorinolaringoiatri. Durante la pandemia, la principale riduzione è stata osservata per l'attività chirurgica (78,8%), seguita dal servizio ambulatoriale (16,9%). Le condizioni maggiormente colpite da una diagnosi ritardata sono state le infezioni respiratorie nel 45,8% e l'ipoacusia neurosensoriale nel 37,3%.

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Conclusioni. L'ORL pediatrica è stata influenzata dalla pandemia COVID-19 con una riduzione statisticamente significativa delle attività chirurgiche e ambulatoriali. Molte diagnosi che necessitano di un trattamento tempestivo sono state differite. Pertanto, si raccomanda di implementare nuove strategie, come la telemedicina.

PAROLE CHIAVE: *bambino, otorinolaringoiatria pediatrica, COVID-19, adenoidectomia, tonsillectomia*

Introduction

The COVID-19 outbreak profoundly impacted work routines in healthcare. The main changes in otorhinolaryngology (ORL) practice included unit rearrangement, personnel reallocation, changes in clinical and surgical activity, and SARS-CoV-2 contagion among ORL physicians and patients¹. In the first study conducted by the Task Force of the Young Otolaryngologists of the Italian Society of ORL-Head and Neck Surgery (GOS) in April 2020, a drastic reduction in sinonasal procedures (98.5%), paediatric ORL surgery (97.6%) and ear surgery (94.9%) was reported, while all elective procedures (100%) were homogeneously suspended across the country². In addition, ORL emergencies presented a drastic reduction ranging from 70% to 100% during the first wave of pandemic, as reported by two main Italian referral centres³. While the impact of these aspects has been investigated in the adult population, the field of paediatric ORL has been less explored. The cancellation and/or the delay in treating paediatric ORL surgical cases show the need to reconsider treatment algorithms for the diagnosis and treatment of these conditions in children. In fact, lockdown measures such as the mandatory use of masks, school closure and remote learning paradoxically led to a reduction in the transmission of upper respiratory tract infections (URTI) among children⁴. According to the scientific literature, social distancing and other restrictive policies had a positive impact on the general symptoms (i.e., nasal obstruction, mouth breathing, rhinorrhoea, snoring, apnoea, and behavioural changes) and associated comorbidities such as otitis media with effusion (OME) in children suffering from adenoid or adenotonsillar hypertrophy^{5,6}.

The aim of this study was to assess the impact of the SARS-CoV-2 infection on paediatric ORL in Italy, highlighting the differences with a two-year period preceding the pandemic. The main outcomes were the volume of outpatient visits, day surgeries and elective procedures, but also the changes in the diagnosis, patients and parents' behaviours, protocols and access to emergency departments. This is the first nationwide article analysing the changes occurred after the COVID-19 outbreak on the subspecialty of paediatric ORL with quantitative data.

Materials and methods

The study was conducted between May and July 2022 and

was compliant with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES)⁷. The Task Force of the GOS proposed this study, which was approved by the Institutional Review Board of the Italian Society of ORL-Head and Neck Surgery. The questionnaire was developed in Italian and uploaded to Google Drive.

Development of the questionnaire

A scientific committee of paediatric otolaryngologists, well acquainted with the topic involved, proposed a group of questions concerning the main issues related to COVID-19 and paediatric ORL. A preliminary version of the questionnaire including all the suggestions was developed by the first and last authors (E.M.C.T., M.R.). Finally, the expert group developed a consensus version of the questionnaire. As a last step, the tool was pre-tested on a pilot group of eight otolaryngologists who fulfilled the inclusion criteria mentioned in the previous section to check for comprehensibility, redundancy, and consistency of the items, including technical usability and functionality of the electronic platform.

The Google form consisted of three screens presenting the following sections on paediatric patients (0-16 years):

- a section for collecting demographic data of responders (i.e., name/surname, e-mail, age, sex, nationality, geographic area, working position, workplace) and acquiring informed consent to participate in the study;
- workplace activities: 20 questions on the number and types of outpatient visits, surgeries, and paediatric emergencies at the responder's workplace;
- personal activity: 6 questions on outpatient care, day surgery and elective surgery of the responder.

The statements of the second and third parts referred to pre-COVID-19 time (two-year period February 2018 - February 2020) and to COVID-19 time (two-year period March 2020 - March 2022). The questionnaire included multiple-choice questions and responders could select only one statement among the proposed alternatives.

Administration of the questionnaire

Informed consent was obtained from all participants and instructions and purpose of the research explained in the introduction. The link was advertised on social media platforms of the Italian Society of ORL-Head and Neck Surgery (i.e., Facebook, Instagram) and sent by e-mail to a sample of 469 Italian otolaryngologists. The cohort included the members

of the Italian Society of ORL-Head and Neck Surgery, comprising a variety of otolaryngologists working in hospital and academic settings, as well as private practice. University students and international/exchange visitors were not included according to the criteria mentioned above.

Before submitting the questionnaire, a mandatory completeness check highlighted the missing response items. Answers were automatically captured and stored in an electronic spreadsheet (Excel, Microsoft®, version 16.66.1). To prevent multiple entries from the same individual, users were required to register first. The username was stored together with the survey results and later eliminated. The spreadsheet was stored and protected by unique passwords and kept on a secure, restricted network drive. The data were processed in anonymous and aggregate form in accordance with the General Data Protection Regulation (GDPR) of the European Community. Only the first and last Authors (E.M.C.T., M.R.) had access to the files. No incentives were offered to complete the survey.

Reproducibility of the questionnaire

The reproducibility of the questionnaire was evaluated using internal consistency and test-retest reliability. Internal consistency was considered acceptable in case of Cronbach's alpha values between 0.7 and 0.9. Additionally, the pilot group of eight otolaryngologists was selected for assessment of test-retest reliability. In this cohort, the questionnaire was administered twice, after an interval of one month, without any possibility for participants to look at the answers given the first time. Test-retest reliability was assessed through Intraclass Correlation Coefficients (ICC2k) and considered acceptable with a minimum test-retest correlation coefficient of 0.7.

Statistical analysis

Descriptive analysis was used to define the main clinical and demographic characteristics based on the responses to the questionnaire. Qualitative data were summarised as percentages. Unpaired t-test was used to evaluate differences for numeric values. A p-value ≤ 0.05 was considered the cut-off for statistical significance. Prism Software version 9.4.1 (Graph-Pad Software LLC) was used to perform statistical analysis.

Results

Demographics

Overall, 118 otolaryngologists answered the questionnaire with a response rate of 25.2%. Calculation of Cronbach's alpha showed good internal reliability ($\alpha = 0.88$). Test-retest evaluation was also satisfactory for all the subscales, with an overall ICC2k = 0.85 (CI 0.8-0.9).

Of the responders, 80 (67.8%) were males, 38 (32.2%) were females, 73 (61.9%) were hospital staff, 25 (21.2%) were university professors, 14 (11.9%) worked in private practice and 6 (0.5%) were PhD students or research fellows. When sorting by geographic area, 52 (44.1%) worked in Northern Italy, 24 (20.3%) in Central Italy, 42 (35.6%) in Southern Italy and islands. When sorting by organisational structure, 112 (94.9%) worked in a clinic treating both adults and paediatric patients, 4 (3.4%) in centres treating only paediatric patients and 2 (1.7%) in centres treating only adult patients, but sporadically visiting children. The average age of the responders was 43.7 years, while the median was 39 (range: 27-76 years).

Workplace activities

The questionnaire was composed of 20 questions that investigated the number and types of outpatient visits, surgeries, and paediatric emergencies at the responder's workplace. A comparison of the number of outpatient procedures performed during pre-COVID-19 (February 2018 - February 2020) and during COVID-19 time (March 2020 - March 2022) is shown in Figure 1. A significant reduction of total procedures was found during the pandemic compared to the pre-pandemic period ($p = 0.0002$, $t = 3.720$, $p = 0.234$). A comparison of the number of surgical procedures performed during pre-COVID-19 and during COVID-19 time is shown in Figure 2. A significant reduction of total procedures was found during the pandemic compared to the pre-pandemic period ($p < 0.0001$, $t = 4.493$, $p = 234$).

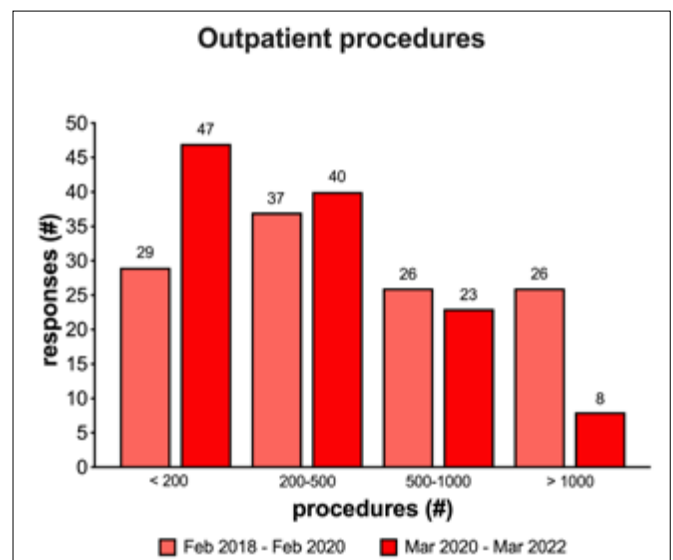


Figure 1. Number of outpatient procedures performed during pre-COVID-19 and during COVID-19 time. A significant reduction of total procedures was found during pandemic compared to the pre-pandemic period ($p = 0.0002$).

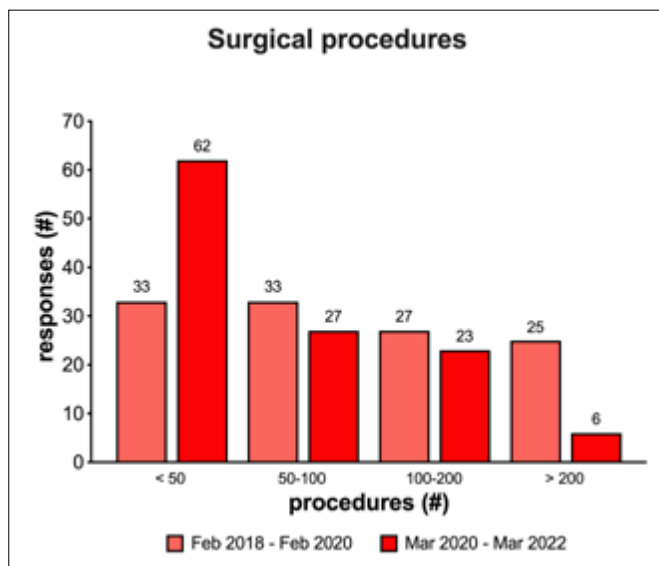


Figure 2. Number of surgical procedures performed during pre-COVID-19 and during COVID-19 time. A significant reduction of total procedures was found during pandemic compared to the pre-pandemic period ($p < 0.0001$).

During the pandemic, the main reduction was observed for surgical activity (78.8%), followed by outpatient service (16.9%) and emergency procedures (4.2%).

A preliminary evaluation of potential COVID-19 symptoms for outpatient visits was performed at admission by 67.8% of responders' workplaces, while in 13.6% of cases the evaluation was performed 24 hours before the visit via phone call. Nearly 20% of participants' institutions (18.6%) did not perform any preliminary screening of COVID-19 symptoms. Upper airway endoscopy procedures during outpatient visits – when required – were performed only in selected cases for 55.1% of responders, always for 38.1% and not performed in 6.8% of cases.

When investigating the number of conditions that were mostly impacted by a delayed diagnosis during outpatient visits during the COVID-19 pandemic, 45.8% reported URTI, 37.3% sensorineural hearing loss (SNHL), 9.3% otitis media and 7.6% epistaxis. Delayed diagnosis was also impacted by a reduction of the number of outpatient visits during pandemic, that – except for lockdown measures – was mainly due to the fear of parents of going to healthcare facilities (44.1%), social distancing (30.5%), use of face masks (16.9%) and telemedicine (8.4%).

According to the responders, the main conditions treated in emergency settings during the pandemic were traumas (35.6%), foreign bodies in the upper airways (22.9%), and acute mastoiditis (0.8%). All other cases, accounting for 40.7% of responses, were classified as “other conditions”. When analysing surgical procedures performed during the pandemic, in most

cases they were urgent procedures (61.9%). Elective surgery was performed only for high priority cases (45.8%), followed by medium priority (21.2%). In 21.1% of cases no elective surgeries were performed during pandemic. Most treated conditions were obstructive sleep apnoea syndrome (69.5%), recurring tonsillitis (13.6%), transmissive hearing loss (10.2%), adenoid hypertrophy (6.8%). Despite this, when investigating the number of surgeries that were mostly reduced during the COVID-19 pandemic, 42.4% were surgeries for obstructive sleep apnoea syndrome and ear surgery (32.2%), followed by sinonasal surgery (16.9%) and laryngeal surgery (8.5%).

Emergency surgical procedures were performed on paediatric patients positive for COVID-19 in 41.5% of cases; these procedures were performed in a COVID-19 dedicated operating room provided by the hospital in 46.6% of cases, while 53.4% of hospitals did not provide a dedicated room and surgeries were performed in ordinary operating rooms. The percentage of elective surgical procedures delayed for COVID-19 positivity (child/parent) was < 25% in 39.8% of cases, 25%-50% in 37.3% of cases, > 50% in 0.02%.

When investigating the changes in waiting lists for surgical procedures due to the pandemic, 66.9% of responders reported an increase of the number of procedures in the waiting list, 22% reported no significant changes while only 11% reported a decrease.

Personal activities

The questionnaire investigated 6 questions about outpatient care, day surgery and elective surgery of the responder.

Figure 3 shows the number of outpatient procedures requiring fiberoptic evaluation performed individually by responders during pre-COVID-19 and during COVID-19 time. A significant reduction of total procedures was found during pandemic compared to the pre-pandemic period ($p = 0.0003$, $t = 3.664$, $p = 0.234$).

Figure 4 shows the number of surgical procedures (day surgery) performed individually by responders during pre-COVID-19 and during COVID-19 time. A significant reduction of total procedures was found during the pandemic compared to the pre-pandemic period ($p < 0.0001$, $t = 4.402$, $p = 0.234$).

Figure 5 shows the number of surgical procedures (elective surgery) performed individually by responders during pre-COVID-19 and during COVID-19 time. A significant reduction of total procedures was found during pandemic compared to the pre-pandemic period ($p = 0.0016$, $t = 3.189$, $p = 0.234$).

Discussion

Study results

According to these results, both surgical and outpatient pro-

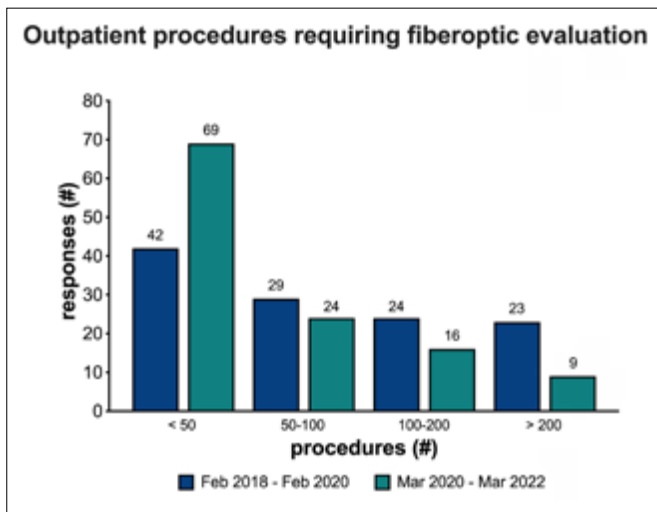


Figure 3. Number of outpatient procedures requiring fiberoptic evaluation performed individually by responders during pre-COVID-19 and during COVID-19 time. A significant reduction of total procedures was found during pandemic compared to the pre-pandemic period ($p = 0.0003$).

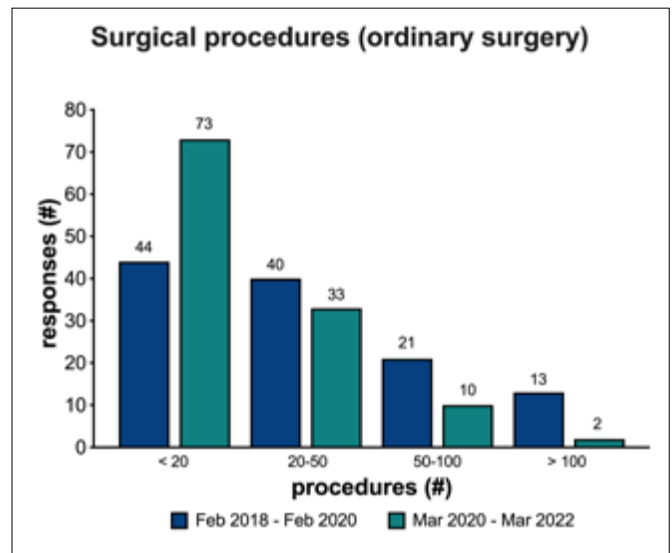


Figure 5. Number of surgical procedures (ordinary surgery) performed individually by responders during pre-COVID-19 and during COVID-19 time. A significant reduction of total procedures was found during pandemic compared to the pre-pandemic period ($p = 0.0016$).

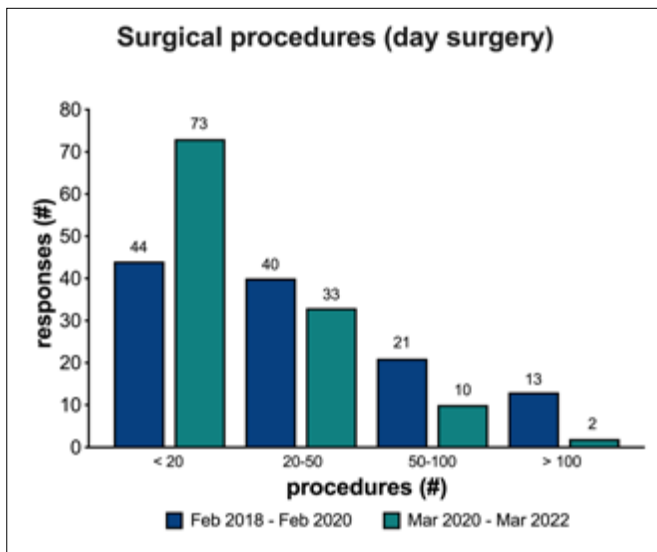


Figure 4. Number of surgical procedures (day surgery) performed individually by responders during pre-COVID-19 and during COVID-19 time. A significant reduction of total procedures was found during pandemic compared to the pre-pandemic period ($p < 0.0001$).

cedures presented a significant reduction ($p \leq 0.05$) during the pandemic compared to pre-COVID-19 time. Precisely, the main reduction was observed for surgical activity (78.8%), which was mostly made up of urgent procedures in 61.9% and high priority cases in 45.8%. Conversely, emergency procedures underwent only a mild reduction. The two most delayed diagnoses were URTI in 45.8% of cases and SNHL in 37.3% of cases; this is particularly alarming giv-

en the importance of a time-sensitive management of these conditions. Regarding hospital organisation, nearly 20% of cases did not undergo preliminary screening for COVID-19 symptoms. Emergency surgical procedures were performed on paediatric patients positive for COVID-19 in 41.5% of cases, but more than half of hospitals (53.4%) did not provide a dedicated room for their completion.

Although the data show a tendency to return to normality, it is evident that the Italian national healthcare system was not prepared to deal with the unique context of the pandemic. Additionally, the difficulties encountered in the hospital administration were amplified in cases of paediatric patients which routinely necessitate different protocols of diagnosis and treatment and that are mostly asymptomatic or mildly symptomatic with an underestimation of COVID-19 disease ⁸.

Management of adenotonsillar disease

Even though the current risk of contagion is significantly decreased thanks to vaccination and protective measures, an increased number of procedures in the waiting list accounting for 66.9%, as reported by our data, is worrying and could keep growing without the application of an integrated strategy. In fact, even a common diagnosis of adenotonsillar disease can lead to several comorbidities, such as cardiopulmonary complications, deficit of attention and dental malocclusions ⁹⁻¹¹.

Medical management of severe obstructive sleep apnoea during the COVID-19 pandemic, including continuous

positive airway pressure therapy in severe cases, showed that this kind of treatment is poorly tolerated, and that surgery remains the gold standard¹². Normally, stratification of patients according to the endoscopic classification of adenoid hypertrophy is the method of choice to indicate medical or surgical therapy¹³. However, considering that otolaryngologists are at high risk of contagion because of the proximity to superior airways during physical examination and of the aerosolisation of many common procedures including nasopharyngeal fibre-endoscopy¹⁴, according to our responders, the number of outpatient procedures requiring fibreoptic evaluation significantly decreased during the COVID-19 period. To reduce the rate of transmission of COVID-19 to healthcare workers, review of hospital records and telemedicine via phone consultation as well the presence of risk factors (i.e., syndromic diseases, persistent OME, associated hearing impairment and/or language development delay) can be a good strategy to prioritise more urgent cases in the exceptional context of the COVID-19 pandemic¹⁵.

Moreover, the delay in diagnosis of SNHL highlighted the shortage of audiological professionals¹⁶, and the enhanced difficulties experienced by deaf individuals during the hospital visits and accessing specialised services in the COVID-19 pandemic¹⁷.

In some categories of adult and paediatric patients, such as cochlear implant users which necessitate lifelong post-operative care, telemedicine has provided effective solutions to limit in-person controls to urgent needs, while leaving ordinary maintenance and stable patients to remote/asynchronous check¹⁸. Sadly, the application of telemedicine systems was reported only by 8% of responders, showing that although the COVID-19 pandemic accelerated technology implementation, its diffusion in routine practices is still limited in Italian ORL departments.

The impact of lockdown measures

In accordance with previous literature^{3,5,6,19}, possible speculations for the reduction of paediatric symptoms as well as paediatric emergencies and traumas can be due to lockdown restrictions (30.5%), which forced children to have distance learning with less interaction with their peers and minimal exposure to pathogens, but also to the fear of parents (44.1%) to go to hospital and possibly contract nosocomial infections or simply maintain the appointments especially if coming from suburbs or rural areas. This last data is fundamental if we consider that children are dependent on adults and cannot receive adequate medical care without family support.

It is interesting to note that besides traumas, foreign bodies in the airways and acute mastoiditis, other miscellaneous con-

ditions requiring access to the emergency department during the pandemic accounted for 40.7% of responses. Even if the number of ORL conditions requiring prompt evaluation is consistent, this data could suggest a trend in the Italian population to seek emergency consultation even for non-critical clinical situations³. This may have further contributed to a reduction in the capacity of the ORL departments to provide pre-pandemic levels of healthcare, in terms of timing and consistency with surgical lists priorities.

Lessons learnt from the COVID-19 pandemic

Although some national and international societies developed guidelines and recommendations focused on paediatric ORL during the first year of pandemic^{20,21}, they may be subject to change considering the constant evolution of the situation²², and an update is surely warranted. As reported by this study, although the reduction of outpatients and surgical procedures was significant and the pathway toward pre-pandemic normality is still long, data from a long-term perspective are more encouraging than those published at the beginning of 2020^{1,2}. According to the several lessons learnt from the challenging context of COVID-19, the building of a better post-pandemic healthcare system should be based on new strategies and resources such as telehealth consultations, videoconferencing platforms, unlimited availability of personal protective equipment, and new solutions for aerosol generating procedures (AGPs)²³. This management may also be fruitful to create a more child-centred health-care system, in which paediatric otolaryngologists work and improve the quality and timing of care of paediatric patients.

Limitations

Limitations of this study include the possible subjective biases described in other survey articles²⁴. Considering the responses that were received, it is not possible to stratify results according to the paediatric age. The low response rate (25.2%; n = 118) could represent a major limitation of this study; however, this value is consistent with a previous survey about the impact of the COVID-19 pandemic on ORL practice conducted by the Task Force of GOS where 154 responses were collected⁸. Moreover, the low response rate may be explained by the fact that paediatric ORL is even a more specialistic topic and not all otolaryngologists treat paediatric patients.

Conclusions

The field of paediatric ORL seemed to be highly impacted by the COVID-19 pandemic with a significant reduction of surgical activities followed by outpatient services and

emergency procedures. Also, the diagnosis of a wide range of conditions, which necessitate time sensitive management, including SNHL, was delayed during these exceptional times. Given the importance of a timely treatment of the ORL diseases in the paediatric age, the implementation of new strategies, such as teletherapy²⁵, it is recommended to avoid potential consequences on growth and development in children and adolescents.

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Conflict of interest statement

The authors declare no conflict of interest.

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Author contributions

All authors meet the International Committee of Medical Journal Editors (ICMJE) criteria: 1) substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work (EMCT, FYR, MTZ, AA, AMDL); 2) drafting the work or revising it critically for important intellectual content (EMCT, MG, GM, GM, MR); 3) final approval of the version to be published (EMCT, MG, GM, FYR, MTZ, AA, AMDL, GR, GM, MR); 4) agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved (EMCT, MG, GM, FYR, MTZ, AA, AMDL, GR, GM, MR). EMCT and MR were specifically responsible for the data collection.

Ethical consideration

This study was approved by the research committee of the Young Otolaryngologists of the Italian Society of Otolaryngology-Head and Neck Surgery (GOS) and the questionnaire administered under permission of the Italian Society of ORL-Head and Neck Surgery (SIOeChCF).

The research was conducted ethically, with all study procedures being performed in accordance with the requirements of the World Medical Association's Declaration of Helsinki.

ki. Informed consent was obtained from each participant for study participation and data publication.

Task Force of the Young Otolaryngologists of the Italian Society of Otolaryngology-Head and Neck Surgery:

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