Head and neck cancer in the post-COVID era: does the pandemic still linger?

Original Article

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Abstract

Introduction: Head and Neck Cancer (HNC) remain the 7th most common cancer worldwide, being number 5 in male patients. The COVID pandemic, and associated health care disruption, led to a decrease in the identification of HNC, with patients presenting at more advanced stages. The present study aims to understand if the pandemic's effects reflected in the post-COVID period, namely leading to more advanced cancers and higher mortality rates.

Materials and Methods: Retrospective observational study that included all patients with a diagnosis of HNC at the Otorhinolaryngology department of Unidade Local de Saúde de Santo António, between January 2020 and December 2025. Demographic and clinical data was collected using the patients digital records. Cancer was staged in accordance with the American Joint Committee on Cancer 2025 guidelines, with patients being divided in Group 1 (Stage 0, Stage I and Stage II) and Group 2 (Stage III and IV) for statistical analysis. COVID years were considered between March 10th 2020 and September 20th 2022, date in which the alert state was lifted in Portugal.

Results: 277 patients were included in the present study, of which 89.5% (n= 248) were from the male sex, with a mean age of 63.49 years (SD 10.570). No statistically significant difference was found between the number of patients admitted through the urgency versus appointment (p= 0.226). In patients admitted through an appointment, time from referral to appointment was significantly shorter during COVID years (p= 0.009), with no differences being found in time from observation to diagnosis (p= 0.328) and between diagnosis and treatment initiation (p= 0.818). No statistically significant difference was found between the number of patients diagnosed with Stage III-IV disease (p= 0.191), with a binary logistic regression showing no association between year of diagnosis and stating at diagnosis.

The percentage of patients who died before the 1-year mark after diagnosis was significantly higher for patients diagnosed during COVID years (p= 0.042), with a binary logistic regression showing a statistically significant association between year of diagnosis and 1-year mortality (OR per year 0.70, 95% CI 0.50-0.98, p= 0.037).

Conclusion: Despite its negative impact on healthcare services, the adaption that came to be during COVID years allowed for a minimization of the possibly negative impacts of the pandemic, with no statistically significant difference being found in staging and with mortality decreasing as the pandemic progressed.
Keywords: Head and Neck Cancer; COVID

Introduction

The COVID-19 pandemic remains one of the biggest challenges faced by healthcare systems worldwide in modern history, with its impact on overall health still being studied. During this period, the allocation of health professionals to patients suffering from acute SARS-CoV-2 infection, paired with fear of infection among the general public, led to the disruption of timely healthcare, with a decrease in consultation numbers, Emergency Department (ED) visits, and even in cancer screening programs[1,2]. This disruption led to a decrease in the diagnosis of new cancer cases in the first 10 months of the pandemic, in the USA, a reflection of diagnostic delays[3], with cancer numbers being 15 to 24% lower than expected in 2020, and 9% lower than 2019 in Portugal[4]. This data points to a deeply negative impact of the pandemic on cancer diagnosis, with numbers also showing a decline in the number of patients undergoing cancer treatment[5].

Head and Neck Cancers (HNC) remain the 7th most common malignancy worldwide, with the ranking rising to fifth place when considering male patients[6]. Despite its prevalence, HNC remains associated with delayed diagnosis, something partly due to disparities in healthcare access, associated to socioeconomic barriers[6]. In fact, this type of tumor still presents its highest incidence in lower socioeconomical communities, who are particularly vulnerable to healthcare disruptions, as happened during the pandemic[7,8,9]. Despite this vulnerability, the impact of the COVID-19 pandemic on HNC diagnosis, and its effect on HNC in the post-COVID era, remains largely unknown. Some studies have shown that, during the pandemic, HNC patients presented with more advanced disease stages, with higher proportions of stage IV patients[10,11]. Additionally, fewer HNC diagnoses were also noted, with Gazzini reporting a statistically significant decrease in new HNC diagnoses in Italy[11]. It is therefore plausible that these changes might have had an impact on the post-COVID years, increasing the number of HNC patients, advanced-stage disease cases, and mortality in the post-pandemic period, especially in the immediate years after the pandemic ended.

The goal of this study was, therefore, to determine whether the COVID-19 disruption of healthcare services and the associated lack of access to healthcare services were reflected in changes in HNC characteristics, namely disease stage and mortality.

Materials and Methods

The present retrospective observational study was conducted at Unidade Local de Saúde de Santo António – Porto. Patients diagnosed with Head and Neck Malignancies by the Otorhinolaryngology and Head and Neck Surgery department between January 2020 and November 2025 were included in the present study. Patients with lymphoid HNC were excluded. The present study was approved by the local ethics committee, and patients' rights were protected in accordance with the ethical principles of the Declaration of Helsinki. Demographic and clinical data were collected from patients' electronic medical records, including gender, age at diagnosis, referral type (D or Outpatient Consultation), cancer location, histological diagnosis, TNM staging, type of treatment, and the need for additional treatment and disease persistence. Dates for the first clinical observation, histological diagnosis, and treatment initiation were also recorded. Patients were staged according to the 2025 American Joint Committee on Cancer guidelines for Head and Neck Cancer, then divided into Group 1 (which included Stage 0, when applicable, Stage I, and Stage II) and Group 2 (Stage III and Stage IV) for analysis.

COVID years were considered from March 10th, 2020, until September 30th, 2022, the date on which the Portuguese government ended the COVID-19 state of alert, and were compared with post-COVID years (from October 1st, 2022, until 31st December 2025).

Statistical analysis was performed using the SPSS version 30 software (IBM Corp., Armonk, NY). A descriptive analysis of patients' characteristics was performed considering frequencies (for categorical variables) and mean and standard deviation (SD) (for continuous variables). Normal distribution was assessed using the Shapiro-Wilks test and through analysis of the skewness and kurtosis. Differences among paired groups were evaluated with the use of a chi-square test (for categorical variables) and an independent sample t-test or Mann-Whitney test (for continuous variables).

Results

A total of 277 patients were included in this study, with a mean age of 63.49 years (SD 10.570), and 89.5% (n=248) were male. 45.8% of patients (n=127) were diagnosed during the pandemic years, while 54.2% (n=150) were diagnosed in the post-COVID years (Table 1). Diagnoses in 2020 included 48 patients; 46 in 2021; 49 in 2022; 54 in 2023; 44 in 2024; and 36 in 2025. The number of diagnosed patients did not significantly differ across years (p=0.446), as shown in Graph 1, which shows the number of patients diagnosed each month for each year included in the study.

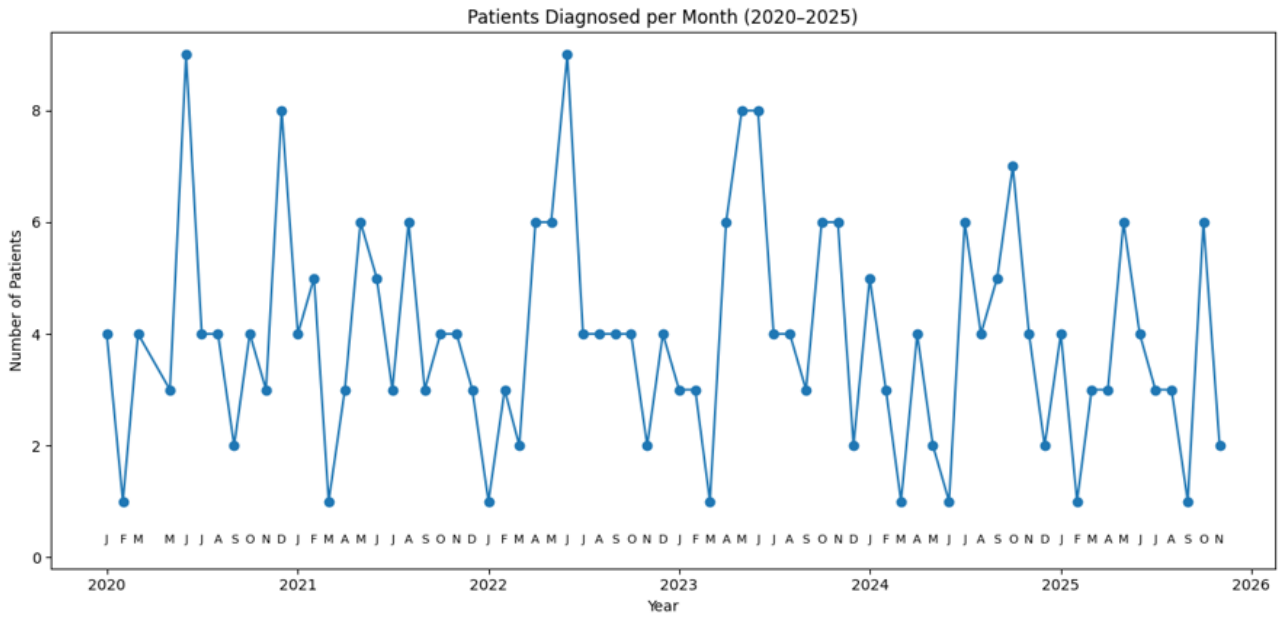
48% (n= 133) of patients were first observed in the ED, with no statistically significant difference found in the route of first observation between COVID and Post-COVID years (p= 0.226). In patients for whom a referral had been placed, the mean waiting time was 45.48 days (SD 48.222), with this time being significantly shorter during the pandemic (40.93 versus 55.98 Non COVID, Z = −2.63, p = 0.009). In patients referred without a previous diagnosis, the average time from Clinical Observation to histological diagnosis was 29.22 days (SD 57.411), with no statistically significant difference observed between COVID and Non-COVID years (Z = −0.978, p = 0.328).

The location of the diagnosed HNC is represented in Table 2. 64.6% (n=173) of patients presented with Stage III or IV cancer, while 35.4% (n=95) presented with Stage I or II. No statistically significant difference was found between staging in COVID and non-COVID years (p=0.191). A comparison was also made between COVID years and the period from September 2022 to September 2023 (the first year after the state of alert was lifted),

Table 1
Demographic data of patients diagnosed with Head and Neck Malignancies

		Percentage (n)	
Sex	Feminine	10.5% (n= 29)	
	Masculine	89.5% (n= 248)	
Age		63.42 (DP 10.570)	
First Observation	Urgency	48.0% (n= 133)	
	Appointment	52.0% (n= 144)	
Time period of diagnosis	COVID	45.8% (n= 127)	2020: 17.3% (n= 48)
			2021: 16.6% (n= 46)
			2022: 17.7% (n= 49)
	Post-COVID	54.2% (n= 150)	2023: 19.5% (n= 54)
			2024: 15.9% (n= 44)
			2025: 13.0% (n= 36)

Graph 1
Temporal distribution of monthly patient diagnoses from January 2020 to December 2025



with no statistically significant difference observed in stage at diagnosis (p=0.123). In 2020, 63% (n= 29) of patients were diagnosed with stage III-IV cancer; in 2021, stage III-IV was observed in 56.8% (n= 25) of patients, with the percentage being of 52.1% (n= 25) in 2022; in 2023, 2024 and 2025 this percentage was of 61.1% (n= 33), 68.2% (n= 30) and 67.6% (n= 23) respectively. To evaluate temporal trends in Staging, a binary logistic regression with year of diagnosis as a continuous predictor was used: year of diagnosis was not significantly associated with advanced stage disease at presentation (OR per year 0.93, 95% CI 0.80-1.08; p= 0.32). Of the 277 patients, 4% (n=11) did not begin any type of treatment: 3 died before a formal therapeutic approach was proposed; 4 refused treatment; and 4 missed their follow-up appointments. Of the patients with a formal treatment proposal, 87.2% (n= 232) began treatment with curative intent. Among these, 60.8% (n= 141) started with medical

Table 2
Location of diagnosed Head and Neck Malignancies

Site	Percentage (n)
Pharynx	42.9% (n= 119)
Larynx	41.5% (n= 115)
Nasal Cavity	7.6% (n= 21)
Unknown Primary	4% (n= 11)
Pharynx and Larynx	1.4% (n= 4)
Oral Cavity	0.7% (n= 2)
Nasal Vestibule	0.7% (n= 2)
Oral Cavity and Pharynx	0.4% (n=1)
Oral Cavity and Larynx	0.4% (n=1)
External Auditory Canal	0.4% (n=1)

treatment, while 39.2% (n= 91) underwent surgery as their primary treatment. No statistically significant difference was found in the type of treatment (medical or surgical) between COVID and non-COVID years (p= 0.420). The mean time between histological diagnosis and treatment initiation was of 49.44 days (SD 26.311) during COVID years and 53.50 days (SD 47.384) in Post-COVID years, with no statistically significant difference being found between values (p= 0.818). Of the 266 patients who maintained follow-up, 35% (n=93) died, with 74.5% (n=70) of these deaths attributed to HNC. To better assess potential differences in mortality among patients diagnosed during COVID years, the percentage of patients who died within one year of diagnosis was calculated for both COVID and Post-COVID years, excluding patients diagnosed in 2025 due to insufficient follow-up. During COVID years, 54.7% of patients died before one year, compared to 45.3% during post-COVID years, and this difference was statistically significant (p=0.042). No statistically significant difference was found between one-year mortality during COVID years and the first year after the state of alert ended (p=0.914). To evaluate temporal trends in 1-year mortality, a binary logistic regression with year of diagnosis as a continuous predictor was used: year of diagnosis was significantly associated with 1-year mortality (OR per year 0.70, 95% CI 0.50-0.98; p= 0.037), with the one-year mortality significantly decreasing over calendar time.

Pharyngeal Tumors

42.9% (n= 119) of patients were diagnosed with pharyngeal tumors. Demographic data and COVID and Post-COVID comparisons for patients with oropharyngeal and hypopharyngeal cancer are represented in Table 3., Table 4. and Table 5.

Laryngeal Tumors

Laryngeal tumors represented 41.5% (n=115) of all diagnosed HNC, with patients presenting a median age of 66.30 years (SD 10.382), and with 91.3% (n= 105) of patients being male. COVID and Post-COVID comparisons for patients with laryngeal cancer are represented in Table 6.

Discussion

The COVID-19 pandemic remains an unprecedented global health crisis, with its impact still being studied. The effects of the pandemic on HNC have been reported inconsistently, with significant differences between countries. However, studies indicate that patients are often presenting with more advanced stages and that there have been disruptions in the timing of initial clinical observation, diagnosis, and/or treatment initiation[13]. These changes could have long-term effects on HNC, potentially leading to more patients presenting with later-stage disease and higher mortality rates.

Regarding HNC as a whole and specifically pharyngeal and laryngeal tumors, our study

Table 3
Demographic data of patients with pharyngeal cancer

		Percentage (n)		
Sex	Feminine	10.1% (n= 12)		
	Masculine	89.9% (n= 107)		
Age				
First Observation	Urgency	54.6% (n= 65)	**COVID: 56.4%**	p= 0.784
	Appointment	45.4% (n= 54)	**Post-COVID: 53.8%**	
	Oropharynx	56.3% (n= 67)		
	Hypopharynx	29.4% (n= 35)		
	Nasopharynx	14.3% (n= 17)		

Table 4
COVID and Post-COVID comparison in patients diagnosed with Oropharyngeal Cancer

COVID		Post-COVID	
Urgency	**Appointment**	**Urgency**	**Appointment**
54.8% (n= 17)	45.2% (n= 14)	61.1% (n= 22)	38.9% (n= 14)
p= 0.606			
Stage I-II	**Stage III-IV**	**Stage I-II**	**Stage III-IV**
22.6% (n= 7)	77.4% (n= 24)	25% (n= 9)	75% (n= 27)
p= 0.817			
Time from Referral to Appointment			
18.17 (SD 12.067)		41.86 (DP 28.115)	
Mann–Whitney U = 18.0, Z = −2.030, **p = 0.042**			
Time from Appointment to Diagnosis			
22.48 (SD 40.722)		5.21 (SD 8.328)	
Mann–Whitney U = 344.5, Z = −1.575, p = 0.115			
Time from Diagnosis to Treatment			
55.30 (DP 25.882)		48.69 (DP 23.797)	
Mann–Whitney U = 265.0, Z = −0.682, p = 0.495			
1-Year Mortality			
52.4% (n= 25)		47.6% (n= 17)	
p= 0.386			

Table 5
COVID and Post-COVID comparison in patients diagnosed with Hypopharyngeal Cancer

COVID		Post-COVID	
Urgency	**Appointment**	**Urgency**	**Appointment**
62.5% (n= 10)	37.5% (n= 6)	47.4% (n= 9)	52.6% (n= 10)
p= 0.378			
Stage I-II	**Stage III-IV**	**Stage I-II**	**Stage III-IV**
6.3% (n= 1)	93.8% (n= 15)	10.5% (n= 2)	89.5% (n= 17)
p= 0.649			
Time from Referral to Appointment			
18.33 (SD 11.776)		26.71 (DP 24.226)	
Mann–Whitney U = 18.500, Z = −0.358, p = 0.721			
Time from Appointment to Diagnosis			
15.07 (SD 10.521)		24.88 (SD 28.805)	
Mann–Whitney U = 106.500, Z = −0.497, p = 0.619			
Time from Diagnosis to Treatment			
42.85 (DP 26.156)		77.44 (DP 101.986)	
Mann–Whitney U = 87.500, Z = −0.724, p = 0.469			
1-Year Mortality			
64.3% (n= 10)		35.7% (n= 7)	
p= 0.697			

Table 6
COVID and Post-COVID comparison in patients diagnosed with Laryngeal Cancer

COVID		Post-COVID	
Urgency	**Appointment**	**Urgency**	**Appointment**
47.1% (n= 24)	52.9% (n= 27)	31.3% (n= 20)	68.8% (n= 44)
p= 0.084			
Stage I-II	**Stage III-IV**	**Stage I-II**	**Stage III-IV**
62.7% (n= 32)	37.3% (n= 19)	45.3% (n= 29)	54.7% (n= 35)
p= 0.62			
Time from Referral to Appointment			
30.17 (SD 23.846)		70.71 (DP 61.999)	
Mann–Whitney U = 148.500, Z = −2.330, p = 0.020			
Time from Appointment to Diagnosis			
42.49 (SD 64.240)		43.32 (SD 75.045)	
Mann–Whitney U = 1468.500, Z = −0.364, p = 0.716			
Time from Diagnosis to Treatment			
43.17 (DP 22.016)		45.53 (DP 26.091)	
Mann–Whitney U = 955.500, Z = −0.711, p = 0.477			
1-Year Mortality			
77.8% (n= 7)		62.5% (n= 10)	
p= 0.441			

showed that the waiting time from referral to appointment was significantly shorter during COVID years compared to post-COVID years. Although healthcare services were highly disrupted by the emerging pandemic, oncologic patients remained a priority for healthcare providers. Despite cancellations or postponements of appointments for non-urgent patients, those referred with suspected cancer, concerning symptoms, or risk factors for HNC were seen in a timely manner. The results of this study suggest alignment with these norms, with the shorter waiting times explained by initial appointment slots being available from non-emergent patients and allocated to those with suspicion of HNC. The return to normal clinical activity in the post-COVID years likely explains the increased time from referral to appointment. These findings are consistent with Stevens et al[14], who observed a reduction in wait time from referral to appointment during COVID years compared to pre-pandemic years. It is also worth noting that there was no statistically significant difference in the number of patients admitted through the ER during COVID or post-COVID years, which supports the relative normalcy of appointment availability for this subset of patients during the pandemic.

Additionally, there wasn't a statistically significant difference in terms of time from appointment to diagnosis and from diagnosis to treatment. These results are in accordance with a recent Systematic Review by Simonsen et al. showing that, in most studies included, only marginal changes in time to treatment were observed during the pandemic and that most included patients actually had a decrease in time to treatment[13].

Despite not finding any statistically significant differences in terms of timings between COVID and Post-COVID periods, the time between referral, appointment, diagnosis and treatment surpassed the recommended times for each step, in both periods. While caution should be taken when analyzing

these numbers, as they include patients referred from primary care with non-urgent referrals, patients who had to undergo further evaluation before a treatment decision could be done and patients who had to be stabilized before treatment could be started, these number further highlight the need to educate primary care services for the recognition of patients at risk for HNC and for healthcare services to streamline access to exams and evaluations to these patients. While these nuances have the potential to deeply affect the timing numbers obtained and, possiblly, the one-year mortality, the existence of a statistically superior one-year death rate in patients diagnosed during the COVID years sustains the effect the pandemic had on the survival of HNC patients.

Regarding staging, our results show that most HNC presented at more advanced stages, during COVID and Post-COVID years. HNC are typically diagnosed at later stages, with 58.5% of HNC diagnosed at stages III or IV in the UK, and with only 29% being deemed localized tumors in the USA[15,16]. These patients are, therefore, typically diagnosed later in the disease progression, even without the constraints of the pandemic. The lack of a statistically significant difference in staging between COVID and Post-COVID years, even when considering each year alone, only reinforces the ideia that these patients are mostly observed when disease progression has already occurred.

One year mortality was significantly higher for patients diagnosed during COVID years, with results also showing a significant decrease in short-term mortality over time. While no difference was found in terms of appointment, diagnosis and treatment timings in the present study, healthcare services and resources were still heavily constrained by the pandemic. The difference in mortality rates is a probable reflection of those constraints, more so than a reflection of the disease itself, as indicated by the lack of a significant difference in Cancer related deaths. This is a probable reflection of the increased mortality rates of the general population during 2020 and 2021, with the oncology population representing an even more vulnerable subset of patients when considering the Sars-CoV2 infection and its complications[17].

There are several limitations to the present study. First and foremost, its retrospective nature relies on written data collection. Secondly, it would be of interest to include a pre-pandemic group to have a better understanding of the pandemic effects and if the post-COVID numbers are similar to the pre-pandemic numbers. Additionally, the present study is single-center and thus these findings may not reflect a broader reality.

Nonetheless, the current study provides a clearer understanding of how adaptation occurred during the pandemic, with cancer patients being prioritized at a time when healthcare was heavily disrupted and non-urgent care was largely postponed. This adaptation, carried out by healthcare professionals, helped minimize the potential negative and long-lasting effects of COVID-19.

Conclusion

The COVID-19 pandemic remains one of the biggest healthcare challenges worldwide, with its effects still lingering. The present study highlights the adaptations that occurred during the pandemic, with appointment times actually being shorter during COVID years and the time to treatment remaining the same between the two periods. This allowed for a relatively normal follow-up of HNC patients, preventing an increase in advanced-stage disease and mortality in the post-COVID years.

Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

Data Confidentiality

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

Protection of humans and animals

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the 2013 Helsinki Declaration of the World Medical Association.

Privacy policy, informed consent and Ethics Committee Authorization

The authors declare that they have written consent for the use of photographs of patients in this article.

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During the preparation of this work, the author(s) did not use Artificial Intelligence and take full responsibility for the content of the publication.

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