Jordan Medical Journal

ORIGINAL ARTICLE

Trends in Salivary Gland Tumors among Jordanians: A Retrospective Multi-Institutional Study

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Received: February 8, 2024
Accepted: July 23, 2024

DOI:
https://doi.org/10.35516/jmj.v59i3.2355

Abstract

Background: Salivary gland tumors are uncommon. To the best of our knowledge, little data are available on the demographics and histopathological distribution of these tumors in Jordan. This study aimed to investigate the clinicopathological aspects of different salivary gland tumors diagnosed in four large Jordanian medical institutions, and to compare our findings with those from different countries.

Materials and Methods: Patients (N= 410) with surgically removed or biopsied salivary gland tumors, diagnosed between 2008 and 2018, were included in a retrospective analysis of the patient's demographics, tumor site, and histopathology type. Corresponding data were retrieved from the archives of the four major referral Jordanian institutions: Jordan University Hospital, King Hussein Cancer Center, King Abdullah University Hospital, and King Hussein Medical City.

Results: The mean age for patients was 46.3 years. Only 6.6% of the cases were for patients younger than 20. Malignancies were found in 59.3% of the cases. The male-to-female ratio was 1.15:1.0. Benign tumors were more common than malignant tumors (69 %), the most frequent of which was pleomorphic adenoma (61.5%), which was more commonly identified in females (62.1%). Warthin's tumor was the second frequent type; it was more commonly seen in males (87.1%). Mucoepidermoid carcinoma was the most common malignant tumor (34.9%). Most of the tumors originated from the parotid glands (85.6%), with a clear predominance of benign tumors.

Conclusion: Our results are in alignment with most studies and slightly different from others, supporting the hypothesis that there is a geographic variation in tumor distribution.

Keywords: Salivary glands, parotid, submandibular, sublingual, tumors.

INTRODUCTION

Salivary gland tumors are uncommon; they represent a diverse set of tumors with a wide range of clinical behaviors, ranging from totally benign tumors to those of low-grade malignant potential to high grade aggressive neoplasms [1]. Collectively, they constitute around 3-4% of all head and neck tumors [2]. The most recent classification of salivary gland tumors set forth by the World Health Organization (WHO) is currently adopted for sub-typing this heterogeneous group of tumors [3].

The most commonly affected glands are the parotid followed by the submandibular; frequently by benign tumors where the most common of which is pleomorphic adenoma [3,4]. The sublingual gland, the third major salivary gland, is the least commonly involved by tumors. Tumors arising from sublingual gland are almost always malignant [5]. The minor salivary glands are distributed underneath the mucosa in the upper aero-digestive tract. The majority of tumors arising from the minor salivary glands are malignant, similar to those affecting the sublingual gland [5].

Discrepancies are found in the literature regarding the most common malignant salivary gland tumors, albeit most studies have found that mucoepidermoid carcinoma, adenoid cystic carcinoma, and carcinoma ex-pleomorphic adenoma are among the most frequent subtypes, with a varying degree of frequency [6].

Many studies have been published to describe the epidemiology of salivary gland tumors in different parts of the world. These studies have shown geographical variations in relative incidence, with discrepancies among demographic features and clinicopathological aspects in different populations [2,4,5]. However, very little data is available regarding the demographics and histopathological distribution of these tumors in Jordan.

The aim of this study was to investigate the clinicopathological aspects of the various types of salivary gland tumors diagnosed in four main large referral Jordanian medical institutions, and to compare findings with those of different countries.

MATERIALS AND METHODS

A retrospective multi-institutional study was conducted in the four major institutions in Jordan (Jordan University Hospital (JUH), King Hussein Cancer Center (KHCC), King Abdullah University Hospital (KAUH), and King Hussein Medical City (KHMC)). The corresponding clinicopathological data were obtained from the archives of the corresponding institutions for the period from January 2008 until December 2018. The data was analyzed for all patients with surgically removed or biopsied salivary gland masses assumed to be primary tumors of the salivary glands, which included age, gender, localization, and histopathology subtype. A total of 410 cases of primary salivary gland tumors from the four centers were identified and analyzed.

All the histopathology slides, including their corresponding immunohistochemical stains, were retrieved, reviewed, and reclassified. The first author (MH) and the last author (MA) reviewed all the material from these cases with the corresponding authors from each institution. The final classification of these tumors was finalized by consensus. Whenever necessary, new sections were prepared and stained with hematoxylin and eosin for more accurate evaluation. All tumors were reclassified according to the latest WHO's histological typing of salivary gland tumors [3].

Availability of complete epidemiological and pathological data of these cases was considered the inclusion criteria in our study. Moreover, non-neoplastic masses and cysts, metastatic tumors, and secondary involvement of the salivary gland by an extension of a primary skin tumor were all excluded from the study.

Our study was approved by the institutional review board (IRB) of each institution. Simple descriptive statistical analysis of the data was performed using the program Microsoft Excel. Categorical variables were analyzed as frequencies and percentages. Quantitative variables were summarized as means.

RESULTS:

Distribution of Tumors According to Age

During the 11-year period, 410 cases of salivary gland tumors were retrieved from the archival material of our institutions. The mean age for all patients with salivary gland tumors was 46.3 with an age range of 3-90 years. The mean age for females with salivary gland tumors was slightly lower than males (43.2 versus 48.9). However, the mean age for all patients with benign tumors was very similar to that for malignant tumors (46.07 and 47.15, respectively). Out of these, 27 (6.6%) cases were identified in patients less than 20 years of age, 10 (37%) of them were benign, 16 (59.3%) were malignant, while one case was of uncertain malignant potential (Figure 1). The highest frequency of benign tumors was observed in the 5th decade (63 cases, 22.3%), while the highest frequency of malignant tumors was observed in the 6th decade (29 cases, 23%). Table 1 shows the distribution of benign and malignant tumors according to different age groups.

Distribution of Tumors According to Gender

Among the 410 cases, 220 (53.7%) were males and 190 (46.3%) were females, with a male to female ratio of 1.15:1.0. Notably, both benign and malignant salivary gland tumors were slightly more prevalent in males. Regarding benign tumors, 153 (54.1%) were identified in males, while 130 (45.9%) were identified in females. For malignant tumors, 67 (53.17%) were identified in males, while 59 (46.8%) were in females.

Table 1: The distribution of benign and malignant salivary gland tumors according to different age groups

Age group (years)	Benign tumors # (%)	Malignant tumors #(%)	Tumors of UMP*# (%)	Total # (%)
0-10	1 (0.4)	2 (1.6)	1 (100)	4 (1)
11-20	9 (3.2)	14 (11.1)	-	23 (5.6)
21-30	40 (14.1)	9 (7.1)	-	49 (12)
31-40	57(20.1)	17 (13.5)	-	74 (18)
41-50	63 (22.3)	23 (18.3)	-	86 (21)
51-60	59 (20.8)	29 (23)	-	88 (21.5)
61-70	38 (13.4)	20 (15.9)	-	58 (14.1)
71-80	14 (4.9)	10 (7.9)	-	24 (5.9)
81-90	2 (0.7)	2 (1.6)	-	4 (1)
Total	283 (69.1)	126 (30.7)	1 (0.2)	410

*UMP: uncertain malignant potential.

Table 2 summarizes the distribution of various tumor subtypes among different genders. Pleomorphic adenoma, the most common benign tumor, was more commonly identified in females (108 cases in females versus 66 cases in males). Male predominance was observed for Warthin tumor (81 cases in males versus 12 cases in females). However, no gender difference was observed for mucoepidermoid carcinoma, which was the most common malignant tumor. On the other hand, adenoid cystic carcinoma, the second most common malignant tumor, was more prevalent in females (17 cases (68%) in females versus 8 cases (32%) in males).

Table 2: The distribution of various salivary gland tumor subtypes by gender.

Tumor subtype	Male # (%)	Female # (%)	Total # (%)
Pleomorphic adenoma	66 (37.9)	108 (62.1)	174 (42.4)
Warthin tumor	81 (87.1)	12 (12.9)	93 (22.7)
Basal cell adenoma	3 (33.3)	6 (66.7)	9 (2.2)
Myoepithelioma	-	4 (100)	4 (1)
Mucoepidermoid carcinoma	24 (54.5)	20 (45.5)	44 (10.7)
Adenoid cystic carcinoma	8 (32)	17 (68)	25 (6.1)
Acinic cell carcinoma	11 (57.9)	8 (42.1)	19 (4.6)
Epithelial/myoepithelial carcinoma	3 (75)	1 (25)	4 (1)
Salivary duct carcinoma	6 (60)	4 (40)	10 (2.4)
Carcinoma ex pleomorphic adenoma	6 (85.7)	1 (14.3)	7 (1.7)
Basal cell adenocarcinoma	1 (33.3)	2 (66.7)	3 (0.7)
Poorly differentiated adenocarcinoma	4 (100)	-	4 (1)
Others *	7 (50)	7 (50)	14 (3.4)
Total	220 (53.7)	190 (46.3)	410

*This list includes hemangiomas, mixed Warthin tumor and pleomorphic adenoma, adenocarcinoma NOS, clear cell carcinoma, marginal zone lymphoma, oncocytic carcinoma, papillary cystadenocarcinoma, polymorphous adenocarcinoma, myoepithelial carcinoma, and sialoblastoma.

Distribution of Tumors According to Histopathologic Type

Overall, benign tumors were far more common than malignant tumors, 283 (69 %) were benign while 126 (30.7%) were malignant. Pleomorphic adenoma was the most frequent among benign tumors (174 cases, 61.5%) while Warthin tumor was the second most common (93 cases, 32.9%). Mucoepidermoid carcinoma was the most common subtype among malignant tumors (44 cases, 34.9%), 20 cases were of low grade and 24 cases were of high grade. Adenoid cystic carcinoma was the second most common malignant tumor constituting 25 cases (19.8%), followed by acinic cell carcinoma (19 cases, 15.1%). The frequency of different tumor subtypes among the study group is illustrated in Table 3.

Table 3: The frequency of different tumor subtypes among the study group.

Tumor subtype	Frequency
Benign tumors	**N=283**
Pleomorphic adenoma	174 (61.5)
Warthin tumor	93 (32.9)
Basal cell adenoma	9 (3.2)
myoepithelioma	4 (1.4)
Pleomorphic adenoma and Warthin tumor	1 (0/4)
Hemangioma	2 (0.7)
Malignant tumors	**N=126**
Mucoepidermoid carcinoma	44 (34.9)
Adenoid cystic carcinoma	25 (19.8)
Acinic cell carcinoma	*19 (15.1)*
Salivary duct carcinoma	*10 (7.9)*
Carcinoma ex pleomorphic adenoma	*7 (5.6)*
Epithelial myoepithelial carcinoma	*4 (3.1)*
Poorly differentiated carcinoma	*4 (3.1)*
Basal cell adenocarcinoma	*3 (2.4)*
Polymorphus adenocarcinoma, low grade	*2 (1.6)*
Myoepithelial carcinoma	*2 (1.6)*
Others*	*6 (4.8)*
Tumors of uncertain malignant potential	
Sialoblastoma	*1*

*****This list includes adenocarcinoma NOS, carcinosarcoma, oncocytic carcinoma, clear cell carcinoma, papillary cystadenocarcinoma, marginal zone lymphoma.

Distribution of Tumors According to Location

Most salivary gland tumors originated from the parotid gland (351, 85.6%). Benign tumors were more significantly observed at this site than malignant tumors (253 cases, 72.3% versus 97 cases, 27.7%). The second most commonly affected gland was the submandibular gland, 36 (8.8%) cases were identified at this site, more than half of which were benign (21 cases, 58.3%). The minor salivary glands were involved in 5% of cases, while the sublingual gland was the least affected by tumors. Only 2 cases were diagnosed in the sublingual gland and both were malignant. In the minor salivary glands, malignant tumors were more common than benign tumors (12 malignant cases versus 9 benign ones). Table 4 shows the relative frequency of benign and malignant tumors in various anatomic locations.

Table 4: The distribution of salivary gland tumors by site.

Site	Benign tumors n=283 # (%)	Malignant tumors n=126 # (%)	Total (%)
Parotid gland	253 (72.3)	97 (27.7)	350 (85.6)
Submandibular gland	21 (58.3)	15 (41.7)	36 (8.8)
Sublingual gland	-	2 (100)	2 (0.5)
Minor salivary glands	9 (42.9)	12 (57.1)	21 (5.1)

DISCUSSION

Salivary gland tumors are well known for their great diversity and marked overlapping of pathological features. However, regardless of their pathologic diversity, these tumors are relatively uncommon. The WHO classification of salivary gland tumors has listed more than 30 subtypes of epithelial tumors, in addition to a few mesenchymal and hematolymphoid neoplasms [3]. Numerous epidemiological studies have been reported in the literature from different countries, with variable results regarding the demographics, frequency and site distribution for each histologic subtype [5]. However, the exact epidemiology of these tumors is not well established because many of these studies were based on limited clinical numbers and are sometimes restricted to specific populations [7]. Herein, we conducted the largest multi-institutional retrospective study in our country and the region, analyzing 410 cases of salivary gland tumors that were diagnosed in the four major medical institutions in Jordan, spanning eleven years.

The mean age of diagnosis for all tumors in our study was 46.3 years. This result is similar to the mean age reported by many other studies. One is from southern Iran which reported a median age of 41.8±16.7 years [8]. Similar studies from Brazil [9], Eastern Caribbean [2],and Northeastern China [10] also reported mean age in the range of 45 years. Additionally, a mean age of distribution in the 5th decade was also reported from United Arab Emirates [11]. On the contrary, our observed mean age of diagnosis was higher than that reported from Cameroon, which was found to be 37.4 years [12]. Moreover, it was lower than the mean age reported from Japan (54.3 years) [13]. A previous study from northern Jordan of parotid gland tumors in 2013, reported a mean age of 50 years, which is slightly older than our mean [14].

Our observed mean ages of diagnosis for benign and malignant tumors were, however, very similar (46.07 and 47.15 years, respectively). This is different from results reported from other studies where the mean age of diagnosis for benign tumors is far lower than that for malignant tumors. This was observed in studies from Nigeria (37.1 versus 48.9 years) [6], southern Iran (37.7 versus 50.6 years) [8], Brazil (43 versus 55 years) [9], Cameroon (37.4 versus 46.9 years) [12], and southern Brazil (46.3 versus 54 years) [7]. On the other hand, similar to our results, no big difference was observed in the mean age of diagnosis between benign and malignant tumors in studies reported from northeastern China (48 versus 51 years) [10] and Croatia (50 versus 56 years) [5]. Moreover, the difference was also minimal in the previous parotid gland tumors study from northern Jordan (48 versus 55 years) [14]. It is possible to speculate that perhaps the cause for this minimal difference is that the northern Jordan study included only parotid gland tumors for comparison.

According to literature, salivary gland tumors are uncommon in teenagers, and the frequency of tumors in this age group only accounts for 1.7-5% of all tumors [15], however, in this age group patients are more prone to have malignant tumors compared to adults. Our study has found that 27 (6.6%) cases of salivary gland tumors were identified in children and adolescents (<20 years of age). A higher percentage of those (16, 59.3%) were malignant when compared to adult cases as discussed below, and only 10 (39%) cases were benign. One case was of unknown malignant potential and was best classified as sialo blastoma (Figure I). This was consistent with previously reported results on childhood and adolescent tumors from other studies [15-18].

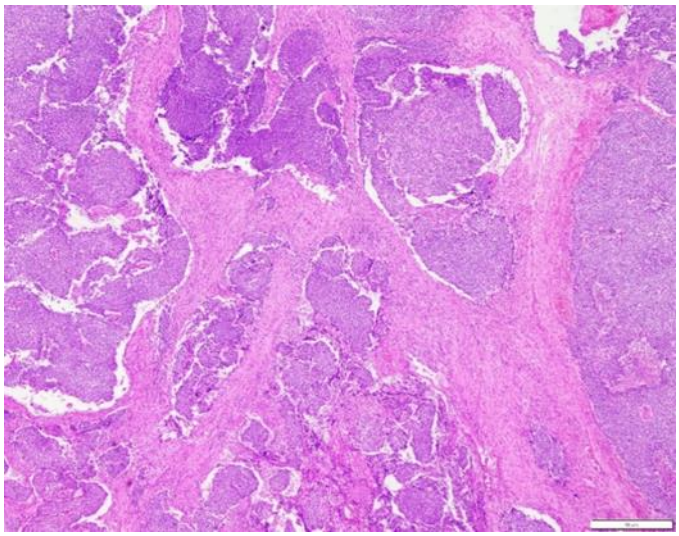

Figure 1a

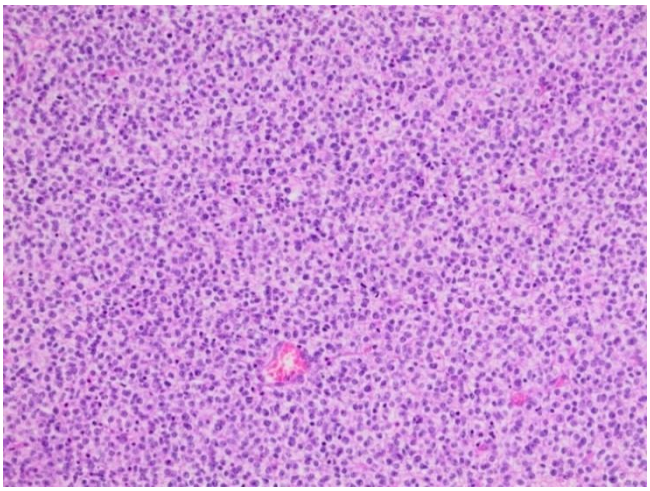

Figure 1b

Figure I: The microscopic appearance of sialoblastoma, a rare tumor of uncertain malignant potential of the salivary glands. Ia: The tumor exhibits solid organoid nests that are composed of basaloid epithelial cells with round to oval nuclei with scant cytoplasm (Ib). (H&E stain, Ia: 4x magnification, Ib: 20x magnification)

This study also showed an overall slight male predominance for all tumors collectively (53.7% males and 46.3% females). Male predominance was also similarly reported from southern Iran [8], Shanghai [19], an eastern Caribbean nation [2], United Arab Emirates [11] and in two previously reported studies from Jordan [14-20]. However, several other studies have reported female predominance, as in reports from Nigeria [6], Brazil [9], Cameroon [12] and Iran [21]. Interestingly, few studies reported no gender difference [5,15]. On the other hand, definite female predominance was observed in pleomorphic adenoma (the most common benign tumor and the most

common salivary gland tumor overall) and adenoid cystic carcinoma (the second most common malignant tumor). The reason for this observation is not well understood, but we can only speculate that it could be partially explained by females' attention to their cosmetic appearance, and seeking medical help earlier, especially since these tumors are located in the head and neck region. These observations need further assessment, due to similar findings regarding predominance of pleomorphic adenoma in females was also reported from several other studies [4, 6-9, 10, 12, 23, 24]. In addition, similar findings regarding adenoid cystic carcinoma were also reported by other studies [9,10, 12, 21]. In contrast to these observations, other studies reported higher frequency of these tumors in males [2, 19, 22].

As reported in many studies [2,4,5,7-15,19,20] the present study indicated that the majority of tumors were benign (69%). A few controversial studies from Nigeria and Iran reported a predominance of malignant tumors [6, 21, 22] the reasons for this were most likely due to institutional variations and possible selection bias from which the cases were evaluated in those studies.

Pleomorphic adenoma was the most frequent salivary gland tumor overall (42.4%), and the most common benign tumor (61.5%), followed by Warthin tumor. This finding was in concordance with the results from most other reported series [5, 6, 8, 11-15, 20, 25]. The second most common benign tumor was Warthin tumor (93 cases, 22.7% of tumors overall and 32.9% of benign tumors). Warthin tumor was more frequently seen in males (78.1% of cases were males), this could be partially explained by the strong well-known association of this tumor with smoking [3] and that women had lower prevalence of smoking [26]. This finding was concordant with many other series findings [6,8,13, 14,15]. It will be interesting to see if the frequency of Warthin tumor among females may change in future studies from Jordan, since a growing incidence in women has been reported in some extended retrospective studies [27,28].

Among malignant tumors, however, mucoepidermoid carcinoma was found to be the most common subtype, followed by adenoid cystic carcinoma. Similar findings were also reported from Brazil [7,9], north China [15], an eastern Caribbean Nation [2], Iran [21], United Arab Emirates [11], Chile [4], the United States of America [29-31] and from Italy [32]. On the contrary, some authors have reported adenoid cystic carcinoma as the most frequent malignant salivary gland tumor, followed by mucoepidermoid carcinoma, as in those studies from Nigeria [6], Cameroon [12], Japan [13], Croatia [5], and southern Iran [8]. Interestingly, a previous retrospective study from eastern China spanning 23 years included 6,982 cases of primary salivary gland tumors and found that malignant tumors were predominantly mucoepidermoid carcinoma (30%) and adenoid cystic carcinoma (30%) [25]. This variation in histopathological patterns may be attributed to differences in etiological factors in different geographic locations as well as a selection bias depending on the institutions from which the cases were collected. Figure II shows the microscopic appearance of papillary cystadenocarcinoma, a rare variant of malignant tumors.

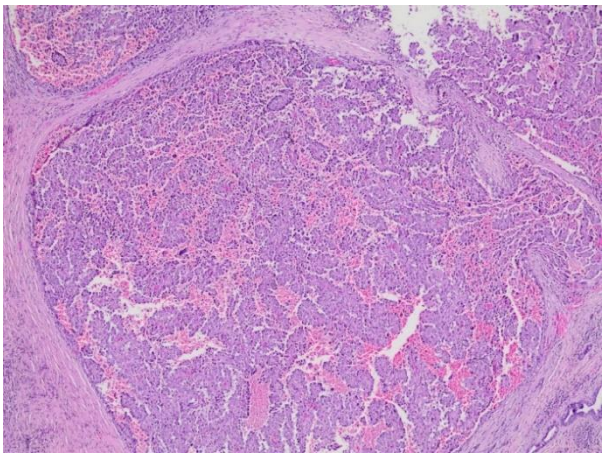

Figure 2a

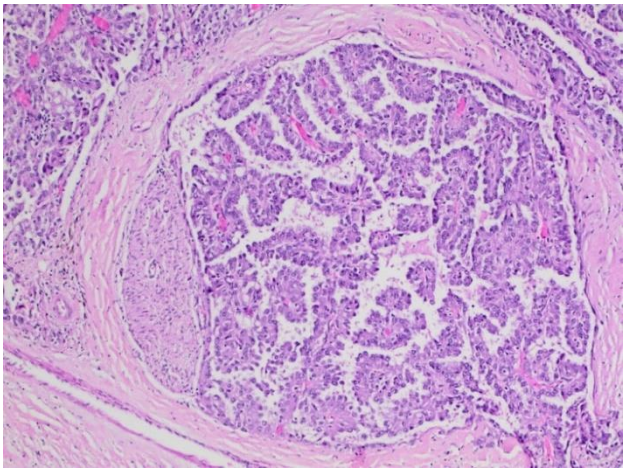

Figure 2b

Figure II: The microscopic appearance of papillary cysadenocarcinoma, a rare malignant tumor of the salivary glands. The tumor exhibits haphazardly arranged cysts, that focally infiltrate the adjacent paranchyma, the lumens of which exhibit varying degrees of papillary proliferation. The nuclei of the epithelial cells are uniformly bland and mitosis is rare. (H&E stain , IIa: 10x magnification, IIb: 40x magnification)

In the present study, the majority of salivary gland tumors were located in the parotid. Among the 410 cases, tumors from the parotid, submandibular, sublingual, and minor salivary glands accounted for 85.6%, 8.8%, 0.5% and 5%, respectively. Additionally, the majority of parotid gland tumors were benign. Malignant tumors predominated over benign tumors in the minor salivary glands. Several large series in the literature have reported similar results with some discrepancies in the frequency of tumors among the submandibular and minor salivary glands [2, 4, 5, 7-9, 12, 13, 15, 19]. Similar results were also observed in previous studies from Jordan and United Arab Emirates [11,20]. On the contrary, a few studies reported contradictory results, where most of salivary gland tumors originated from minor salivary glands, as

reported from Iran and Nigeria, where 73.9% and 70.6% of tumors were derived from minor salivary glands, respectively [6,21]. The sublingual gland was least involved with tumors. In our study, only two cases were located at this site, and both were malignant, and this observation is consistent with what was reported in the literature [3,5].

After a thorough review of the English language literature, only three previous studies were found about this topic in Jordan [14,20,33]. However, those studies were limited by the number of cases and institutions from which the cases were evaluated. Two of those studies [14,20] showed nearly similar results to the current study in terms of the mean age of diagnosis and gender distribution. In addition, the parotid gland was the most common site involved with tumors, predominantly by benign tumors. Pleomorphic adenoma and mucoepidermoid carcinoma were the most common benign and malignant tumors, respectively. However, one of those studies [33] showed slightly different results from the current study, in which there was female predominance for tumors overall. Although the parotid gland was the most common site involved in that study, only half of the tumors involved the parotid in comparison to our study where 85.6% of tumors involved the parotid. In addition, adenoid cystic carcinoma was the most common malignant tumor reported in that study, in contrast to mucoepidermoid carcinoma of this study. The reason for this variation is probably due to the limited number of cases involved in that study at that time, where only 102 cases were included, and they were only from a single institution.

Our study has some limitations, as the retrospective design is inherently associated with data bias and is susceptible to incomplete data capture, which might influence the conclusions of certain findings especially in rare tumor subtypes. In addition, our findings may not be directly applicable to other populations or geographic regions in Jordan, especially the southern region, which was not covered by our study despite the fact that most of these patients would have been transferred to one of the study referral institutions. Furthermore, simple descriptive statistics were utilized which could not provide deeper insights into factors influencing tumor trends and characteristics. However, the study's strengths include being a comprehensive multi-institutional approach and the reclassification of the tumors according to the latest WHO criteria, ensuring the reliability of our findings. In addition, we strongly believe that this is the first multi-institutional study of its kind in our region.

CONCLUSION

In conclusion, our study presents the largest multi-institutional analysis of salivary gland tumors in our country and in the region. Although our results were relatively similar to results from different series, our study is peculiar in that it represents the largest study carried out in Jordan and the region. We noticed a slight overall tendency for males, however, pleomorphic adenoma, which was the most common benign tumor in our study, affected female patients more frequently.

In addition, this study emphasizes the importance of collaboration between different healthcare institutions to investigate diseases with more representative samples and better statistical data. Since salivary gland tumors are considered a heterogeneous group of neoplasms, a multi-institutional approach to improve our knowledge and understand the burden and clinicopathological features is

always recommended. Overall, our results are in alignment with most studies and slightly different from others, supporting the hypothesis that there is a geographic variation in the distribution of these tumors that could be related to different etiologic factors, which should be investigated in further studies.

Conflict of interest

We confirm that none of the authors have any conflicts of interest associated with this manuscript.

Funding support

We have received NO Source(s) of support in the form of grants, equipment and/or drugs.

Author contribution statement:

This manuscript has been read and approved by all the authors, and the requirements for authorship have been met and each author believes that the manuscript represents honest work.

Acknowledgements

We thank Ali. M. Al-Abbadi, who is a native English-speaker for his copy edits.

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أورام الغدد اللعابية بين الأردنيين: دراسة استعادية من مؤسسات متعددة

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Received: February 8, 2024

Accepted: July 23, 2024

DOI:
https://doi.org/10.35516/jmj.v59i3.2355

الملخص

الخلفية والاهداف: تعتبرأورام الغدد اللعابية من الاورام النادرة. بناء على الدراسات السابقة, لا تتوفر سوى القليل من البيانات حول التركيبة السكانية والتوزيع النسيجي المرضي لهذه الأورام في الأردن. تهدف هذه الدراسة إلى تحديد الجوانب المرضية لأورام الغدد اللعابية المختلفة التي تم تشخيصها في اكبرأربع مؤسسات طبية أردنية ، ومقارنة النتائج مع تلك الموجودة في مختلف بلدان العالم.

منهجية الدراسة : تضمنت الدراسة المرضى الذين يعانون من أورام الغدة اللعابية التي تمت إزالتها جراحيًا أومن خلال أخذ خزعة نسيجية, بأثر رجعي ,وعددهم 410، و تم تشخيصهم بين عام 2008 و2018، و تم دراسة التركيبة السكانية ، وموقع الورم، والنوع النسيجي للورم. و قد تم استخراج البيانات من أرشيفات المؤسسات الطبية الأردنية الرئيسية الأربع: مستشفى الجامعة الأردنية، مركز الحسين للسرطان، مستشفى الملك عبد الله الجامعي، ومدينة الحسين الطبية.

النتائج: كان متوسط عمر المرضى 46.3 سنة. وكانت 6.6% فقط من الحالات لمرضى تقل أعمارهم عن 20 عامًا حيث كانت نسبة الأورام الخبيثة في هذه الفئة 59.3% من الحالات. وكانت نسبة الذكور إلى الإناث 1.15:1.0. كانت الأورام الحميدة أكثر شيوعاً من الأورام الخبيثة (69%)، وأكثرها شيوعاً هو الورم الحميد متعدد الأشكال (61.5%)، والذي كان أكثر شيوعاً عند الإناث (62.1%), و كان ورم وارثين هو ثاني اكثر الاورام شيوعا و لكنه اكثرشيوعاً عند الذكور (87.1%). كان سرطان الجلد المخاطي هو الورم الخبيث الأكثر شيوعًا (34.9٪). معظم الأورام نشأت من الغدد النكافية (85.6%)، حيث كانت الأورام الحميدة هي السائدة.

الاستنتاجات : تتوافق نتائجنا مع معظم الدراسات وتختلف قليلاً عن الدراسات الأخرى، مما يدعم الفرضية القائلة بوجود تباين جغرافي في توزيع هذه الاورام.

الكلمات الدالة: الغدد اللعابية، الغدة النكفية، الغدة تحت الفك السفلي، الغدة تحت اللسان، الأورام.