ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 06 | June - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

HISTOMORPHOLOGICAL STUDY OF SALIVARY GLAND TUMORS AT SMS MEDICAL COLLEGE JAIPUR DURING 2021-22.

Pathology

Dr. Sheela Kuldeep Resident, Department of Pathology, Sawai Man Singh Medical College, Jaipur.

Dr. Kalpana Mangal* Professor, Department of Pathology, Sawai Man Singh Medical College, Jaipur. *Corresponding Author

Dr. Navita Gupta Senior Demonstrator, Department of Pathology, Sawai Man Singh Medical College, Jaipur.

Dr. Mahi Gupta MBBS Student, Geetanjali medical college, Udaipur.

ABSTRACT

Background: Salivary gland lesions are morphologically and clinically diverse group of lesions which is difficult task for histomorphological interpretation. Since salivary gland tumors are uncommon owing to limited experience with them. Also there are different and limited epidemiological data especially of rare cases of salivary gland tumors. The salivary gland system comprises three pairs of major glands (parotid, submandibular and sublingual) and about 500-1000 lobules of minor glands dispersed in the submucosa of the oral cavity. Benign and malignant lesions arise from major and minor salivary glands. This prospective study was carried out to know the diverse histopathological spectrum of various salivary gland neoplasm and to study the distribution of salivary gland tumor according to age sex and site. **Method:** A Laboratory based Descriptive type of Observational study done in Department of Pathology, S.M.S Medical College. Jaipur from July 2021 to june 2022, 65 cases of salivary gland tumors were included and histologically divided into benign and malignant lesions according to WHO classification of salivary gland tumours and analysed statically. **Result:** Out of 65 cases, 76.92% cases were Benign and 23.08% malignant. Pleomorphic adenoma and Warthin's tumor were most common benign tumor and in malignant tumors, Mucoepidermoid carcinoma was most common malignant tumor followed by Adenoid cystic carcinoma. Male preponderance seen in benign tumor and malignant tumors were more common in females. Age wise distribution showed that benign lesions were common between 3rd to 5th decade, whereas malignant tumors between 3rd to 7th decade. Parotid gland was most commonly involved (64.62%) followed by minor salivary glands (20%) and submandibular (15.38%). **Conclusion:** Histomorphological examination of salivary gland tumors is the most important method in establishing the final diagnosis, typing, staging and grading of malignant tumors. Our select results are different from other published literatures. There are a limited number of published literatures on rare tumor of salivary glands which we found in our study.

KEYWORDS

Salivary gland tumors, Histomorphological, Benign tumor, malignant tumor.

INTRODUCTION

Salivary gland tumors (SGTs) are tricky areas of diagnostic pathology, with multiple overlapping features and significant morphological diversity. The problems are compounded by the number of different tumors.[1]SGT accounts less than 3-10% of head and neck neoplasm[2]. As per 2005, revised WHO classification of salivary gland tumors account for more than 35 distinct variants of salivary gland neoplasm[3] and they represent <5% of head and neck tumors[4]. This tumor shows a striking range of morphological diversity between different tumor types and sometimes within an individual tumor mass. In addition, hybrid tumors differentiation and the propensity for some benign tumor stop progress to malignancy can confound histopathological interpretation.[3]

In India, overall incidence of SGTs can be ascertained from the cancer registry established by Indian Council of Medical Research.[5] However, the geographic area and population covered by these registries are very small and perhaps unrepresentative of the Indian population. In addition, there is a limited published literature on SGTs in Indian population.[6]

Parotid, submandibular and sublingual glands are three major salivary glands present in the oral cavity in pair The distribution of salivary neoplasm between sites has followed a rule of 100: 10: 10: 1 ratio for parotid, submandibular, minor salivary glands and sublingual tumors, respectively. About 80% of all tumors are benign and can be appreciated that salivary gland malignancies are very rare with reported incidence of only 1.2 to 1.3 cases per 100,000 and representing around 3% of all cancers of the head and neck.[7] Benign tumors commonly occur in the age group of 30-70 years (fourth decade) whereas peak incidence of malignant tumors is in the 6th to 7th decades. Malignant tumors are more frequent in women than men.[8] Among the pediatric age group, 35% of salivary gland tumors are considered malignant.[9]

Although the aetiology of salivary gland tumors is unknown, literature reports certain risk factors implicated in causation of these tumors. Among the viruses, Epstein-Barr, polyoma, cytomegalovirus, human immune deficiency and human papilloma virus types 16, 18 are likely to cause salivary gland neoplasm. Patients exposed to head and neck radiation for treatment shows increased incidence. Certain occupations such as asbestos mining, manufacturing of rubber products and plumbing (exposure to metals) and working in the automobile are other risk factors.[10,11,12]

The parotid gland is the most commonly affected salivary gland and it accounts 70% of all cases. The second most commonly affected salivary gland is submandibular which accounts for 15% of total cases. Sublingual is involved in 1% cases and minor salivary gland in 5 to 15% cases.[12] Pleomorphic adenoma is the most common benign salivary gland tumor and mucoepidermoid is the most common malignant tumor of the salivary gland.[13] Clinically, salivary gland tumors present as a slow growing mass. However, rapid growth, pain, nerve involvement and fixation to skin or underlying muscles indicate malignancy.12 Traditionally, these tumors are diagnosed on morphological grounds, with ancillary special stains and immune histochemistry. This prospective study was carried out to know the diverse Histopathological spectrum of various salivary gland neoplasms.

MATERIALS AND METHODS

A laboratory based descriptive type of observational study was conducted on salivary gland biopsies received from patient admitted in SMS Medical College and attached hospitals. The study was done in department of pathology S.M.S Medical College, Jaipur from July 2021 to June 2022. All formalin fixed biopsies were included in our study. Autoimmune, inflammatory, granulomatous lesion involving major and minor salivary glands and inadequate and improperly fixed biopsies were excluded. The tissue was fixed in 10% buffered formalin for histopathological examination. Processing was done by automated tissue processor and then paraffin embedded blocks were made in the usual manner. Thin section of 3-5micron was cut using a microtome. Sections were stained by haematoxylin and eosin and special stains like Periodic Acid Schiff and Mucicarmine. After staining, sections were examined microscopically.

RESULTS

Out of total 65 cases, 50 (76.92%) were diagnosed as benign tumor and 15 (23.08%) as malignant tumor. In this study, pleomorphic salivary

adenoma was the most common among all salivary gland tumors comprised of 52.3% cases followed by Warthin's tumors (12.3%), Mucoepidermoid carcinoma (9.23%), Hemangioma (6.15%), Adenoid cystic carcinoma (4.61%), Basal cell adenoma (4.61%) Polymorphous adeno carcinoma (4.61%) and one case each for Papilloma (1.53%), CA ex Pleomorphic adenoma (1.53%), Epithelial myoepithelial (1.53%) and Squamous cell carcinoma (1.53%). In our study, we have observed that 47.70% of cases all tumor belongs to 31 to 50 years of age groups. Benign tumors were common in the age group of 21 to 50 and malignant tumors were common in the age groups 21 to 70 years.In our study, benign tumors were significantly higher in males as compared to females while on the other side malignant tumors were more common in females as compared to males. The male-to-female ratio in benign and malignant tumors was 1.77:1 and 0.36:1 respectively. The overall male-to-female ratio was 1.24:1. From site wise distribution the most common site for the all salivary gland tumors was parotid gland (64.62%) followed by minor salivary gland (20%) and sub mandibular gland (15.38%).

Table 1: Incidence Of Salivary Gland Tumors

Tumors	Number	Percentage (%)
Pleomorphic salivary adenoma	34	52.30
Warthin's Tumors	8	12.30
Hemangioma	4	6.15
Basal cell adenoma	3	4.61
Papilloma	1	1.53
Mucoepidermoid carcinoma	6	9.23
Adenoid cystic carcinoma	3	4.61
Polymorphous adenocarcinoma	3	4.61
CA ex-Pleomorphic adenoma	1	1.53
Epithelial myoepithelial carcinoma	1	1.53
Squamous cell carcinoma	1	1.53
Total	65	100

Table 2: Distribution of Benign Tumors according to age, sex and site

Benign Tumors	Pleo-morphic adenoma	Warthin's Tumors	Heman-gioma	Basal cell adenoma	Papil-loma	Total
0-10	0	0	0	0	1	1
11 -20	4	0	2	0	0	6
21-30	8	0	1	0	0	9
31-40	12	0	1	1	0	14
41-50	8	4	0	0	0	12
51-60	0	1	0	1	0	2
61-70	1	3	0	1	0	5
71-80	1	0	0	0	0	1
Male	22	6	4	0	0	32
Female	12	2	0	3	1	18
M:F Ratio	1.83:1	3:1	4:0	0:3	0:1	1.77:1
Parotid	20	8	2	2	0	32
Minor Salivary gland	8	0	0	1	1	10
Subman-dibular	6	0	2	0	0	8

In our study among the benign salivary gland tumors pleomorphic adenoma was commonly seen in 21 to 50year whereas Warthin's tumor was more common in 41 to 70 years. Hemangioma was seen in 21 to 40 years. Basal cell adenoma was seen in higher age group and papilloma was seen in lower age group. In our study, male predominance was seen in pleomorphic adenoma, Warthin's tumor and hemangioma. However cases were more common in female in basal cell adenoma and papilloma. overall male predominance was seen in benign tumors and male to female ratio was 1.77:1. In our study, parotid gland was the most common site for all the benign salivary gland tumors except hemangioma which was equally distributed in parotid gland and submandibular gland. Papilloma was seen in minor salivary gland only. Over all most common site for benign tumor was parotid followed by minor salivary gland and submandibular gland. (Table 2)

Table 3: Distribution Of Malignant Tumors According To Age, Sex And Site

Mali-gnant Tumors	Mucoepi-dermoid carci-noma	Adenoid cystic carci-noma	Polymor-phous adenocar-cinoma	CA ex-Pleo-morphic adenoma	Epith-elial myoepith elial car-cinoma	Squa-mous cell carci-noma	Tot al
0-10	0	0	0	0	0	0	0
11 -20	1	0	0	0	0	0	1
21-30	2	0	0	1	0	0	3
31-40	0	1	1	0	0	0	2
41-50	0	1	1	0	0	1	3
51-60	2	0	0	0	0	0	2
61-70	0	1	1	0	1	0	3
71-80	1	0	0	0	0	0	1
Male	3	1	0	1	0	0	5
Female	3	2	3	0	1	1	10
M:F Ratio	1:1	0.5:1	0:3	1:0	0:1	0:1	0.5 :1
Parotid	6	0	2	1	0	1	10
Minor Salivary gland	0	1	1	0	1	0	3
Subman dibular	0	2	0	0	0	0	2

In our study, cases of mucoepidermoid carcinoma were seen between 11 to 80 years, adenoid cystic carcinoma and polymorphs adenocarcinoma were found between 31 to 70 years. One case of CA ex-Pleomorphic adenoma was seen in 25year male, one case of epithelial myoepithelial carcinoma in 64year female and one case of squamous cell carcinoma in 46year female. Overall female predominance was seen in malignant salivary gland tumors except mucoepidermoid carcinoma which was equally distributed among male and female and carcinoma ex Pleomorphic adenoma where male predominance was seen and M:F ratio was 1:0. Parotid gland was the commonest site for malignant tumors followed by minor and sub mandibular gland. Mucoepidermoid carcinoma was seen in parotid gland (40%). Adenoid cystic carcinoma was seen more commonly in submandibular gland (13.33%) and minor salivary gland (6.66%). (Table 3)

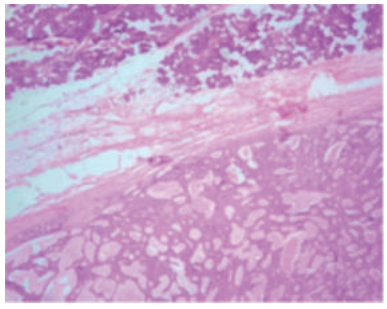

Fig:1 Pleomorphic Adenoma (H&E 4X).

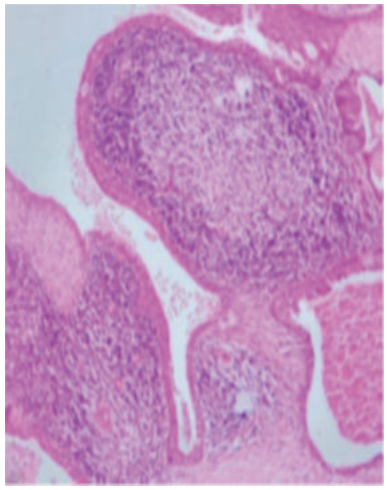

Fig: 2 Warthin's Tumor (H&E 10X).

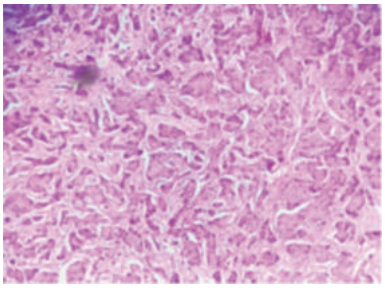

Fig. 3 High Grade Mucoepidermoid Carcinoma (H&E10X).

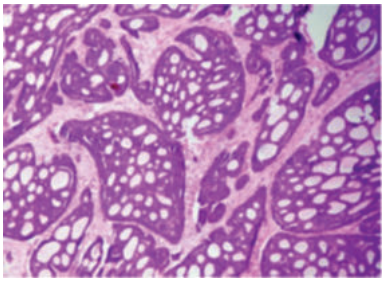

Fig.4 Adenoid Cystic Carcinoma (H&E 10X).

DISCUSSION

This study was conducted over a period of 1 year from july 2021 to june 2022 in Department of Pathology, SMS Medical College Jaipur. 65 cases of salivary gland tumors were studied with respect to age, sex, site, personal history and microscopic features.

Benign tumor more common (76.92%) than malignant (23.08%) as found in the present study as well as in previous studies done by J margaret Theresa et al[13] (70.17 % benign and 29.83 malignant), Susmitha N S et al[14] (65.08% benign and 34.92% malignant) and Sando Z et al[4] (78.10% benign and 21.90% malignant),

In our study, pleomorphic adenoma was the most common tumor (52.30%) followed by Warthin's tumor (12.30%) and mucoepidermoid carcinoma (9.23%). In this study, Pleomorphic salivary adenoma was the most common among all salivary gland tumors comprised of 52.3% cases followed by Warthin's tumours (12.3%), Mucoepidermoid carcinoma (9.23%), Hemangioma (6.15%), Adenoid cystic carcinoma (4.61%), Basal cell adenoma (4.61%) Polymorphous adenocarcinoma (4.61%), and one case each for Papilloma (1.53%), CA ex-Pleomorphic adenoma (1.53%), Epithelial myoepithelial (1.53%) & Squamous cell carcinoma (1.53%).

M. Hemalata et al[20] Pleomorphic adenoma accounted for 70.3% of all salivary gland tumors followed by mucoepidermoid carcinoma (10.9%), Warthin tumor (8%). Gomathi Srinivasan et al[16] Pleomorphic adenoma was 64% and mucoepidermoid carcinoma was 8%, Warthin's tumor was 4%, Basal cell adenoma 4%, myoepithelioma 4%, benign metastasising Pleomorphic adenoma 4%, schwannoma 4%, Myoepithelial carcinoma 4% and carcinoma ex Pleomorphic adenoma 4%. Dr Anurag Mohan et al[18] Pleomorphic adenoma was 76.5%, monomorphic adenoma 2.9% and mucoepidermoid carcinoma was 8.8%, Warthin's tumor was 2.9 %, adenoid cystic carcinoma 5.9% and acinic cell carcinoma 2.9%. Dharmesh Kapuriya et al[15] Pleomorphic adenoma was 81.8%, Warthin's tumor was 9.09%, Nerve sheath myxoma 2.27%, mucoepidermoid Carcinoma 2.27%, and poorly differentiated angiosarcoma 2.27%.

From age by distribution of the tumors it was observed benign tumor are seen in middle age group (21-50 years) malignant tumors are more common in higher age group that is also observed in other studies done by Gomathi Srinivasan et al benign cases in 21-50 years and malignant cases were more in 41-70 years of age groups. Anushree CN et al[17] observed benign cases in 31 -50 years and malignant cases were more in 50-70 years of age groups. Syed Imtiyaz Hussain et al [19] observed benign tumors in 21-50 years and malignant tumors 21-60 years.

In present study there is female preponderance (M:F 0.36:1) in malignant tumor as in most of the studies by Gomathi Srinivasan et al[16] (M:F 1:3), Shinde A et al[24] (M:F 0.6:1) and Dharmesh Kapuriya et al[15] (M:F 1:1.4). however in benign tumor there is male preponderance observed (M:F 1.77:1). Which is correlates with Dharmesh Kapuriya et al[15] and Bashir S et al[21] (M:F 2.5:1).

In our study parotid gland was the commonest site for all tumors (64.62%) followed by minor salivary gland (20%) and submandibular gland (15.38%). In most of the studies done by M. Hemalata et al[20], Gomathi Shinivasan et al[16] and Syed Imtiyaz Hussain et al[19] sub mandibulargland is the second most common site for salivary gland tumors. But in our study minor salivary gland was the second most common site which is correlate with Anurag Mohan et al[18].

In our study, Pleomorphic adenoma was the most common salivary gland tumor accounting for 52.30 of all tumor and 68% of all benign tumors. This study corelate with Susmitha N.S. et al[14](41.26% of all tumor and 63.4 % of all benign tumors) and J margaret Theresa et al[13](57.89% of all tumors and 82.5 % of all benign tumors).

Commonly seen in 21 to 50year of age and M:F ratio was 1.83:1 this study corelate with Syed Imtiyaz hussian et al[19] age group 21-50 year and M:F ratio was 1.8:1

In our study, Pleomorphic adenoma was most commonly seen in parotid gland (58.8%) followed by minor salivary gland (23.5%) and sub mandibular gland (17.6%). In most other studies parotid gland was most common site for pleomorphic adenoma but second most common site was submandibular gland followed by minor salivary gland. Bashir S et al[21]parotid 65.30% submandibular 20.40% and minor salivary gland 4.08%, Syed Imtiyaz hussian et al[19] parotid (47.6%), submandibular (14.2%), minor salivary gland (4.7%). our study corelate with M Hemlata et al[20]parotid (79.4%), minor (11.3%), and submandibular gland (9.3%).

In this study Warthin's tumor accounts (12.3%) of all tumor and (16%) of all benign tumors. This is correlate with that of Dharmesh Kapuriya et al[15] (9.3% of all tumor and 9.75 % of all benign tumor) and Sushimita N.S et al[14] (19.04 % of all tumor and 29.2% of all benign tumors.

Age incidence was seen in 41 to 70year with M:F ratio 3:1 correlate with De Oliveira FA et al[2] (peak age group 30-79 years and M:F ratio was 1:0.6). In a study by Anushree CN et al[17] in which most commonly in volved age group 30 to 59 and M:F ratio was1.2:1.

In this study the Warthin's tumor was found only in parotid gland this study correlate with J Margaret Theresa et al[13] and Bashir S et al[21].

Three cases of basal cell adenoma accounting 4.6% of all tumor and 6% of all benign tumor occurring in 38, 54 and 61year female in parotid and minor salivary gland.

In a study by M Hemlata et al[20] this tumor accounting for 2.9% of all tumor 3.5% of benign tumor. Two each occurred in submandibular gland, with equal sex distribution. The commonest age group was 5th to 6th decades. In a study by Shinde A et al[24], three cases of basal cell adenoma accounting 3.75%of all tumor and 6.5 % of all benign tumor.
In this study mucoepidermoid carcinoma was the most common malignant tumor accounting 9.23% of all tumors and 40% of all malignant tumors. Sando Z et al[4] mucoepidermoid carcinoma 22.4% of all malignant tumor. Saldanha C et al[26](26.15%) cases were malignant, of which mucoepidermoid carcinoma 8 (12.31%) was frequently observed. Anushree CN et al[17] Most common malignant tumour of salivary gland is mucoepidermoid carcinoma (22.85% of all salivary gland tumor and 53.33% of all malignant tumor). J margaret Theresa et al[13] 1mucoepidermoid carcinoma was the most commonly observed malignant tumor (10.52% of all tumor and 35.29% of all malignant tumor).

Commonly seen between age group 11 to 80 year and M:F ratio was 1:1. and all cases were occurred in parotid gland. M. Hemlata et al[20] the commonest age group involved was 15 to 30 years (47% cases), out of fifteen, 14 cases were reported in parotid gland except for one which was reported in submandibular gland. De Oliveira FA et al[2] age group 10 to 89 years, M:F ratio was 1:1.7, DR. Radhika et al[27] most of the cases seen in parotid gland, Pachori et al[22] Age incidence of mucoepidermoid carcinoma in 21-70 year age group with female predominance.

In this study adenoid cystic carcinoma was the second most common malignant tumor accounting 4.6% of all tumor and 20% of. all malignant tumor. In Pachori et al[22] 3 cases of adenoid cystic carcinoma

were found accounting for 4.41 % of all tumors and 21.43 % of malignant tumors, Bashir S et al[21] 2.5 % of all tumor and 6.45% 0f all malignant tumor. J margaret Theresa, et al[13] 8.77 % all tumor and 29.41% of all malignant tumor.

All cases were distributed between age group 31 to 70, M:F ratio 0.5:1 and out of three cases 66.67% were seen in Submandibular gland and rest in Minor Salivary Gland. Ahmed Oluwatoyin Lawal et al[25] peak age incidence between 60 to 69 years M:F ratio 1:1.25, De Oliveira FA et al[2] peak age incidence 20 to 89 years and M:F ratio was 1:2, Syed Imtiyaz Hussain et al[19] age group 21 to 60 and M:F ratio 5:1, Sushimita N.S et al[14] All cases were distributed between age group 30 to75 year Anushree CN et al[17] age group 40 to 69 years, Thomas et al[23] (M:F ratio was 1.33:1). Most commonly seen in submandibular gland (66.66% cases) followed by minor salivary gland as seen in study by Bashir S et al[21], Syed Imtiyaz Hussain et al[19] (most commonly seen in minor salivary gland followed by submandibular gland).

In the present study 3 cases of polymorphous low grade adenocarcinoma accounting 4.61% of all tumor and 20% of all malignant tumor Seen in female of age group 31 to 70 year. Syed Imtiyaz Hussain et al[19] two cases (2% of all tumor and 5.4% of all malignant tumor) of polymorphous adenocarcinoma were seen in male, age group 41 to 50 year. Shinde A G et al[24] three cases (3.75% of all tumor and 8.82% of all malignant tumor) were found (M:F rato1:2). Out of three cases two were seen in parotid and one in minor salivary gland J Margaret Therasa et al[13] one case of polymorphous adenocarcinoma was seen in minor salivary gland. Bashir S et al[21] one case was seen parotid and one case in submandibular gland. Syed Imtiyaz Hussain et al[19] all cases seen in minor salivary gland.

One case of carcinoma ex Pleomorphic adenoma accounting 1.53% of all tumor and 6.66% of all malignant tumor was seen in 25year male in parotid gland. Ahmed Oluwatoyin Lawal et al[25] five cases 2.3% of all malignant tumor were seen 70 to 79 age group, M:F ratio 3:2, three cases in parotid, one case in minor salivary gland and one in ectopic. Syed Imtiyaz Hussain et al[19] 4 cases (4 % of al tumor and 10.8% all malignant tumor) were seen in 51 to > 60 year age group M:F ratio 4:0

Acknowledge: Not applicable
Financial Support & Sponsorship: None
Conflict of Interest : None

REFERENCES

1. Paul M. Speight, A William Barrett,Salivary gland tumours: diagnostic challenges and an update on the latest WHO classification,Diagnostic Histopathology,Volume 26, Issue 4,2020,Pages 147-158,
2. De Oliveira FA, Duarte EC, Taveira CT, Máximo AA, de Aquino EC, de CássiaAlencar R, Vencio EF. Salivary gland tumor: a review of 599 cases in a Brazilianpopulation. Head and neck pathology. 1Dec 2009;3(4):271.
3. Eveson JW, Reichart P, Sidransky D. World Health Organization classification of tumours: pathology and genetics of head and neck tumours. Word Health Organization Classification of Tumours: Pathology and genetics of head and neck tumors. 2005.
4. Sando Z, Fokouo JV, Mebada AO, Djomou F, NDjolo A, Oyono JL. Epidemiological and histopathological patterns of salivary gland tumors in Cameroon. Pan Afr Med J. 2016;23:66.
5. Nandakumar A, Ramnath T, Roselind FS, Shobana B, Prabhu K. National Cancer Registry Programme, Indian Council of Medical Research. Bangalore: Co-ordinating unit, NCRP (ICMR); 2005. Two year report of population based cancer registries.1999-2000;160–95.
6. Shanta V, Swaminathan R, Nalini J, Kavitha M. National Cancer Registry Programme, Indian Council of Medical Research. Bangalore: Co-ordinating unit, NCRP (ICMR); 2006. Consolidated report of population base cancer registries. 2001- 2004;135–53.
7. Lin H.H.,Limesand K.H,Ann D.K.,Current state of knowledge on salivary gland cancers.Crit Rev Oncog. 2018; 23: 139-151.
8. Ahmed S, Lateef M, Ahmad R. Clinicopathological study of Primary Salivary- gland tumors in Kashmir. JK Pract. 2002; 9 (4): 231-3.
9. Nagarkar NM, Bansal S, Dass A, et al. Salivary gland tumors - our experience. Indian J Otolaryngol Head Neck Surg. Jan 2004;56(1):31-4.
10. Hashemi P, Zarei MR, Chamani G, RadM. Malignant salivary glands tumors in Kerman province: a retrospective study. Dent Res J. 2007; 4: 4-10.
11. Jude U O, Olu-Eddo A N. Salivary gland tumors, a twenty-year retrospective study. Afr J Med Health Sci. 2014; 13(1):24-9.
12. ShafkatAhrnad, Mohainmad Lateef, Rouf Ahmad. Clinicopathological study of primary salivary gland tumors in Kashmir. JK-Practitioner. 2002; 9(4): 231-33.
13. Theresa, J. Margaret, A. B. Harke, and M. Lavanya. "A study on the morphological spectrum of salivary gland tumors." Indian Journal of Pathology and Oncology. 2020;7(1):1-4.
14. Susmitha, N. S., and D. C. Sathyaki. "Histopathological spectrum of salivary gland neoplasms." IP Journal of Diagnostic Pathology and Oncology. 2019;4(1) 54-57.
15. Kapuriya, Dharmesh, Hiral Pandya, and Jignasa Bhalodia.Histopathological study of non-neoplastic and neoplastic lesions of salivary gland. IP Archives of Cytology and Histopathology Research. 2019;4(1) :75-81.
16. Srinivasan G., Joseph F.A, Kaliyaperumal S., Ponnaiah A. "Histopathological spectrum salivary gland lesions - in a tertiary care centre" International Journal of Research in Medical Sciences..January2021;9 (1).
17. CN, Anushree, V. J. Jayalakshmi, and Y. A. Manjunatha. Histomorphological study of salivary gland lesions: A study in tertiary care centre, Bangalore. Indian Journal of Pathology and Oncology. 2019;6.(3):460-463.
18. Mohan, Anurag, Debi Prosad Dasgupta, and Ajay Kumar. Histopathological study of salivary gland tumours in a tertiary care hospital.2019.
19. Syed Imtiyaz Hussain, Gulshan Akhter, Farooq Sideeq, Baba Iqbal, Ruby Reshi, Farzana Manzoor and Arshi Beg. histopathological spectrum of salivary gland tumours. a hospital based study. Int. J. of Adv. Res.2017; 5.
20. M. Hemalata, C. P. Manjula, Rishitha NandiHistomorphological study of salivary gland neoplasms: fifteen year study. International journal of research in medical science. 2020;7(8).
21. Bashir S, Mustafa F, Malla H A, Khan A H, Rasool M, Sharma S. Histopathological Spectrum of Salivary Gland Tumors: A 10 Year Experience. Sch J App Med Sci. 2013;1(6):1070-4.
22. Pachori, G., Chandra, S., Bihari, N. A., & Kasliwal, N. (2019). Histopathological spectrum of salivary gland lesions in Ajmer region, Rajasthan, India. International Journal of Research in Medical Sciences, 2019;7(7): 2708–2713.
23. Thomas K M, Hutt M S R and Borgestein J. Salivary gland tumors in Malawi,Cancer 1980;46:2328-2334.
24. Shinde A. P" Histopathological study of salivary gland lesions". International journal of medical and health research. sept 2017;3(9): 77-80.
25. Lawal AO, Adisa AO, Kolude B, Adeyemi BF. Malignant salivary gland tumours of the head and neck region: a single institutions review. Pan Afr Med J. 12 Feb 2015;20:121.
26. Saldanha C., Yaranal P, Upadhyaya K. A clinicopathological study of salivary gland tumors.13th November 2018.
27. Mucharala R, Kotagiri R.Histopathological spectrum of salivary gland lesions with clinical correlation.GJRA.December 2020;9.