THE OCCURRENCE, CLINICO-PATHOLOGICAL PRESENTATION AND MANAGEMENT OF SALIVARY GLAND DISEASES AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM

by

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A Dissertation Submitted in Partial Fulfillment of the Requirements for
The Degree of Masters of Dentistry (Oral Surgery) of
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CERTIFICATION

The undersigned certify that they have read and hereby recommend for examination of dissertation entitled ***''The Occurrence, Clinico-pathological Presentation and Management of Salivary Gland Diseases at Muhimbili National Hospital, Dar es Salaam,''*** in fulfillment of the requirements for the degree of Master of Dentistry (Oral Surgery) of Muhimbili University of Health and Allied Sciences.

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I, **Bonny Betson,** declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other university for a similar or other degree award.

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DEDICATION

This work is dedicated to my lovely wife Neema and my son Dennis for their sacrifices and support during the long journey of my studies.

ABSTRACT

Background: Salivary glands are mainly distributed in the head and neck region, with major ones comprising the paired parotid, submandibular and sublingual salivary glands. The minor salivary glands are situated in the palate, lips, cheeks and floor of the mouth. Both major and minor salivary glands are subjected to different diseases. The clinical presentation of salivary gland diseases is complex and mimics several other conditions or they do occur in conjunction with other conditions. Due to this complexity the diagnosis and treatment of these diseases are very variable. Currently little is known on the occurrence and clinico/pathologic presentation of salivary gland diseases and their management in Tanzania. This study aimed at determining the occurrence, clinical and pathologic characteristics of different salivary gland diseases.

Objective*:* The main objective was to determine the occurrence, clinico-pathological presentation and management of salivary gland diseases at Muhimbili National Hospital.

Study Design: This was a hospital clinical based cross-sectional prospective study.

Setting: The study was conducted at the Oral and Maxillofacial Surgery department at Muhimbili National Hospital (MNH).

Methods: All patients who attended at the Oral and Maxillofacial Surgery department were examined and those found with salivary gland diseases were interviewed using a structured questionnaire. Clinical examination and histological/cytological investigations were done. Data including age, sex, location, type of the disease, histological/cytological diagnosis and treatment modality offered were collected and recorded in a special clinical form designed for this study. Patients were treated accordingly depending on the diagnosis and the treatment modalities included surgery, antibiotics, analgesics, radiotherapy and chemotherapy. Data were analyzed using Statistical Package for Social Sciences (SPSS version 15.0)

Results*:* A total of 5174 patients comprised of 2184 (42.2%) males and 2990 (57.8%) females were attended in the department during the study. Out of these, 56 patients consisting of 36 (64.3%) females and 20 (35.7%) males had salivary gland diseases. The male to female ratio was 1:1.8 and the most affected age group was 20-29 years. Pleomorphic adenoma observed in 12 (21.4%) patients was the commonest encountered

salivary gland tumor, followed by adenocarcinoma in 7 (12.5%) patients, mucoepidermoid carcinoma and adenoid cystic carcinoma in 2 (3.6%) patients each. Ranula detected in 16 (28.6%) patients was the most frequently encountered salivary gland cyst followed by mucocele in 3 (5.3%) patients.

The results indicate that, regardless of histopathological diagnosis majority 39 (69.6%) of salivary gland diseases were detected in major salivary glands, and the rest 17 (30.4%) were observed in minor salivary glands. Minor salivary glands were affected mostly by malignant tumors in 8 (47.1%) patients followed by the benign tumors mainly pleomorphic adenoma in 6 (35.3%) and mucoceles in 3 (17.6%) patients. The submandibular gland was mostly affected by sialolithiasis in 9 (56.25%) patients, followed by pleomorphic adenoma in 4 (25%) patients, malignant tumors in 2 (12.5%) and non specific chronic sialoadenitis in 1 (6.25%) patient. The parotid gland was mostly affected by malignant salivary gland tumors in 4 (57.14%) patients and less by pleomorphic adenoma, sialolithiasis and lymphoepithelial cyst each affecting 1 (14.28%) patient. The sublingual gland was mainly affected by ranula. Swelling was the commonest clinical presentation observed in all patients with salivary gland diseases, followed by pain in 15 (26.8%) patients, infection in 7 (12.5%) patients and ulceration in 5 (8.9%) patients. Facial palsy was detected in 2 (3.6%) patients and no patient presented with dry mouth.

Conclusion

Generally the clinico-pathological presentation of salivary gland diseases seen in this study is similar to other studies. Pleomorphic adenoma is the most common benign salivary gland tumor while adenocarcinoma is the most common malignant tumor and ranula is the most common salivary gland cyst. Majority of salivary gland diseases occurred in major salivary glands similar to other studies. High number of malignant tumors in the parotid salivary gland is contributed by the fact that malignant salivary gland tumors in the parotid gland grow with pain and that is why these are frequently reported unlike the benign salivary gland tumors in the same gland which grow without pain and are likely to present late. Patients with salivary gland tumors presented with advanced lesions. Surgery was the treatment of choice for the majority of conditions. Adjuvant radiotherapy or chemotherapy was given to patients with malignant lesions.

ABBREVIATIONS

CT- Computed Tomography

DPX- Di-N-Butyle Phthalate in Xylene

ENT- Ear, Nose and Throat

HIV- Human Immunodeficiency Virus

HTLV-1- Human T-lymphoma Virus-1

MNH- Muhimbili National Hospital

MRI- Medical Resonance Imaging

MUHAS- Muhimbili University of Health and Allied Sciences

RNA- Ribonucleic Acid

SLE- Systemic Lupus Erythermatosus

SPSS- Stistical Package for Social Sciences

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1. INTRODUCTION AND LITERATURE REVIEW

1.1. Background

Salivary glands are important structures which secrete saliva, that take part in food digestion process. Saliva, apart from carrying some digestive enzymes, also has concentration of antibodies that participate in the body defense system. The constant flow of saliva in the mouth reduces the accumulation of bacteria on intra oral structures, therefore reducing the chances of infection. Its lubrication effect makes speech and mastication easy and comfortable. However, salivary glands often develop diseases and conditions that can affect their basic functions. Metabolic disorders, infections (fungal, bacterial and viral), neoplastic conditions (both benign and malignant), cyst and occasionally trauma can affect the function of a single or several glands. Such conditions often cause discomfort or pain resulting in physical and psychological incapacitation.

Except for acute infections which are usually painful, salivary gland diseases rarely present any symptoms during the early stages[1]. Because of this, patients stay with their diseases for a long time before reporting to hospital. Majority of them present with advanced disease that may complicate the management due to the huge size or metastasis. Most of the salivary gland disorders present as non-specific tumors without any unique features. Because of the complicated anatomy of the maxillofacial region it requires sophisticated imaging techniques like x rays, ultrasonography, CT or/and MRI to be able to accurately see the extension of the tumor. This is necessary in planning of the definitive treatment. Unfortunately, most of these investigations are not available in lower level health facilities. The definitive diagnosis is possible only through histological investigations. Although the treatment of salivary gland tumors is basically surgical, the approach differs according to their behavior and stage of the disease when patients report for health care.

Salivary gland diseases/conditions affect all age groups with some of them showing a sex predilection. The distribution of lesions among the different salivary glands has been reported to show a difference in occurrence between whites and blacks. For non African populations, more than 80% of salivary gland neoplasms have been found to involve the parotid gland.[1] Much less were seen in the submandibular gland, minor salivary glands or

the sublingual gland.[1] The presentation differs among blacks whereby nearly a 1:1:1 ratio for tumors from the parotid (34%), submandibular (33%), and minor salivary glands (32%) respectively, has been reported.[2] However, in their studies Vuhahula[2] and Masanja[3] reported no sublingual salivary gland lesion. Despite some slight variations, the preponderance of the parotid gland is universal.

Management of bacterial infections of salivary glands often calls for an aggressive use of antibiotics. Rarely is incision and drainage required. Viral infections (like mumps) usually need symptomatic treatment and reassurance. Since salivary gland tumors do not respond to chemotherapy and are virtually radioresistant, surgery remains the only treatment of choice.

1.1.1. Embryology

All salivary glands develop from the embryonic oral cavity as buds of epithelium that extend into the underlying mesenchymal tissues.[1] The epithelial ingrowths branch to form a primitive ductal system that eventually becomes canalized to provide for drainage of salivary secretions. The minor salivary glands begin to develop around the fortieth day in utero, whereas the larger major glands begin to develop slightly earlier at about the thirty-fifth day in utero. Secretory cells called acini begin to develop around the ductal system at around the seventh or eighth month in utero. The minor salivary glands become fully developed and functional at birth.[1]

1.1.2 The salivary glands

The parotid gland

The parotid gland is the largest of the major salivary glands which lies in the preauricular region deep to skin and subcutaneous tissues. Its acinar cells are mainly of the serous secreting type. The gland is divided into superficial lobe and deep lobe by the major branches of the facial nerve. The parotid gland is invested by fascia to form the parotid compartment which contains the parotid gland, nerves, blood vessels, and lymphatic vessels. Stensen's duct is the major duct of the parotid gland and it opens intraorally opposite the second maxillary molar.

Branches of the external carotid artery provide arterial supply to the parotid gland. The posterior facial vein provides venous drainage, and lymphatic drainage is from lymph nodes within and external to the gland that leads to the deep jugular lymphatic chain. The gland is innervated by the parasympathetic secretomotor preganglionic fibers that arise in the inferior salivatory nucleus.[1]

The submandibular gland

The submandibular gland is the second largest salivary gland, after the parotid. It is encapsulated and paired gland located in the submandibular triangle of the neck. It comprises both mucous and serous cells. The main duct of the submandibular gland is known as Wharton's duct which opens in the floor of the mouth at an area known as punctum. Arterial blood supply is from the lingual and facial arteries. The anterior facial vein provides venous drainage while its lymphatic drainage is to the submandibular nodes and then to the deep jugular chain. The submandibular gland receives innervations from both the sympathetic and parasympathetic secretomotor innervations.[1]

The sublingual salivary gland

The sublingual gland is the smallest of the major salivary glands and lies just below the floor of mouth mucosa. Unlike the parotid and submandibular glands, the sublingual gland is unencapsulated. The acinar ducts of the sublingual gland are called Batholin's ducts and in many cases they coalesce and form 8-20 ducts of Rivinus which are shot and small in diameter. These ducts either open individually directly into the anterior floor of the mouth or indirectly through connections to the submandibular duct then in the oral cavity through Warthon's duct. The submandibular and sublingual glands receive parasympathetic secretomotor innervation from preganglionic fibers, which originate in the superior salivatory nucleus

Minor salivary glands

There are thousands of minor salivary glands throughout the mouth, most of which are named according to their anatomic location as labial, palatal, buccal, tonsillar (Weber's

glands), retromolar (Carmalt's glands), inferior apical (Blandin Nuhn), test buds (Ebner's glands) and posterior lubricating glands. These minor glands are located just below the mucosal surface and communicate with the oral cavity with short ducts.

1.2. LITERATURE REVIEW

1.2.1 Infections

Majority of salivary gland infections are viral in origin and only a minority are bacterial. The initiation and progression of salivary gland infections depends on the decrease in host resistance to infection. General conditions that may predispose salivary glands to sialoadenitis is debilitation, dehydration and local conditions including obstruction of ducts due to sialolith, stricture or other pathology [1, 4, 5,]

1.2.1.1. Viral infections

The most common viral infection is mumps. Mumps is an acute, infectious viral sialoadenitis primarily affecting the parotid glands. It is caused by an RNA paramyxovirus which infects circulating lymphocytes, especially activated T cells.[4] The incidence of mumps was high world wide before the mumps, measles and rubella vaccination programs. The incubation period of mumps is about 2-3 weeks.[5,6] Mumps presents as enlargement of the major salivary glands, especially the parotid, with pain and tenderness, fever, malaise, chills and sore throat.[5] However, up to 40% of the patients are asymptomatic.[7] There is no sex difference in the occurrence of mumps, but children are more affected than adults.[6] Severe pain may be experienced especially with movement of the jaw, and the Stensen's duct may be obstructed. The diagnosis is usually made on clinical grounds and laboratory investigations may be made which include serology and electron microscopy. Mumps is associated with complications which include pancreatitis, orchitis, and meningitis (meningoencephalitis) in about 20% to 30% of the cases.[4,5] The clinical course of mumps varies widely, from a mild upset lasting a day or two to a severe illness with high fever lasting up to 2 weeks, and complete recovery is a usual phenomenon. Treatment of mumps

is usually symptomatic because there is no specific therapy and the disease resolves spontaneously within 5 to 10 days.

1.2.1.2. Salivary gland diseases in HIV infection

Salivary glands disease may occur in the minority of HIV infected individuals. Xerostomia and or enlargement of the major salivary glands are the two main presentations, in which xerostomia is present in 10% of the individuals.[4] The etiology of HIV induced salivary pathology is not yet known.

1.2.1.3. Bacterial sialoadenitis

Bacterial infection of the salivary glands may be subdivided into acute and chronic forms.

The incidence of bacterial sialoadenitis in the general population is very low, but it increases among post operative patients.[8] The majority of cases occur in the parotid glands, and less in the submandibular glands. The reason for this is due to the high molecular weight of the mucinous saliva in the submandibular glands which has a bacteriostatic effect.[8] Sialoadenitis do occur whenever there is reduced salivary flow which results into retrograde infection of the glandular tissue via the salivary duct. The predisposing factors include drugs that reduce salivary flow, localized sialectasis and immunological conditions (Sjögren syndrome). Sialoadenitis can also be due to obstruction of the duct due to stone, common in submandibular glands; epithelial debris, and interdental problems common in parotid gland.[1,4]

The etiology of sialoadenitis is both monomicrobial and polymicrobial of which *Staphylococcus aureus* is the commonest pathogen associated with acute sialoadenitis, others include, streptococci and gram-negative aerobic bacilli.[9,10]

Clinically, patients present with severe pain which is made worse when eating, by raised temperature and trismus due to spasm of the masseter muscle. Parotid and submandibular glands may be enlarged and the ducts openings may be edematous.

The treatment of bacterial sialoadenitis is by broad spectrum antibiotics, rehydration and analgesics. Amoxicillin is the drug of choice or erythromycin in those who are allergic to

penicillin. Surgery to remove a sialolith in the case of sialoadenitis secondary to obstruction is also an important measure. In severe cases surgical drainage is indicated.

Chronic bacterial sialoadenitis follows acute bacterial sialoadenitis when not adequately treated, and usually have mild symptoms, with less discharge.

1.2.1.4. Sialolithiasis (Stones)

Sialolithiasis is the main cause of unilateral diffuse parotid or submandibular gland swelling.[11]. Sialoliths are calcified organic matters that form within the secretory system of the major salivary glands. The etiology of sialolith formation is still unknown; however, factors like inflammation, irregularities in the duct system, local irritants and anticholinergic medications have been associated with sialolithiasis.[12,13]. The mechanism of stone formation is still unknown. Detection of sialolith is difficult due to differing calcification pattern, 50% of parotid gland sialoliths and 20% of submandibular gland sialoliths are poorly calcified.[14] Several studies report that submandibular gland is the most common site followed by the parotid and sublingual is rarely affected [13,15]. It is believed that the higher rate of sialolith formation in the submandibular gland is due to the torturous course of Wharton's duct, higher calcium and phosphate levels, and the dependent position of the submandibular glands, which leave them prone to stasis.[14,16]. Patients with sialoliths most commonly present with a history of acute, painful, and intermittent swelling of the affected major salivary gland. The degree of symptoms is dependent on the extent of salivary duct obstruction and the presence of secondary infection. Typically, eating will initiate the salivary gland swelling which subsides when stimulation is removed and output decreases and saliva seeps past the partial obstruction.[12,17]. The gland is usually enlarged and tender and may be associated with infection, fibrosis, and gland atrophy. Chronic cases may present with fistulae, a sinus tract, or ulceration. Diagnosis of sialolithiasis is by history and clinical examination by palpation of the stone along the pathway of the duct. Radiographic examination is often necessary since the stone may not be accessible to bimanual palpation, however poorly calcified sialoliths are not visible radiographically. Plain radiography, computed tomography and sialography can be used to view the presence of the sialolith.

Treatment of the sialolithiasis is both symptomatic and more invasive in severe cases, where surgery to remove the stone may be necessary. Smaller stones may come out on their own while larger stones generally require medical or surgical intervention. Removal of involved salivary glands in some cases has been used for long time. Minimally invasive methods in the form of extracorporeal shock wave lithotripsy and intracorporeal laser lithotripsy has been introduced to treat salivary stones[18,19]. Extracorporeal shock wave lithotripsy (ESWL) is one of the minimally invasive approaches that uses high energy shock waves generated outside the body to pulverize or crush the stones inside the body[18,19]. Intracorporeal laser lithotripsy, with the guide of a flexible endoscope, has also been proposed to treat salivary gland stones[18,19]. In this procedure, a pulsed dye laser is used to fragment the salivary gland stones inside the body. Higher energy levels may be used without causing adjacent tissue injury since the delivery is pulsed, or intermittent, reducing the risk of excessive thermal build-up that is possible with a continuous laser.[18,19]

1.2.2. Reactive lesions

1.2.2.1. Mucocele

Mucocele is the term that includes mucus extravasation phenomenon and a mucus retention salivary gland cyst that commonly affects the minor salivary glands.[20] Mucoceles have been reported to occur in varying ages, but young age is more favoured ranging from 10-20 years with a slight male predilection.[21] There are two types of mucoceles, the mucous *extravasation* type and mucous retention type. The mucous extravasation type is related to physical-traumatic injury to minor gland excretory duct, and mucus retention cyst results from dilatation of salivary excretory duct due to obstruction by a mucous plug or sialolith formation, periductal scar or impinging tumor.[6] Mucoceles are most frequently located in the lower lip (60% to 70%); the floor of the mouth is only involved in 6% to 15%[21,22]. They usually present as painless swellings with bluish hue when mucin is near the surface, however when deep in the tissues they may be diffuse and covered by the normal mucosa without change in color.[12] Patients may present with a history of trauma preceding the lesion which usually waxes and wanes in size due to frequent rupturing. The diagnosis of mucocele

is based principally on the clinical examination, radiographic findings and histological findings.[21] Fine-needle aspiration may demonstrate the mucus with inflammatory cells. The other test is chemical analysis which will reveal high amylase and protein contents.[6]

1.2.2.2. Ranula

This is the most common lesion of the sublingual gland that may be considered as a mucocele of the sublingual salivary gland. Ranulas result from either mucous retention in the sublingual gland ductal system or mucous extravasation as a result of ductal disruption. There are two subtypes the superficial ranula which is on the oral aspect of mylohyoid muscle and the plunging ranula which extend below the mylohyoid muscle and manifest itself extrorally.[23] Ranula if large, may affect swallowing, speech, or mastication and may result in airway obstruction. The very rare thoracic ranula may compromise respiratory function and may be life threatening.[24] Mandel[23] reported a series of three cases of plunging ranula following dental implants, which developed due to traumatic injury following implant perforation of the cortices.

Clinically ranula presents as unilateral, fluctuant, soft tissue mass on the floor of the mouth. It usually has bluish, slightly translucent appearance. The study done in New Zealand showed no difference among the sexes.[25] Diagnosis of this lesion depends on clinical examination, imaging and aspiration of mucinous salivary fluid.[6, 26] The excised tissue presents with granulation tissue lining around mucin pool. The treatment varies from marsupialization as an initial procedure, excision of the involved gland (extravasation type) and Sialolithectomy (in obstructive type).

1.2.2.3. Necrotizing Sialometaplasia

This is a benign condition that typically affects the minor salivary glands of the palate. This condition requires high index of suspicion because it usually mimics malignancy and may lead to unnecessary surgery due to error in diagnosis.[27] This condition results from local ischemic injury of salivary gland lobules secondary to alteration in local blood supply. It

may also be preceded by trauma or local anesthetic injury, or it may appear spontaneously. Acinar becomes necrotic and then squamous metaplasia follows.

This condition affects a wide range of age between 15 and 45 years with mean age of 21.9 years.[29] Males are slightly more affected than females with a male to female ratio of 1.4:1.[29] Both major and minor salivary glands can be affected, however the hard palate is more affected than the soft palate and is usually unilateral. It presents initially as a painful sub-mucosal swelling, which ultimately develops a central necrotic crater.[6]

Diagnosis therefore depends on microscopic findings. Treatment of this lesion is usually symptomatic because it is self limiting; however the need for biopsy to confirm diagnosis is essential.

1.2.3. Conditions associated with immune defects

1.2.3.1. Sjögren Syndrome

Sjögren syndrome is a clinicopathologic entity characterized by dry eyes (*keratoconjunctivitis sicca*) and dry mouth (*xerostomia*), resulting from immune-mediated destruction of the lacrimal and salivary glands. There are two types of Sjögren syndrome; the primary form occurs as an isolated disorder, also known as the *sicca syndrome,* and the secondary form which more often occur in association with another autoimmune disease. Among the associated disorders, rheumatoid athritis is the most common, but some patients have systemic lupus erythermatosus (SLE), polymyositis, systemic sclerosis, vasculitis, or thyroiditis.[30]

The specific cause of this syndrome is unknown. It is said to be related to the numerous immunological alteration resulting in polyclonal B cell hyperactivity that reflect the lack of regulation by T cell subpopulations.[6] Viruses are viable candidates as environmental triggers, although proof of causation has remained elusive, and certainly no single virus has been implicated. Sjögren-like syndromes are seen in patients infected with Human Immunodeficiency Virus (HIV), Human T-Lymphoma Virus-1 (HTLV-1), and hepatitis.[31,32,33] Epsein-Barr virus has also been demonstrated in salivary gland tissue of

patients with this syndrome although there is no strong correlation because the virus is also found in normal individuals.[6]

This syndrome is known to affect people of all ethnic and racial groups. It usually peaks in the late fifties and rarely occurs in young population.[6,31,32,33] Sjogren syndrome is known to affect females more than males. The symptoms are xerostomia, parotid enlargement, dental caries, candidiasis, keratoconjanctivitis sicca, rheumatoid arthritis, anemia, leukopenia, hypergammaglobulinemia respiratory infections and hepatomegally. [6,31,32,33]

Management of this syndrome is symptomatically by artificial saliva and tears, maintenance of oral hygiene, topical fluoride and remineralizing solutions are important. The prognosis is complicated by its tendency to transform to lymphoma in about 7% of cases.

1.2.3.2. Benign lymphoepithelial lesion

This is a unilateral or bilateral swelling of the parotid glands resulting from a benign infiltration of lymphoid cells. This lesion was previously considered to be inflammatory in origin, later as a pseudoneoplastic process, and the most recent evidence points to the immunological abnormality, or it may be one of the manifestations of Sjögren syndrome or possibly HIV disease.[6]

The cause of the lymphoepithelial lesion is obscure, the most likely possibility is the genetic abnormalities or susceptibilities within the cell mediated arm of the immune system[6.] Clinically, the lesion presents as a progressive, asymptomatic enlargement of the affected salivary gland. Women are more affected than men, and several studies have shown that the parotid glands are the most affected.[34] This lesion has also been described to occur in association with HIV infection and is one of the early signs of unrecognized HIV infection.[35] The commonest site for lymphoeithelial lesion is the parotid gland.[6]

Microscopically the salivary gland tissue is completely replaced by lymphoid tissue including epithelial islets composed of polyhedral cells with relatively small nuclei, suggesting epimyoepithelial cells in origin. The lymphocytes occasionally infiltrate into the interlobular and surrounding fat tissues, resulting in obliteration of lobular forms. Several ducts with slight dilatation remain in the disintegrating parenchyma.

The treatment of this lesion is usually symptomatic, and surgery is reserved for the lesions with a potential to malignant transformation. Studies have shown regression of the lesion with antiretroviral therapy.

1.2.4. Salivary gland neoplasms

All salivary glands have been reported to be affected by tumors arising from salivary acinar or ductal cells. The prevalence of salivary gland tumors in African countries ranges from 2.8% to 10% of all head and neck tumors.[3,36,37] The occurrence of salivary gland tumors vary with geographical distribution.[3,38,39].

1.2.4.1. Benign salivary gland tumors

The benign salivary gland tumors are more common than the malignant ones. Studies done among blacks show that the parotid gland is more affected, followed by the submandibular and minor salivary glands with the sublingual gland being rarely affected.[2,40]

1.2.4.1.1. Pleomorphic adenoma

Pleomorphic adenoma, a benign mixed tumor is the most commonly reported benign tumor of the major and minor salivary glands worldwide.[6] The histogenesis of this tumor is related to proliferation of cells with ductal and or myoepithelial features which determine the overall composition and appearance of the mixed tumor.[6] In the study on tumors of salivary glands in Tanzania pleomorphic adenoma was found to comprise 44.4% of all tumors.[3] A study in Jordan reported the pleomorphic adenoma to be 54% of all the reported tumors.[41] Moatemri[42] reported an occurrence of pleomorphic adenoma in the parotid gland in about 60%. There is variation in gender distribution of the pleomorphic adenoma, in some reports females are more affected than males, while in others males are more affected than females.[2,40] Pleomorphic adenoma has been reported to transform into malignant myoepithelioma after recurrence in Japan.[43] The commonest site for pleomorphic adenoma is the parotid gland followed by the minor salivary glands.[2,40] However, this has also been

reported in ectopic salivary gland sites, such as the neck, nose, cervical lymph nodes and the parapharyngeal spaces.[40] The treatment for pleomorphic adenoma is wide surgical excision.

1.2.4.1.2. Warthin tumor

This tumor is also known as papillary cystadenoma lymphomatosum or adenolymphoma. This tumor is thought to arise within lymph nodes as a result of entrapment of salivary gland elements early in development. This tumor accounts for approximately 7% of epithelial neoplasms of salivary glands. This tumor has been reported to affect white Americans, and rarely affects blacks'. In studies on salivary gland diseases in Africa, Warthin tumor has been reported to be very rare in occurrence.[2,40]

The average age of onset is between fifth and eighth decades of life.[6] This tumour is generally occurring among males.

The tumor is characteristically situated in the tail of the parotid gland, and is nearly always found in the heavily built or obese individuals with short fat necks and prominent jaws.[1,6] Warthin tumor has been reported in the parotid gland with a frequency of 0.1% to 2.5%.[2,40,44]

The clinical feature is generally of enlargement of glands, pain and tenderness. It usually presents with fluctuating swelling and intermittent pain especially of the parotid glands. Acute pain and increase in size may occur, and rarely patients may complain of pain in the ear and tinnitus. The facial nerve is usually unaffected.

Microscopically it is composed of areas of lymphoid tissue intermingling with cystic spaces lined by a tall tubular or papillary epithelium.[6] Treatment of this lesion is wide excision similar to the treatment of pleomorphic adenoma.

1.2.4.1.3. Monomorphic adenomas

Monomorphic adenoma is a tumor of salivary glands that is composed of cells predominantly of one type and absence of connective tissue stroma.[6] Others have a bimorphic pattern of differentiation in which there is minimal participation by

myoepithelial-type cells. Monomorphic adenomas constitute about 3.8% to 6.9% of all the salivary gland tumors.[2,40,45]

Monomorphic adenoma presents as a slow growing lesion which usually affects adults, with slight predilection for females.[46] The parotid gland is the usual site, although occasionally it is found within the periparotid lymph nodes. The age of patient at presentation is between 35 and 80 years, and a distinct male predilection is noted.[6] Generally the isomorphic pattern and the absence of chondroid metaplasia and mucoid to myxoid stroma help to differentiate these lesions from the benign mixed tumor. Like pleomorphic adenoma, treatment of these lesions is wide surgical excision.

1.2.4.2. Malignant salivary gland tumors

1.2.4.2.1. Mucoepidermoid carcinoma

Mucoepidermoid carcinoma is the most common occurring malignant neoplasm of the major and minor salivary glands in adults and children. This malignancy has no sex predilection. Mucoepidermoid carcinomas grow slowly and recur locally. About 30% of patients present get lymph node metastasis, which is present at initial diagnosis in 15% of the cases.[1] This tumor can be of low grade or high grade depending on histology. Low grade tumor is associated with an increased survival rate with a comparable figure for high grade tumors.[47] Low-grade tumors are usually small and appear partially encapsulated upon gross examination. They usually grow very slowly and have fewer tendencies to metastasize. High-grade tumors are usually larger and are more infiltrative and have tendency to metastasize.[17] Both minor and major salivary glands can be affected, but the parotid and the minor glands are the most frequently affected sites and among the minor salivary glands, the palatal glands predominate.[1]

Low grade tumors should be managed by local excision and prolonged follow up, high grade lesions require more radical resection and adjunctive radiotherapy

1.2.4.2.2. Adenoid cystic carcinoma

Adenoid cystic carcinoma is the second most common malignant salivary gland tumor, accounting for 6-23% of all salivary gland neoplasms of major and minor salivary glands.[6,12] It is a slow growing but very aggressive tumor and unique in that has tendency for distant metastasis.[6,17] Adenoid cystic carcinoma is the most common malignant tumor of the submandibular and minor salivary glands. They make up 15 to 30% of submandibular gland tumors, 30% of minor salivary gland tumors, and 2 to 15% of parotid gland tumors. It has been reported in several studies that 50% to 70% of adenoid cystic carcinomas occur in the minor salivary glands. It has been reported to occur at older age with no gender predilection. Though it has a relatively promising 5 years survival rate (65%), adenoid cystic carcinoma is an aggressive tumor, because it presents with distant metastasis 10 years or longer following initial treatment. Local recurrence is also common. The tendency for this tumor to grow along perineural and perivascular planes, often with skip lesions, helps explain the generally poor success of treatment. Perineural extension accounts for the difficulty in eradicating adenoid cystic carcinoma despite extent of excision.

It has been reported in studies in Europe and America that while the tumour size, peri-neural invasion and margin status (staging characteristics) influence the local control of adenoid cystic carcinoma, the tumour grade and stage are less important than previously described in the survival of patients with mucoepidermoid carcinoma.[49, 50]

1.2.4.2.3 Acinic cell carcinoma

Acinic cell carcinoma is a low-grade neoplasm that accounts for 1% of all salivary gland neoplasms. Almost all (95%) arise in the parotid gland, and most of the remainder arises in the submandibular gland.[51] The tumors are formed of serous cells, explaining the propensity for the parotid gland. Grossly, they are encapsulated, hard, gray-white tumors. The tumors consist of lobules of round uniform-appearing cells with abundant cytoplasm arranged in nests. The cells most commonly resemble the serous acinar cells of the parotid gland, but they may have a clear cytoplasm as well.[6]

1.2.4.2.4 Carcinoma ex-pleomorphic adenoma

Carcinoma ex pleomorphic adenoma is a malignant tumor that arises within a pre-existing pleomorphic adenoma. The malignant cells in this tumor are epithelial in origin. This tumor accounts for 2 to 5% of all salivary gland tumors. It usually occurs from long term untreated benign mixed tumors. The parotid gland is the commonly affected gland followed by the minor salivary glands.[6] It occurs 20 years later than the age at which the benign tumors are found.

The characteristic clinical feature of carcinoma ex-pleomorphic adenoma is sudden rapid growth of an otherwise slow growing or stable mass. Gross tumors appear firm, unencapsulated, and nodular with areas of central necrosis and hemorrhage. Microscopically, the diagnosis is based on a malignant process that infiltrates a neoplasm, which has the histologic features of a pleomorphic adenoma. The malignant component may appear as an adenocarcinoma, squamous cell carcinoma or undifferentiated carcinoma. Treatment is exclusively surgical, with radical neck dissection; however, the disease has a high recurrence rate with high metastatic potential.[1,6,12]

1.2.4.2.5. Adenocarcinoma

Adenocarcinomas by definition are any tumors arising from salivary duct epithelium. This name implies to lesions that do not meet the specific criteria for other lesions (such as polymorphous low-grade adenocarcinoma, epimyoepithelial carcinoma, or salivary duct carcinoma). In Tanzania, Masanja et al[3] revealed that adenocarcinoma represented about 6% of all salivary gland tumors. The adenocarcinoma are classified by some pathologists as low or high-grade, although all generally have an aggressive biologic behavior[6]. Treatment is mainly surgery with or without radiotherapy.

1.2.4.2.6. Squamous cell carcinoma

Primary squamous cell carcinoma of the parotid is uncommon, occurring in 2% of parotid neoplasms.[65] This is an aggressive malignancy, usually presenting in advanced stage and with facial nerve involvement or cervical metastases.

The submandibular gland is most commonly involved, followed by the parotid **and** most patients are in the seventh decade of life or beyond.[6,65] Diagnosis of primary squamous cell carcinoma of the salivary gland should be considered only after high -grade mucoepidermoid carcinoma and metastases to the parotid gland from cutaneous, oropharyngeal, or other primary site have been excluded[66]

Prognosis is poor even with radical surgery and adjunctive radiotherapy. Careful clinical and histological review is necessary to differentiate primary squamous cancer of the parotid from metastases or other primary parotid malignancy.

1.2.4.2.7. Lymphoma

Lymphomas of the salivary glands have been reported in the literature but they are very rare in both the blacks and whites.[40,41] The occurrence of lymphoma of salivary gland almost always follows systemic lymphoma. The major forms of lymphoma are non-Hodgkin's lymphoma (NHL) and Hodgkin's disease. The parotid gland is the most commonly involved gland, followed by the submandibular gland.[12]

1.2.4.3. Diagnosis of malignant salivary gland tumors

A large number of malignant salivary glands tumors are indistinguishable from the benign tumors. Only very few tumors have specific features which are pathognomonic, therefore the definitive diagnosis depends on the histopathological examination of the lesion.[1,6] Open biopsy is totally contraindicated, because seeding of the area with neoplastic cells during biopsy is inevitable leading to local recurrence. Open biopsy as a prelude to treatment is only justified when the tumor arises in the minor gland, example in the palate. The precise histological diagnosis is made by examination of the post-operative specimen. Diagnosis of the salivary glands lesions is aided by the fine needle aspiration cytology, although this has its limitations. One study has demonstrated that repeated fine needle aspiration is associated with increased chance of diagnosing the lesion.[52] Pain, ulceration, nerves involvement and lymphnodes involvement may be indicative of malignancy but are uncommon occurrence.[1,6]

1.2.4.4. Treatment of malignant salivary glands tumors

The main stay of management of malignant salivary gland neoplasms is wide surgical excision. Radical surgery, the removal of the entire gland and more recently supraradical surgery, that is resection of the entire gland with its surrounding tissues and lymphatic drainage field, have been advocated for some tumors regardless of the stage with or without neck dissection depending on nodal status.[1,53] Another treatment modality is radiotherapy, however it is recommended that radiotherapy be used as an adjunct to surgery, or be used as a palliative management to advanced malignancies because many salivary gland tumors do not respond to radiotherapy.[1,6] The role of chemotherapy in the management of salivary glands neoplasms is still questionable.

Currently little is known on the occurrence and clinico/pathologic presentation of salivary gland diseases and their management in Tanzania. There was therefore a need of determining the occurrence and clinical and pathologic characteristics of different salivary gland diseases.

2. 1. Problem statement

Salivary glands diseases are conditions that are frequently seen at MNH Oral and Maxillofacial department. Patients with salivary gland diseases usually present with a variety of clinical features including dry mouth, swelling and/or ulceration resulting in impaired function and disfigurement. Although there are different salivary gland diseases that patients present with, salivary gland tumors are the most common. These tumors when left without intervention for a long time they have the capacity to grow big enough to cause pain and disfigurement resulting in increased morbidity and incapacitation of the patient. Progression of the disease in the oral cavity may result into difficulty breathing and impaired feeding both of which increase patients' suffering and decrease the quality of life. In this hospital patients usually present very late, with advanced swellings or ulcers.

Diagnosis of salivary glands diseases is highly challenging and requires biopsy as the definitive investigation which can not be accomplished at the lower level hospitals.

Currently little is known on the occurrence and clinico-pathologic presentation of salivary glands diseases and their management in Tanzania. Therefore, there was a need to study the occurrence and the clinical and pathologic characteristics of different salivary glands diseases.

2.2 Rationale of the study

It is expected that after this study, knowledge on salivary glands would expand. Findings of this study will provide a baseline data for the occurrence of the salivary glands diseases among Tanzanians. After this study the clinical and pathologic presentation of different salivary glands diseases will be known. This will help in arriving at clinical diagnosis and treatment planning. Findings of this study will be compared with findings from other parts of the world.

Data from this study will also give some clear view of the clinical presentation of salivary gland disorders and will provide a guide on tailoring community based information regarding these conditions based on results of the study. Findings of this study will also help the Ministry of Health and Social Welfare to create evidence based educational materials for Tanzania society for the purpose of improving health.

3.1 Broad objective

The broad objective of this study was to determine the occurrence, clinico-pathological presentation and management of salivary gland diseases in patients attending treatment at the Oral and Maxillofacial Department of the Muhimbili National Hospital (MNH), Dar es Salaam, Tanzania.

3.2. Specific

The specific objectives were:

1. To determine the frequency of occurrence of salivary glands diseases among patients attending Oral and Maxillofacial Department.
2. To determine the clinical presentation of salivary glands diseases among patients attending Oral and Maxillofacial Department.
3. To determine the histological presentation of salivary gland diseases.
4. To determine the type of treatment modalities of salivary gland diseases offered at MNH

4.0 METHODOLOGY

4.1. Study settings.

This study was conducted at the MHN-Oral and Maxillofacial Surgery unit. MNH is a referral hospital with the only oral and maxillofacial centre in the country. Most oral and maxillofacial pathologies that can not be treated in district and regional hospitals are referred to this centre.

4.2. Study design

This was a hospital clinical based descriptive cross-sectional prospective study conducted for the duration of eight months from August 2010 to March 2011.

4.3. Study population

Participants in this study comprised of all patients who attended treatment at the Oral and Maxillofacial Surgery unit during the study period.

4.4. Sample size and sampling technique

4.4.1. Sample size

All patients who attended at the Oral and Maxillofacial department, patients who were admitted in the Oral and Maxillofacial surgical wards 23 and 24, and those admitted in the otorhinolaryngology (ENT) wards 19 and 20, during the period of August 2010 to March 2011 were recruited in the study.

4.4.2. Procedure for obtaining patients

All patients attending out patients clinics at the Oral Surgery and Oral Pathology department and those admitted in wards (19, 20, 23 and 24) were routinely examined and those who were diagnosed of having salivary gland diseases were recruited to participate in the study.

4.5. Inclusion and exclusion criteria

4.5.1. Inclusion criteria

All patients who attended at the Oral and Maxillofacial Surgery firm and who consented were included in the study.

4.5.2. Exclusion criteria

Patients who attended at the Oral and Maxillofacial Surgery firm but did not consent for the study due to various reasons were excluded from the study.

4.6. Data collection and management

4.6.1. Study instruments and methods

Data was collected by interviews using a structured questionnaire. Clinical examination and histological/cytological findings were recorded in a special designed clinical form.

Interview

Interview was conducted by the investigator in a secluded room within the department and responses were recorded in the questionnaire. The interview enquired information on age, sex, the presenting symptoms, the duration of the condition, medical history, and treatment received at home for the condition.

Physical examination

Examination of the patients was conducted by the investigator by first doing general physical examination followed by local examination of the involved salivary gland**.**

General physical examination

This was done by inspection, palpation, percussion and auscultation. Vital signs (blood pressure, pulse, respiratory rate and body temperature) were examined and recorded in a clinical form.

Local examination

Local physical examination involved a thorough head and neck examination. The following were noted in the clinical form; the size of gland, palpable masses (location, number and

size), also the extent of the lesion whether localized or diffuse, location of the swelling, neurologic findings and the character and flow of saliva. Palpation for regional lymph node enlargement was done and the number, size, site, fixity and mobility of the nodes were recorded in the clinical record.

Patients with the following features were considered as cases of salivary gland diseases and were considered for further laboratory workups; patients presenting with xerostomia, patients presenting with ulceration of the salivary gland, patients with swelling of the salivary glands, patients with bluish colored swelling of the floor of mouth, patients with discharge from the salivary duct openings and patients with painful salivary glands.

Salivary glands biopsy

Salivary glands biopsy was done by both fine needle aspiration biopsy and open tissue biopsy.

Fine needle aspiration biopsy

Fine needle aspiration was performed by using a 21 gauge or smaller needle. The needle was advanced into the mass lesion, then the plunger was activated to create a vacuum in the syringe, the needle was then moved back and forth in different directions throughout the mass, with pressure maintained on the plunger. Pressure was then released and the needle withdrawn, and the cellular material and fluid were expelled onto a slide. The cells were smeared on a slide and immediately immersed in 95% ethanol or 50/50 ether/alcohol solution for at least 30 minutes for fixation. Then this fixed smear was passed into water then in 95% ethanol and down to distilled water. The smear was stained in Harri's Haematoxylin for 3 minutes, and then rinsed in tap water. The slide was then differentiated in 1% acid in 70% ethanol and washed in tape water for 5 minutes after which the slide was then rinsed in 95% ethanol. After this the slide was stained in Orange G6 for 2 minutes and rinsed in 95% ethanol. Then the slide was dehydrated in absolute alcohol, and cleared in xylene and finally mounted in DPX. The slide was examined under microscope at 40 magnifications; a diagnosis was provided basing on the cellular characteristics of different lesions and this was the basis for the cytological diagnosis

Open biopsy

Preoperative surgical biopsy for salivary masses was not commonly indicated. In this study open biopsy was done after fine needle aspiration biopsy. This biopsy was dictated by the location and size of the lesion and the suspected pathology. In the parotid gland, biopsy consisted of incisional tissue biopsy, with careful preservation of the facial nerve. For tumors in the submandibular gland the total removal of the gland was done. In the minor salivary glands tumors, total excision with a margin of normal tissue was performed. This surgical approach was both diagnostic and curative in the majority of salivary gland tumors. In large lesions, where excisional biopsy was not possible an incisional biopsy was performed. After taking tissue biopsy the specimen was immediately immersed in a bottle containing 10% formal-saline solution (the volume of a fixative was 15-20 times that of a specimen) for fixation for 1 hour. After fixation, the tissue was cut into slices thin enough to transmit light; this was done using microtome. Then secondary fixation was done by immersing in 70% ethanol for 3 hours, then in 90% alcohol for 2 hours. After secondary fixation, clearing was done by immersing the tissue in xylene solution for 3 hours. This was followed by wax impregnation for 1 hour to produce block and remove clearing agent (xylene).There after casting was done by filling a suitable size with molten paraffin wax orienting the specimen in the mould to ensure its being cut in the right plane. Finally the mass was cooled to promote solidification. After this the tissue was stained using Haematoxyline and Eosine, and examined under light microscope at 40 resolutions**.**

Salivary glands imaging

Radiological investigations selectively included plain radiography, ultrasonography, computed tomography and MRI. The interpretation was done by the investigator with assistance of the radiologist. The radiographic findings were recorded in the clinical form.

Plain-Film Radiography.

Symptoms suggestive of salivary gland obstruction (swelling of the gland and pain) warranted plain-film radiography of the major salivary glands in order to visualize possible radiopaque sialoliths (stones). Panoramic or lateral oblique and anteroposterior (AP)

projections were used to visualize the parotid glands. A standard oclussal and the lateral oblique view film was used to view the submandibular gland.

Sialography.

Sialography is the radiographic visualization of the salivary gland following retrograde instillation of soluble contrast material (iodine) into the ducts to evaluate intrinsic and acquired abnormalities of the ductal system. Salivary ductal obstruction, whether by a sialolith or stricture, could be recognized by sialography. However due to lack of expertise and instruments this was not done routinely.

Ultrasonography

Ultrasound of the salivary gland is performed using a high-resolution (7-12MHz) linear array transducer. Transverse and longitudinal scans were obtained with the patient supine and the head turned away from the side being examined. Transverse scans were performed with the transducer perpendicular and inferior to the ear lobe. When performing longitudinal scans, particular attention shall be paid to the tail of the parotid gland which may be obscured by the ramus of mandible. Transverse scans using a submandibular view is expected to provide most of the information. Oblique and coronal adjustments help to localize lesions and to trace vessels. Colour-flow imaging is a useful adjunctive tool and should be performed whenever a mass is seen on gray scale ultrasound. Both sides shall be scanned for symmetry and to exclude further clinically non-palpable lesions. Regional nodal territories in the neck are included as part of ultrasound examination of the salivary glands.

Computed Tomography and Magnetic Resonance Imaging.

Computed tomography (CT) was indicated to patients with advanced tumors of the soft palate before plane of excision. MRI was not routinely indicated to most of our patients.

Surgery for the treatment of ranula

An intraoral incision was made slightly medial to and along the horizontal axis of the sublingual gland, and the gland was dissected from anterior to posterior, protecting the submandibular duct and maintaining hemostasis as the dissection proceeded. At the posterior edge of the gland, care was taken to identify and preserve the lingual nerve as it

passed under Wharton's duct. The posterior portion of sublingual salivary gland was carefully excised because it may sometimes be associated with oral extension of the submandibular gland. The wound was repaired using absorbable sutures. Plunging ranula was treated under general anaesthesia through an extraoral approach. A submandibular incision was made just above the level of the hyoid bone, subcutaneous tissues were dissected to expose and the cyst capsule which was very thin was dissected and excised removed, then the myelohyoid muscle was retracted and the sublingual gland excised. Wound repair was done in layers using absorbable sutures for deeper tissues and prolene for the skin. The intraoral approach is the most advocated approach for it is less associated with danger of injury to the submandibular duct and gland and the lingual nerve; in this study also there was no complication with this approach.[1,57]

Surgical treatment of pleomorphic adenoma of the submandibular salivary gland

Surgery was done under general anaesthesia through oral endotracheal intubation. Patients with pleomorphic adenoma of the submandibular salivary gland were placed in the supine position with neck extended and the head turned away from the surgeon. A horizontal skin incision was made about 3 centimeters below the lower border of the mandible in a skin crease, and the incision was deepened through subcutaneous fat, platysma, and fascia until the capsule at the lower limit of the gland was reached. This was then opened along the lower border of the gland and a large superior flap was elevated in the plane between the surgical capsule and the gland. The facial vessels were ligated both at the inferolateral corner of the gland and its upper border. The gland was mobilized until it was pedicled on its deeper part, where upon the mylohyoid muscle was retracted forwards to permit separation of the gland from the lingual nerve. Then the duct was severed and ligated and the wound was closed in layers without putting drainage

Surgical treatment of pleomorphic adenoma of the palate

The patients were subjected to general anesthesia through nasal endotracheal intubation. Using a No. 15 surgical blade an 8cm anteroposterior incision was carried through the

mucosal tissue overlying the mesial aspect of the palatal swelling. While exercising extreme care in an attempt to preserve the continuity of the capsular lining, the overlying mucosal tissue was relieved of its submucosal attachments, reflected laterally and held with Allis forceps, thus exposing the entire diameter of the massive lesion. With blunt and sharp dissection, the entire tumor mass was the freed from its submucosal and periosteal attachments and enucleated in total.

The wound edges were then repositioned, closure was completed with interrupted sutures of 1-0 black silk and a pressure pack was placed over the surgical site.

In cases where the mucosal tissue had been infiltrated by the lesion a local incision of the tumor together with a margin of 0.5-1cm of normal tissue was done. The bare palatal bone was cauterized and the defect was covered by a pressure pack and left to heal by secondary intention.

4.6.2. Data management

After collection of data, the investigator checked for completeness and clarity. Then data were entered in the special program: Statistical package for social sciences (SPSS).

4.6.3. Data analysis

The collected data were managed in a personal computer and analyzed using SPSS software for Windows version 15.0

4.7. Ethical consideration

All patients were given explanation about the study before they were asked to participate in the study. Patients who freely consented were enrolled. All information was kept confidential by identifying the patients by numbers in the questionnaires and clinical forms. All patients who were diagnosed to have salivary glands disorders were treated.

7.1 Ethical clearance

The proposal was presented in the department of Oral Surgery and Oral Pathology of the Muhimbili University of Health and Allies Sciences. There after the ethical clearance was

sought from the Research and Publications Committee of the Muhimbli University of Health and Allied sciences.

5.0. RESULTS

During the study period a total of 5174 patients comprising of 2184 (42%) males and 2990 (57.8%) females were attended in the Oral and Maxillofacial Surgery unit of the Muhimbili National Hospital. Out of these, 56 (1.08%) patients comprised of 36 (64.3%) females and 20 (35.7%) males had salivary gland diseases. The age ranged between 3 and 73 years with a mean of 31.8 years. The male to female ratio was 1:1.8.

5.1 Distribution of patients with salivary glands diseases by age and sex

Results as indicated in Table 1 showed that, majority 41 (73.21%) patients with salivary gland diseases were aged between 20 and 59 years, however, the age group 20-29 years with 19 (33.92%) patients was the most affected followed by the age group 30-39 with 9 (16.07%) patients, and the age groups 0-9 and 50-59 years each with 7 (12.5%) patients. Females 36 (64.3%) were more affected than males 20 (35.7%).

Table 1: Distribution of patients with salivary gland diseases by age and sex

Age in years	**Sex**				**Total**	
	Male		Female			
	N	%	N	%	N	%
0 – 9	4	7.14	3	5.35	7	12.5
10-19	0	0	4	7.14	4	7.14
20 – 29	4	7.14	15	26.78	19	33.92
30 – 39	4	7.14	5	8.92	9	16.07
40 – 49	3	5.35	3	5.35	6	10.71
50 – 59	2	3.57	5	8.92	7	12.5
60 – 69	1	1.78	0	0	1	1.78
70 – 79	2	3.57	1	1.78	3	5.35
Total	20	35.72	36	64.28	56	100

5.2 Distribution of salivary gland diseases by age and sex

Pleomorphic adenoma was the only benign salivary gland tumor that was encountered affecting 12 (21.4%) patients comprised of 3 (25%) males and 9 (75%) females. Majority 9 (75%) patients with pleomorphic adenoma belonged to the 20-39 years age group followed by 3 (25%) in the 50-59 years age group.

Malignant salivary gland tumors were observed in 13 (23.2%) patients comprised of 7 (12.5%) males and 6 (10.7%) females. Majority 7 (53.8%) patients affected by malignant salivary gland tumors were aged between 40 and 59 years followed by 3 (23.1%) patients in the 20-39 years age group and 2 (15.4%) patients in the 70-79 years age group. The age groups 0-9 years and 60-69 years were free of malignant salivary gland tumors. The commonest observed malignant salivary gland tumor was adenocarcinoma in 7 (12.5%) patients followed by mucoepidermoid carcinoma and adenoid cystic carcinoma in 2 (3.6%) patients each.

Ranula was the commonest cyst of salivary glands that was encountered in 16 (28.6%) patients whereby 11 (68.75%) were females and 5 (31.25%) males. The commonest age groups affected by ranula included the 0-9 and 20-29 years age groups with 6 (37.5%) patients each followed by the (30-39) years age group. No patients beyond the age of 40 years had ranula. Mucocele observed in 3 (5.3%) patients was the second commonest salivary gland cyst followed by the lymphoepithelial cyst in 1 (1.8%) patient. Mucocele were observed in patients aged between 20-39 years and in one patient in the 50-59 years age group. Sialolithiasis was found in 10 (17.9%) patients slightly more in 6 (60%) females than 4 (40%) males. Majority 9 (90%) patients with sialolithiasis were aged between 20 and 49 years, and the rest of the age groups had no sialolithiasis except the 60- 69 years age group that had only 1 (10%) patient with the condition.

Table 2; Distribution of salivary gland diseases by age and sex

Diagnosis		Age																	
		0-9		10-19		20-29		30-39		40-49		50-59		60-69	70-79		Total		Grand total
		M	F	M	F	M	F	M	F	M	F	M	F	M F	M	F	M	F	
Benign tumors	Pleomorphic adenoma	-	-	-	-	1	5	1	2	-	-	1	2	- -	-	-	3	9	12(21.4%)
Malignant tumors	Adenocarcinoma	-	-	-	-	-	1	1	-	2	-	1	-	- -	2	-	6	1	7 (12.5%)
	Mucoepidermoid carcinoma	-	-	-	1	-	-	-	-	-	-	-	1	- -	-	-	0	2	2 (3.6%)
	Adenoid cystic carcinoma	-	-	-	-	1	-	-	-	-	-	-	1	- -	-	-	1	1	2 (3.6%)
	Squamous cell carcinoma	-	-	-	-	0	0	0	0	-	-	-	1	- -	-	-	-	1	1 (1.8%)
	Acinic cell carcinoma	-	-	-	-	-	-	-	-	-	1	-	-	- -	-	-	0	1	1 (1.8%)
Cysts	Ranula	4	2	-	1	-	6	1	2	-	-	-	-	- -	-	-	5	11	16 (28.6%
	Mucocele	-	-	-	1	1	-	-	-	-	-	-	1	- -	-	-	1	2	3 (5.3%)
	Lymphoepithelial cyst	-	-	-	-	-	-	-	-	-	1	-	-	- -	-	-	0	1	1 (1.8%)
Others	Non-specific chronic sialoadenitis	-	1	-	-	-	-	-	-	-	-	-	-	- -	-	-	-	1	1 (1.8%)
	Sialolithiasis	-	-	-	-	1	4	1	1	1	1	-	-	1 -	-	-	4	6	10 (17.9%)
Total		4	3	0	3	4	16	4	5	3	3	2	6	1 0	2	0	20	36	56 (100.%)
Grand total		7 (12.5%)		3 (5.36%)		20(35.7%)		9 (16.1%)		6 (7.2%)		8 (14.3%)		1 (1.8%	2 (3.6%)		56 (100%)		

5.3 Distribution of salivary gland diseases by anatomical site

Results in the table 3 indicate that regardless of the histological diagnosis majority of salivary gland diseases were detected in the major salivary glands in 39 (69.6%) patients and the rest were observed in minor salivary glands in 17 (30.4%) patients

Amongst the major salivary glands, the submandibular and sublingual glands were equally affected in 16 (28.6%) patients each followed by the parotid in 7 (12.5%) patients.

Minor salivary glands of the palate were the most affected by salivary gland diseases mainly by benign and malignant tumors followed by those of the lower lip by mucoceles and those in the tongue, upper lip and floor of the mouth by the malignant salivary gland tumors.

Majority 6 (50%) of pleomorphic adenoma were commonly detected in the minor salivary glands of the palate followed by the submandibular glands in 4 (33.3%).

Adenocarcinoma was equally distributed in both major and minor salivary glands but it was slightly more common in the palate in 3 (42.86%) patients followed by the parotid in 2 (28.57%) patients.

Mucoepidermoid carcinoma was solely observed in the minor salivary glands equally affecting the tongue, floor of the mouth and the palate. While squamous cell carcinoma and acinic cell carcinoma equally affected the parotid gland, adenoid cystic carcinoma was observed in both the submandibular and minor salivary glands in the palate.

Ranula was exclusively found in the sublingual gland while mucoceles were observed in the lower lip only. The lymphoepithelial cyst affected the parotid gland only.

Sialolithiasis affected major salivary glands only and was most frequently observed in the submandibular gland in 9 (90%) patients followed by the parotid in one patient

Table 3: Distribution of salivary gland diseases by anatomical site

Type of lesion	Diagnosis	Site									
		Parotid	Submandibular	Sublingual	Minor salivary glands						
					Tongue	Upper lip	Lower lip	Buccal mucosa	Floor of mouth	Palate	Nasopharynx
Benign tumor	Pleomorphic adenoma	1	4	-	-	-	-	-	-	6	1
Malignant tumors	Adenocarcinoma	2	1	-	-	1	-	-	-	3	-
	Mucoepidermoid carcinoma	-	-	-	1	-	-	-	1	1	-
	Adenoid cystic carcinoma	-	1	-	-	-	-	-	-	1	-
	Squamous cell carcinoma	1	-	-	-	-	-	-	-	-	-
	Acinic cell carcinoma	1	-	-	-	-	-	-	-	-	-
Cysts	Ranula	-	-	16	-	-	-	-	-	-	-
	Mucocele	-	-	-	-	-	3	-	-	-	-
	Lymphoepithelial cyst	1	-	-	-	-	-	-	-	-	-
Others	Sialolithiasis	1	9	-	-	-	-	-	-	-	-
	Non-specific chronic sialoadenitis	-	1	-	-	-	-	-	-	-	-
	Total	7 (12.50%)	16 (28.60%)	16 (28.60%)	1 (1.80%)	1 (1.80%)	3 (5.40%)	-	1 (1.80%)	11 (19.6%)	1 (1.80%)



Figure1. Pleomorphic adenoma of the right submandibular salivary gland in a 50 years old female patient.

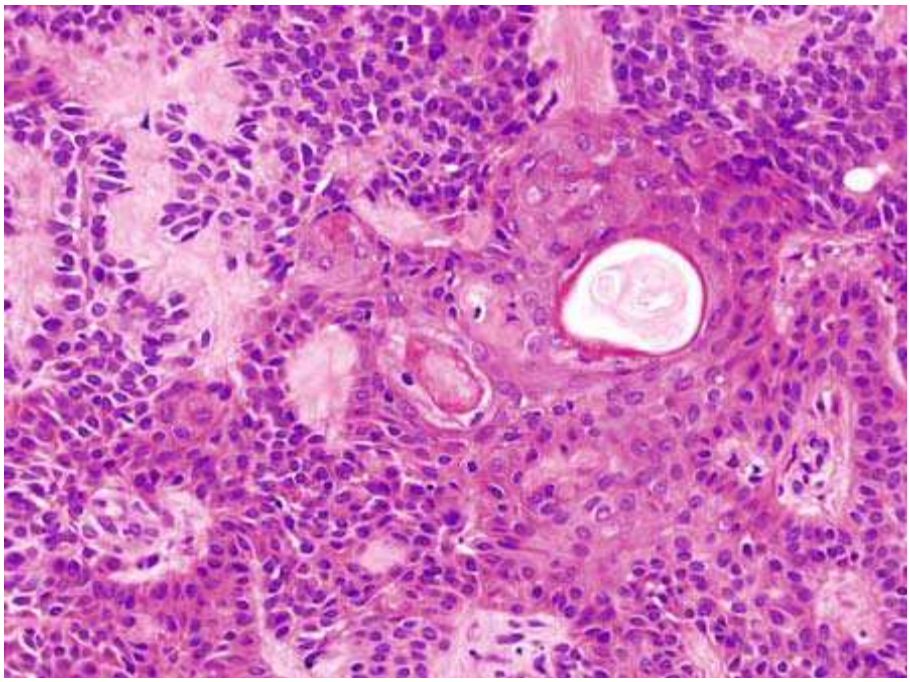


Figure 2. Pleomorphic adenoma; a photomicrography showing myoepithelial cells with an epithelioid cytomorphology. Some cells are also spindle-shaped, plasmacytoid (hyaline) with a clear cytoplasm. Note also a small duct and a focus of squamous metaplasia. Keratinising squamous metaplasia is seen in up to a quarter of pleomorphic adenomas (hematoxyline &Eosine stain x40)

Although cells with a myoepithelial phenotype are seen predominantly in pleomorphic adenoma, these cells can also be seen in other salivary gland tumors, which include myoepitheliomas, adenoid cystic carcinomas, and epimyoepithelial carcinoma of intercalated duct origin. This increases the complexity of histological diagnosis of different salivary gland lesions. Therefore a thorough histological diagnosis is important in order to plan for definitive management of the disease.

5.4 Clinical presentation of salivary gland diseases

Results in Table 4 indicate that, the most frequently encountered clinical presentation of salivary gland diseases in this study was a swelling in all (100%) patients, followed by pain in 16 (28.6%) patients, infection in 7 (12.5%) and ulceration in 5 (8.9%) patients. Two (3.6%) patients presented with facial nerve palsy.

Pleomorphic adenoma presented as a swelling only. All 13 (100%) patients with malignant salivary gland tumors presented with swelling, while in addition 9 (69.2%) of them presented with pain, 5 (38.46%) patients with ulceration, 2 (15.4%) with facial nerve palsy and one had infection.

Ulceration was observed in 3 (42.8%) patients with adenocarcinoma and in one patient each with mucoepidermoid and squamous cell carcinoma.

All patients with malignant salivary gland tumors presented with pain with exception of two patients who had adenocarcinoma and in one each with mucoepidermoid carcinoma and adenoid cystic carcinoma. Facial nerve palsy was observed in patients with adenocarcinoma and squamous cell carcinoma of the parotid gland. All salivary gland cysts observed in this study presented with a swelling while sialolithiasis, besides swelling presented with pain and infection

Table 4, Clinical presentation of salivary gland diseases by histological and cytolocical diagnosis

Diagnosis			Clinical presentations				
			Swelling of gland	**Ulceration**	**Infection**	**Pain**	**Facial nerve palsy**
Benign tumos	Pleomorphic adenoma		12	-	-	-	-
Malignant tumors	Adenocarcinoma		7	3	-	5	1
	Mucoepidermoid carcinoma		2	1	-	1	-
	Adenoid cystic carcinoma		2	-	-	1	-
	Squamous cell carcinoma		1	1	1	1	1
	Acinic cell carcinoma		1	-	-	1	-
Salivary cysts	Ranula		16	-		-	-
	Mucocele		3	-	-	-	-
	Lymphoepithelial cyst		1	-	-	-	-
Others	Sialolithiasis		10	-	6	6	-
	Non-specific chronic sialoadenitis		1	-	-	1	-
	Total	N	56	5	7	16	2
		%	(100%)	(8.9%)	(12.5%)	(28.6%)	(3.6%)

5.5 Distribution of salivary gland disease by treatment modalities rendered

Surgery was the most frequent definitive treatment modality that was rendered to 23 (41.1%) patients followed by chemotherapy to 12 (21.4 %) patients and radiotherapy in 10 (17.9%) patients. Analgesic was used as symptomatic treatment in 6 (10.7%) patients with sialolithiasis.

Table 5, Distribution of salivary gland disease by treatment modalities rendered.

Diagnosis			Treatment modalities					
			Observation	analgesics	antibiotics	Surgery	Radiotherapy	chemotherapy
Benign tumor	Pleomorphic adenoma		-	-	5	5	-	-
Malignant tumors	Adenocarcinoma		-	5	5	3	4	7
	Mucoepidermoid carcinoma		-	1	1	1	2	2
	Adenoid cystic carcinoma		-	1	2	2	2	2
	Squamous cell carcinoma		-	1	1	-	1	-
	Acinic cell carcinoma		-	1	1	-	1	1
Salivary cysts	Ranula		2	-	3	5	-	-
	Mucocele		-	-	3	3	-	-
	Lymphoepithelial cyst		1	-	-	-	-	-
Others	Sialolithiasis		2	6	10	3	-	-
	Non-specific chronic sialoadenitis		-	1	1	1	-	-
	Total	N	5	16	16	23	10	12
		%	(8.9%)	(28.6%)	(28.6%)	(41.1%)	(17.9%)	(21.4%)

6.0. DISCUSSION

6.1. Age and sex distribution

In this study it was found that generally salivary gland diseases mostly occurred in patients younger than 40 years with the highest frequency in the 3rd decade. Cysts were mostly seen below 20 years of age while tumors, both benign and malignant were seen in patients who were aged above 20 years but below 59 years. This could be due to the fact that most of the salivary gland cysts affect young population and when they occur they grow fast leading to early detection, while salivary gland tumors are usually grow slowly with no pain and therefore likely to be detected later. While ranula and the mucoceles, which formed the majority of the cysts, are associated with trauma, tumors of the salivary glands have no clear predisposition.[1] Zhao et al[41] in China reported that ranula was the commonest lesion in young patients while Al-Khateeb et al.[54] in Iran reported a mean age of 40 years for the occurrence of salivary gland tumors. Generally this study showed that there were more females who reported to hospital with salivary gland conditions than males at a ratio of 1.8:1. Al-Khateeb et al[54] in Jordan and Zhao et al[41] in India reported similar trends. However, the studies by Chidzonga[55] in Zimbabwe and Nitin[60] in India had higher numbers of males compared to females. The higher number of females may be attributable to the fact that generally women have a higher tendency of reporting their medical problems earlier than men.

6.2 Distribution of salivary gland diseases

Among cysts the ranula had by far the highest frequency while pleomorphic adenoma was the commonest tumor and among inflammatory conditions sialolithiasis was commonest. This is in concurrence with Zhao et al[41] and Al-Khateeb et al[54] who gave similar reports regarding cysts, tumors and inflammatory conditions respectively. Except for adenocarcinoma there was no clear sex predilection for the malignant tumors, findings which were not consistent with several previous studies which showed clear male predominance.[3,41]

Among the malignant tumors, adenocarcinoma was the most commonly encountered lesion, which is in contrast to several reports which show that the commonest malignant tumor was either adenoid cystic carcinoma or mucoepidermoid carcinoma. [3,44,51,55]

The definitive treatment of salivary gland diseases is surgical excision. In this study surgery was done in 41.1% of the patients comprised of 53.1% of patients with benign salivary gland lesions and 46.9% of patients with malignant lesions. Surgery was done in few cases with malignant salivary gland tumors because of the late presentation, in that patients presented with huge extensive tumors which could not warrant surgery. Although chemotherapy and radiotherapy are not the treatment of choice for salivary gland tumors due to their poor response, 21.4% of patients received chemotherapy and 17.9% received radiotherapy. These were offered to patients with advanced lesions as part of palliative treatment. Antibiotics (frequently, amoxicillin and metronidazole) were used in 28.6% and analgesics (frequently Diclofenac and paracetamol) were used for symptomatic treatment in patients with sialolithiasis and in malignant tumors.

6.3. Salivary gland cysts

6.3.1. Ranula

In the present study ranula was the commonest observed cyst of the salivary glands. Ranula was always associated with one of the sublingual salivary glands. Similar findings have been reported by.[55, 57] This study showed that ranula had a predilection for females, majority of the patients being less than 30 years of age and none was beyond 40 years. This is in concurrence with the previous study by Zhao et al[54] who also reported that the ranula occurred most commonly in young individuals majority of whom were females. Clinically ranula could be categorized as superficial ranula, plunging ranula or mixed. All the cases of ranula presented as unilateral swellings of the right side of floor of mouth. While Chidzonga[55] reported that the ranula occurred equally on both the right and left sides of the sublingual region, in this study most cases involved the right side of the mouth. However, considering the small number presented here, this might be just a coincidental finding.

Different treatment modalities of ranula have been reported by previous studies, which include removal of the sublingual glands and pseudocyst, placement of suture/stitch in the cyst, intra-cystic sclerosing injection with OK-432 and CO2 Laser[57]. There were 5 cases of ranula that were treated, 4 were oral ranulas and one case was plunging ranula. Three cases of

oral ranula were treated under local anaesthesia and one case was treated under general anaesthesia because of the young age of the patient. The advantages of surgery for the removal of oral ranulas under local anaesthesia included treatment on out patient basis, the use of local anaesthesia, no long appointments of waiting for theatre space and minimal materials used. Among the big problems of treatment under general anaesthesia in our environment is the requirement for a minimal level of haemoglobin of 10gm/dl. Many patients reporting with different conditions including those involving the salivary glands have less than optimal haemoglobin levels. Since this is not a strict requirement during treatment under local anaesthesia it was easy to treat these patients even when the haemaglobin could not reach optimal levels. During the duration of the study there was no case that showed recurrence after treatment. However longer follow ups are necessary.

6.3.2. Mucocele

Three cases of mucoceles were found in patients who were in the age groups of the second, third and fifth decades. This is slightly different from the report of Jose et al[21] in which mucoceles occurred in different ages but the highest frequency was in patients who were in the 10-20 years age group with a slight male predilection. Mucoceles have been reported to occur in minor salivary glands of the lips, buccal mucosa, and floor of the mouth, palate, and oropharynx. [21, 58] Similar to most other studies, this study has shown that mucocele occurred predominantly in the lower lip. The lower lip seems to be more prone to suffer trauma which is the most common predisposing factor to the formation of mucoceles. The relatively small number of mucoceles seen in this study might be most likely attributable to the fact that these cystic lesions are usually asymptomatic. Also, they often rupture spontaneously and disappear without any need for reporting to hospital. All mucoceles in this study were treated by surgical excision as recommended by Jose et al[21] and López-Jornet.[59] The surgery included the excision of the mucocele and removal of the underlying minor salivary gland. There was no a case of recurring lesion following excision.

6.3.3. Lymphoepithelial cyst

Only one case of the lymphoepithelial cyst in a 40 years old female patient was encountered. Kooper et al[34] and Regezi[6] had also reported that females were more affected than males. Similar to what was stated by Craven et al[35] the patient with lymphoepthelial cyst had HIV infection and was on antiretroviral therapy. She was kept under observation and managed symptomatically. According to existing reports, such lesions regress spontaneously after patients were started on antiretroviral therapy.

6.4. Salivary glands tumors

6.4.1. Benign salivary gland tumors

Pleomorphic adenoma

Several studies on salivary gland tumors showed that worldwide, benign tumors occurred more commonly than malignant ones. [3,40,41] In this study however, pleomorphic adenoma was the only benign tumor that was encountered in six patients. The small number of pleomorphic adenoma as seen in this study could be due to the fact that these tumors usually slow grow slowly and because they hardly present with any pain, they may grow to voluminous sizes before reporting as seen in figure 1. Different studies have reported the pleomorphic adenoma to be the most common benign tumor of both minor and major salivary glands.[2,3,51] Patients with pleomorphic adenoma seen during the present study were below 60 years of age with a female predominance in all age groups. This is in agreement with findings from a similar study in Zimbabwe which also showed a predilection for females.[55]. A majority (75%) of patients with pleomorphic adenoma were aged between 20 and 39 years, which is similar to that which was reported by Masanja et al[3] in a previous study of salivary gland tumours in Tanzania. Pleomorphic adenoma is known for the predilection for the parotid gland.[2,3,60] However, to the contrary, in this study the minor salivary glands of the palate were most affected followed by the submandibular gland and lastly the parotid.

Pleomorphic adenomas are often completely or partly surrounded by a fibrous capsule of variable thickness that is usually absent in tumours of the minor glands. Neoplastic elements may extend into and even through this capsule in the form of microscopic pseudopodia or

apparent satellite nodules. These could be the cause of future recurrence after apparent surgical removal.[48] To reduce the possibility of such recurrences the advocated treatment of pleomorphic adenoma is tumor excision with a small margin of normal tissue. Out of 11 pleomorphic adenoma eight tumors which included five tumors of the palate and 3 tumors of the submandibular gland were surgically removed using this principle. Because of the involvement of the nasopaharynx one patient with a palatal pleomorphic adenoma was treated by the ENT surgeons. Due to difficult in separating the mucosa from the capsule palatal pleomorphic adenomas were completely excised together with the overlying mucosa in order to avoid recurrence. The tumour bed on bone was then cauterized (electrocautery) in order to minimize the risk of recurrence. The submandibular pleomorphic adenoma was treated by tumor excision together with complete submandibular gland removal. There were no recurrences observed, however the duration for follow up was too short.

6.5. Malignant tumors

There has been a variation in the reported occurrence of malignant salivary gland tumors. While Al-Khateeb[41] reported that mucoepidermoid carcinoma and adenoid cystic carcinoma occurred equally as commonest malignant salivary gland tumours, Masanja et al[3] reported adenoid cystic carcinoma to be the commonest malignant tumor. In the present study adenocarcinoma was the commonest malignant tumor that accounted for 12.5% of all salivary gland diseases followed by the adenoid cystic carcinoma and mucoepidermoid carcinoma with a male to female ratio of 6:1. This difference in the two Tanzanian studies might be because of the difference in the duration of the two studies. Only one case of acinic cell carcinoma in a female patient aged 41 years was seen. This tumor was found involving the parotid gland. The rarity of this tumor and its involvement of the parotid gland are in keeping with the report of Tian et al.[51]

6.5.1. Adenocarcinoma

Adenocarcinoma was the most common malignant salivary gland tumor. These findings did not concur with other African and Western countries reports which showed a lower

occurrence of adenocarcinoma in comparison to other malignant salivary gland tumors.[3, 41, 51] This tumor had a wide range of age of occurrence but the majority was found in patients aged between 20 and 59 years. In all age groups there was a male predominance. More than half of the lesions were located in the minor salivary glands, mostly on the palate, followed by the parotid and submandibular glands. Adenocarcinomas mostly presented as painful swellings but only a few cases had ulceration and one patient presented with facial palsy. The treatment of adenocarcinoma is entirely wide surgical excision with or without adjuvant radiotherapy. It is still questionable about the role of radiotherapy and chemotherapy on the treatment of salivary gland tumors. However radiotherapy has been used for local control of malignant salivary gland tumors in differing doses. Six cases were operable and three cases were treated by alternate treatment methods. For the operable cases surgical excision and adjuvant radiotherapy was the treatment offered to malignant salivary gland tumors. There was no apparent recurrence that was observed, however a longer follow-up is necessary.

6.5.2. Mucoepidermoid carcinoma

Different studies show that mucoepidermoid carcinoma was the most commonly occurring malignant neoplasm of major and minor salivary glands in both adults and children.[51] Nevertheless, in this study there were only two female patients with mucoepidermoid carcinoma of which one was aged 14 years and the other 54 years. This is in agreement with the findings of Bernardes et al[61] but in contrast to Fonseca et al[62] who reported that males were more affected by mucoepidermoid carcinoma than females. Mucoepidermoid carcinoma involved the minor salivary glands of the tongue, floor of mouth and the palate; similar findings were reported.[3] However, Fonseca et al[62] reported predilection for the major salivary glands. The variation in the age of occurrence of mucoepidermoid carcinoma observed in this study is almost similar to what has been reported by Fonseca.[62] The treatment of mucoepidermoid carcinoma depends on histological grading whereby low grade tumors should be managed by local excision and prolonged follow up and high grade lesions should be treated by a more radical resection and adjuvant radiotherapy. In this study, one case of mucoepidermoid carcinoma of the tongue was very advanced and therefore palliative

radiotherapy was the only option. The patient with palatal mucoepidermoid carcinoma underwent partial maxillectomy and received adjuvant radiotherapy. The patient remained well during the few months of follow up.

6.5.3. Adenoid cystic carcinoma

The frequency of adenoid cystic carcinoma seen in the present study was rather low compared to other reports.[3, 51] The two patients, one male and another female with adenoid cystic carcinoma were found in the third and sixth decades, which is similar to other studies worldwide which also reported a varying age of 20 to 80 years. Adenoid cystic carcinoma in this study was found in the submandibular and minor salivary glands. Other studies showed occurrence of adenoid cystic carcinoma in all glands but with predominance in the minor salivary glands.[3, 40, 51] The most common presenting symptom was a swelling with or without pain. One of the patients who had an advanced adenoid cystic carcinoma of the tongue suffered considerable degree of pain. It is known that adenoid cystic carcinoma is a slow growing tumor with a tendency for perineural invasion which may be associated with low-grade pain.

Because of the aggressive nature of this lesion, treatment is required very early. It has been reported that following treatment, adenoid cystic carcinoma can recur at the same site or have distant metastasis one to two decades later.[6, 63] Based on this, the patient with adenoid cystic carcinoma of the palate was treated by wide surgical excision which necessitated partial maxillectomy followed by post-operative radiotherapy. The other patient with adenoid cystic carcinoma of the tongue presented late to hospital with a huge swelling which could not be treated surgically, and therefore radiotherapy was offered as a palliative treatment.

6.5.4. Acinic cell carcinoma

Acinic cell carcinoma is reported to be a very rare tumor of the parotid gland, which has its peak in the fifth decade. This study found only one case of acinic cell carcinoma of the parotid gland in a 41 years female patient. This finding coincides with other report.[6,51] This patient presented with advanced tumor of the parotid, associated with clinically palpable cervical lymphnodes and radiographic examination of the chest showed metastasis in the

lungs. The patient was put on palliative chemotherapy, but died 3 months after diagnosis. Generally the prognosis of acinic cell carcinoma has a favorable prognosis compared to other malignant salivary gland tumors.[6]

6.5.5. Squamous cell carcinoma

Squamous cell carcinoma although a rare tumor in salivary glands it was observed in an adult female patient involving the parotid gland and was associated with facial nerve palsy of the affected side. The patient seen in this study presented with unilateral painful ulcerating swelling of the parotid gland. This finding is in agreement with a study in China that reported on the presence of squamous cell carcinoma of the parotid.[51] Other study from Tanzania by Masanja et al[3] showed a rare occurrence of squamous cell carcinoma.

6.5.6 Other salivary gland lesions

6.5.6.1 Sialolithiasis

The literature shows that sialolithiasis is one of the common salivary gland diseases affecting the major salivary glands. In the present study overall findings revealed sialolithiasis to be the third commonest salivary gland disease seen. Patients with sialolithiasis in this study were aged between 20 and 49 years, which is in agreement with the study of Antoniadis.[64] There were more females than males who presented with sialolithiasis which is contrary to the reports of Antoniadis[64] and Escudier et al[15] which showed a male predominance and Lustman et al[13] who showed no sex predilection. About 90% of the sialolithiasis seen were found in the submandibular salivary gland and the rest were seen in the parotid gland. These findings are similar to other reports. [13, 15,64]

Clinically sialolithiasis in this study presented with swelling following obstruction of salivary flow due to stone and pain due to infection in most cases which is in keeping with almost all reports world wide. In this study, three cases of sialolithiasis of submadibular gland were treated surgically. Of the three cases treated surgically, 2 cases were treated through intraoral approach; a third patient with sialolithiasis had a stone in the hilum of the submandibular gland, therefore a submandibular gland was excised. Other patients with sialolithiasis were

treated symptomatically with broad spectrum antibiotics and analgesics this included; a combination of cloxacillin, metronidazole and diclofenac. Two patients with sialolithiasis were treated symptomatically only because they were not ready for surgery, and the only treatment they sought was relief of pain, and enable them to eat. Surgery was used because of the lack of more sophisticated equipments for less invasive approach like endoscopic lithotripsy. There were no complications associated with the surgical approach noted during this study. Symptomatic treatment with antibiotics and analgesics were of use to decrease morbidity.

6.6 Distribution of salivary glands diseases by site

The commonest site for the salivary gland diseases is the parotid gland. In the present study the minor salivary glands, mostly of the palate were the commonest site for affection followed by major salivary glands mainly the submandibular and sublingual , with less involvement of the parotid at a ratio of 17:16:16:7 for minor salivary gland: submandibular:sublingual: parotid. These findings are different from other findings which showed that the parotid gland was more affected.[2, 3, 6] The reason for this difference may be due to relatively large number of cystic lesions of the lower lip and sublingual gland. It has been previously reported worldwide that, there is an equal occurrence of salivary gland tumors in the minor salivary glands mostly of the palate; this has been proven to be the same in the present study. Most of the parotid tumors were malignant which is contrary to other reports which showed that most of parotid tumors were benign.[2,3]

6.7 The presenting symptoms of salivary gland diseases

All patients with salivary gland diseases (100%) presented with swelling (figure 1-3) followed by pain (26.8%), infection 12.5% while ulceration and facial nerve palsy were less encountered. The small number of patients with pain could be due to the fact that majority of patients presented with benign lesions. They only present to hospital with huge tumors either after finding that there is impairment with esthetic, or when there is infection. In this study,

there is no single or group of clinical symptoms that may be diagnostic for a particular salivary gland tumor except for the salivary gland mucous cyst.

Conclusion

- Generally the clinico-pathological presentation of salivary gland diseases seen in this study is similar to other studies. Although this study combined cysts, tumors and inflammatory conditions together, when they are separated the general picture looks similar to results of other studies from the region and Africa at large.
- Patients with ranula and mucoceles, presented for treatment earlier than those with salivary gland tumors who presented late with advanced lesions that necessitated invasive surgery under general anesthesia.
- With the exception of inflammatory conditions, the majority of salivary gland tumors were treated surgically, and there were no recurrences.

Recommendations

- There is a need for comprehensive education for both community and health personnel on the presentation of salivary gland diseases with an intention of enabling them to make early identification which will lead to early management.
- A larger study conducted over a longer period of time is recommended in order to have a larger sample and also more time for follow up of patients.
- Training of more specialists in Oral and Maxillofacial Surgery, so that they can be employed in regional hospitals closer to majority of people
- Strengthening the regional hospitals and referral centers by supplying equipments so that they can establish Oral and Maxillofacial Surgery units which can be capable of diagnosing and treating salivary gland diseases in time.
- New techniques for management of salivary glands diseases should be introduced so that students can be exposed and used to them.

7. Disposal of patients

All patients were treated according to their condition or diagnosis. Both forms of treatment modalities were used according to the particular problem. For patients with advanced malignancy disease in which surgery was not of benefit were presented and discussed by the tumor board then later they were referred to Ocean Road Cancer Institute for palliative management.

8. Dissemination of results

The findings from this study will be presented as dissertation (in partial fulfillment of Master Dentistry degree of MUHAS), and in scientific seminars/conferences (abstract) and scientific reports (manuscripts) submitted to an appropriate journal. Another copy of this finding will be sent to the Ministry of Health and Social Welfare as the main stakeholder of health issues in the country.

9. Limitation of study

- The duration of eight months for this study was too short to enable the author to get an adequate number of cases of salivary gland diseases.
- Patients with malignant diseases presented very late to hospital with unfavourable lesions therefore it was not possible to do surgical intervention to all patients with malignant salivary gland lesions.
- More advanced methods of treating patients were not available due to lack of appropriate equipments

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Appendix 1

1. CONSENT FORM

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES



DIRECTORATE OF RESEARCH AND PUBLICATIONS, MUHAS
INFORMED CONSENT FORM

ID-NO. ☐☐

Consent to Participate in a Study

Greetings! My name is Dr Bonny Betson; I am working on this research with the objective of determining the occurrence of salivary gland diseases among patients attending Muhimbili National Hospital.

Purpose of the study

The study is conducted in partial fulfillment of the requirements for the degree of Master of Dentistry in Oral Surgery MUHAS. This study is aiming at determining the frequency of occurrence, clinical and histological presentation, and treatment options of salivary gland diseases. You are being asked to participate in this study because you have particular knowledge and experiences that may be important to the study. Kindly please be honest and true for betterment of the results that could lead to better intervention and recommendations for future.

What Participation Involves

If you agree to join the study, you will be interviewed in order to answer a series of questions in the questionnaire prepared for the study. There after a thorough clinical examination of the head and neck will be done to you.

Confidentiality

I assure you that all the information collected from you will be kept confidential. Your name will not be written on any questionnaire or in any report/documents that might let someone identify you. Your name will not be linked with the research information in any way. All information collected on forms will be entered into computers with only the study identification number. Confidentiality will be observed and unauthorized persons will have no access to the data collected.

Risks

We do not expect that any harm will happen to you because of participating in this study. Some questions could potentially make you feel uncomfortable. You may refuse to answer any particular question and may stop the interview at anytime.

Right to Withdraw and Alternatives

Taking part in this study is completely voluntary. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve any penalty.

Benefits

The information you provide and the clinical examination done to you will ascertain the frequency of occurrence, clinical and histological presentation, and treatment options of salivary gland diseases therefore aiding the decision to intervene. Those found with salivary gland diseases will be given appropriate management.

Who to Contact

If you ever have questions about this study, you should contact the Principal Investigator, Dr Bonny Betson of Muhimbili University of Health and Allied Sciences, P. O. Box 65001, Dar es Salaam.

If you ever have questions about your rights as a participant, you may call, Chairperson of the Senate Research and Publications Committee, P. O. Box 65001, Telephone : 255 22 2152489 Dar es Salaam and Dr B Kalyanyama who is the supervisor of this study (Tel +255754496986) and Dr E. Simon who is Co-Supervisor (Tel +255784718235)

Signature:

Do you agree?

Participant agrees …….. Participant does NOT agree …….

I ……. have read the contents in this form. My questions have been answered. I agree to participate in this study.

Signature of participant **……**

Signature of Research Assistant ……..

Date of signed consent …….

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI

KURUGENZI YA TAFITI NA UCHAPISHAJI

FOMU YA RIDHAA

Namba ya utambulisho ☐☐

Ridhaa ya kushiriki kwenye utafiti

Hujambo! Ninaitwa Dr Bonny Betson, nashughulika kwenye utafiti huu wenye lengo la kutathmini magonjwa ya tezi za mate kwa wagonjwa wanaotibiwa katika Hospitali ya Taifa Muhimbilia. Utafiti huu unafanyika katika kutimiza sehemu ya matakwa ya shahada ya uzamili ya Upauaji wa Kinywa ya Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili. Uzito wa magonjwa ya tezi za mate, dalili za magonjwa haya na tabia zake. Unaombwa kushiriki katika utafiti huu kutokana na upeo na ufahamu ulio nao ambavyo ni muhimu kwa utafiti huu. Tafadhali kuwa mkweli na muwazi kwa vile matokeo ya utafiti huu yanaweza yakatoa maamuzi na mapendekezo ya baadaye.

Jinsi ya kushiriki

Ukikubali kushiriki katika utafiti huu, utasailiwa ili kuweza kujibu maswali toka kwenye dodoso lililoandaliwa kwa ajili ya utafiti huu. Baada ya usaili utafanyiwa uchunguzi wa kinywa na maeneo yanazunguka kinywa.

Usiri

Taarifa zote zitakazokusanywa kupitia dodoso zitaingizwa kwenye ngamizi kwa kutumia namba za utambulisho. Kutakuwa na usiri na hakuna mtu yeyote asiyehusika atakayepata taarifa zilizokusanywa.

Hatari

Hatutegemei madhara yoyote kukutokea kwa kushiriki kwako kwenye utafiti huu.

Faida

Kama utakubali kushiriki kwenye utafiti huu taarifa utakazotoa zitatuwezesha kujua kiwango au ukubwa wa tatizo ambao ni muhimu katika uamuzi wa kuzuia au kupunguza tatizo. Watakaogundulika kuwa na meno yaliyooza au matatizo mengine ya kinywa na meno watashauriwa kwenda hospitali iliyokaribu kwenda kutibiwa.

Athari na kukitokea madhara

Hutegemewi kupata madhara yoyote kutokana na ushiriki wako katika utafiti huu. Baadhi ya maswali yanaweza yasikupendeze, unaweza kukataa kujibu swali lolote la aina hiyo na unaweza kuamua kusimamisha udahili wakati wowote.

Uhuru wa kushiriki na haki ya kujitoa

Kushiriki kwenye utafiti huu ni hiari. Unaweza kujitoa kwenye utafiti huu wakati wowote hata kama umeshajaza fomu ya ridhaa ya kushiriki utafiti huu. Kukataa kushiriki au kujitoa kwenye utafiti huu hakutaambatana na masharti yoyote.

Nani wa kuwasiliana naye

Kama una maswali kuhusiana na utafiti huu, wasiliana na Mtafiti mkuu wa utafiti huu, Dr Bonny Betson wa Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S. L. P. 65014, Dar es Salaam.

Kama una swali kuhusu stahili zako kama mshiriki unaweza kumpigia simu Prof. E.F. Lyamuya, Mwenyekiti wa kamati ya Utafiti na Uchapishaji, S.L.P 65001, Simu: 255 22 2152489 Dar es Salaam au msimamizi wa utafiti huu Dr BM Kalyanyama (Simu: 0754496986) au msimamizi msaidizi Dr E. Simon (Simu ; 0784718235)

Sahihi:

Je umekubali?

Mshiriki amekubali ……..... Mshiriki hajakubali …….....

Mimi ..... nimesoma maelezo ya fomu hii.

Maswali yangu yamejibiwa.Nakubali kushiriki katika utafiti huu.

Sahihi ya mshiriki……

Sahihi ya mtafiti msaidizi……

Tarehe ya kutia sahihi ya idhini ya kushiriki……..

Appendix 2

QUESTIONNAIRE AND CLINICAL EXAMINATION FORM

A study on salivary glands diseases among patients attending Muhimbili National Hospital

Questionnaire no……

Date of interview……

Demographic data

1. Hospital Registration number ☐☐☐☐☐☐

2. Age in years. ☐

3. Gender: male= 1, Female=2 ☐

4. Place of domicile; District…….Region…….

5. Education level ☐
   1. No formal Education
   2. Primary school
   3. Secondary school
   4. Post secondary

6. Marital status: ☐
   1. Single
   2. Married
   3. Separated
   4. Divorced
   5. Widow
   6. Widower

Presenting symptoms

What are you suffering from?

7. Swelling Yes=1 No=2 ☐
8. Ulcer Yes=1 No=2 ☐

9. Discharging Yes=1 No=2 ☐

10. Dry mouth Yes=1 No=2 ☐

11. Pain Yes=1 No=2 ☐

12. Duration ……in mouth. ☐

13. History of any other medical condition Yes=1 No=2 ☐
    If yes, List…….…….

14. History of any previous medication Yes=1 No=2 ☐

    If yes what are they…….

15. History of any current medications Yes=1 No=2 ☐

    If yes, what are they? .....

16. Is this the first occurrence of the problem? Yes=1 No=2 ☐

    (If No, means recurrence)

Provisional diagnosis----------

MICROSCOPIC FINDINGS

1. Histological diagnosis

……
……
……
……
……

2. Cytological diagnosis

……
……
……
……

3. Microbiological findings

……
……

EXAMINATION OF THE HEAD AND NECK

A. Involvement of salivary glands

4. The parotid gland ☐
5. The submandibular gland ☐
6. The sublingual gland ☐
7. The minor salivary glands ☐
8. Tongue ☐
9. Upper lip ☐
10. Lower lip ☐
11. Buccal mucosa ☐
12. Floor of the mouth ☐
13. Hard palate ☐
14. Soft palate ☐
15. Gingiva ☐
16. Oropharynx ☐
17. Nasopharynx ☐
18. Maxillary sinus ☐

B. Other sites involved

19. Forehead: ☐
20. Nose: ☐
21. Eye: ☐
22. Mental region: ☐
23. Cheeks: ☐
24. Submandbular region ☐
25. Neck (cervical): ☐
26. Maxillar ☐
27. Mandilbe ☐
28. Ears; ☐
29. Scalp; ☐

Coding
1=Normal 2=Discharging (infection) 3=Swelling 4=Ulcerated 5=Tender Other presentation

30. Presence of pain	Yes=1	No=2	☐
31. Presence of infection	Yes=1	No=2	☐
32. Xerostomia	Yes=1	N0=2	☐
33. Facial nerve palsy	Yes=1	No=2	☐

Radiological findings

Type of imaging ……

Characteristic of the disease

Centre of lesion……

Margin……..

Periphery……..

Treatment

1. Observation Yes=1, No=2 ☐
2. Analgesics Yes=1, No=2 ☐
3. Antibiotics Yes=1, No=2 ☐
4. Surgery Yes=1, No=2 ☐
5. Radiotherapy Yes=1, No=2 ☐
6. Chemotherapy Yes=1, No=2 ☐

Intent of treatment……

Dodoso

Dodoso kwa ajili ya utafiti juu ya magonjwa ya tezi za mate na matibabu yake katika hospitali ya Taifa Muhimbili

Nambari ya dodoso……

Tarehe ya kuhojiwa……

1. Nambari ya kuandikishwa hospitali ☐☐☐☐☐☐

2. Umri wa mgonjwa katika miaka ☐

3. Jinsia: kiume= 1, kike=2 ☐

4. Mahali unapoishi; Wilaya…….mkoa…….

5. Kiwango cha elimu ☐
   1. Hajasoma
   2. Elimu ya msingi
   3. Elimu ya sekondari
   4. Elimu baada ya elimu ya sekondari

6. Hali kindoa: ☐

   1. Hajaoa wala kuolewa
   2. Ameoa au ameolewa
   3. Wametengana
   4. Ameachika
   5. Mjane
   6. Mgane

Matatizo yaliyokuleta hospitali

Je, unasumbuliwa na kitu gani katika tezi

13. Uvimbe Ndiyo=1 Hapana=2 ☐

14. Kidonda Ndiyo=1 Hapana=2 ☐

15. Kutoka usaha au majimaji Ndiyo=1 Hapana=2 ☐

16. Kukauka mate mdomoni Ndiyo=1 Hapana=2 ☐

17. Maumivu ya tezi Ndiyo=1 Hapana=2 ☐

18. Unasumbuliwa na tatizo hili kwa muda ……(miezi) ☐

13. Je, una matatizo mengine zaidi ya hili Ndiyo=1 Hapana=2 ☐
Kama ndiyo, taja…….…….

14. Je, umepata tiba yoyote kabla Ndiyo=1 Hapana=2 ☐

Kama ndiyo, je ni tiba gani? …….

15. Je, kuna matibabu unayoendelea nayo sasa? Ndiyo=1 Hapana=2 ☐

Kama ndiyo, Je ni yapi? .....

16. Je hii ni mara ya kwanza kupata tatizo hili? Ndiyo=1 Hapana=2 ☐