

Histopathological pattern of cervical lymphadenopathy in Hadhrumout-Yemen

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Abstract:

Objective: To describe the histopathological pattern of cervical lymphadenopathy in Hadhrumout-Yemen.

Methods: A retrospective study was carried out in Hadhrumout governorate -Yemen, between January 2009 and June 2014. A total of 838 patients, both male and female of all age groups, having enlarged cervical lymph nodes were included in this study. Data were obtained from request cards and case files from national center for public health laboratory-Hadhrumout branch and private histopathology laboratories in Al-Mukalla city. Data collection included age, sex, and pathology diagnosis.

Results: A total of 838 patients with cervical lymphadenopathy were included in this study, their ages ranging from 1 to 100 years old with a median age of 20 years; there were 423 (50.5%) female & 415 (49.5) male. The majority of the cases (n= 575; 68.7%) were seen in the first three decades, and the elderly age group (>70 years) constituted 2.7%. Of the 838 patients with cervical lymphadenopathy, 76.8% were non-neoplastic lesions and 23.2% were malignant. Tuberculosis lymphadenitis was a common cause of cervical lymphadenopathy which represented 29.7% of non-neoplastic cases and metastatic carcinoma constituted 37.6 % of neoplastic lesions.

Conclusions: Tuberculosis lymphadenitis was a common problem in our country, comparable to other third world countries. Young females were frequently affected by TB as compared to males. Squamous cell carcinoma was the commonest type of metastatic lesion in the cervical lymph nodes.

Keywords: Cervical lymphadenopathy, Tuberculosis, lymphoma, metastatic carcinoma, histopathological pattern, Hadhrumout-Yemen.

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أعتلال الغدد اللمفاوية العنقية في حضرموت اليمن

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الملخص:

الخلفية: تعتبر العقد اللمفاوية احد المكونات التشريحية للجهاز المناعي, ولذلك فان اعتلال هذه العقد اللمفاوية يشكل ظاهره مرضيه عند كثير من الناس ويتمثل هذا الاعتلال في الحجم, المرونه أو العدد الغير طبيعي لهذه الغدد.

وبالإمكان لمثل هذه الدراسات تقديم معلومات قد تساعد في ايجاد الحلول لهذه المشاكل, لأنها تعتبر واحدة من المصادر لقياس معدلات الحالات المرضية والوفيات.

الهدف: تقييم الانماط النسيجية المرضيه لاعتلال العقد اللمفاوية العنقية في محافظة حضرموت من 2009م-2014م. الطرق والوسائل: أجريت دراسته وصفيه استرجاعيه لكل حالات اعتلال العقد اللمفاوية العنقية التي تم إحالتها الى المركز الوطني لمختبرات الصحة العامه فرع حضرموت و المختبرات الخاصه للانسجه المرضيه في مدينة المكلا في الفتره من يناير 2009 الى يونيو 2014.

النتائج: شملت دراسته 838 مريضاً يعانون من اعتلال العقد اللمفاوية العنقيه, اعمارهم تراوحت من 1-100 سنه, وجد ان معظم الحالات (68.7%) كانت في الثلاثه العقود الاولى من العمر. من ضمن 838 حاله, 644 (76.8%) حاله غير ورميه و 419 (23.2%) حاله ورميه. وكان الأعتلال اللمفي السلي يمثل (29.7%) من حالات اعتلال الغدد اللمفاوية الغير ورميه, والسرطان النقيلي يمثل (37.6%) من الحالات الورميه.

الخلاصة: تظهر الدراسة ان الأعتلال اللمفي السلي يعتبر من أكثر حالات أعتلال الغدد اللمفاوية, وهي مشكلة مماثله لدول العالم الثالث الأخرى. وكان سرطان الخلايا الحرشفية هو النوع الأكثر انتقالاً الى الغدد اللمفاوية العنقيه.

الكلمات المفتاحية: اعتلال الغدد اللمفاوية العنقية, الانماط النسيجية المرضيه, السل, الورم اللمفاوي, حضرموت - اليمن.

Introduction:

The lymph node is one of the major anatomic components of the immune system¹. In everyday practice, lymphadenopathy is a common finding in a large proportion of the patients². Lymphadenopathy is defined as abnormal in size, consistency or number of lymph node^{3,4}. It can involve different age groups and any site of the body⁵.

Cervical lymphadenopathy is usually defined as cervical lymph nodal tissue measuring more than 1 cm in diameter⁶, which can be presented as isolated or as a part of generalized Lymphadenopathy due to a number of reasons varying from benign self limiting reactive hyperplasia to infections to malignant conditions^{7,8}. Various reports document tuberculosis and infectious etiology a major causes of lymph node enlargement in developing countries, whereas malignancies as a predominant cause in the developed countries^{9,10}.

Diagnosis of cervical lymphadenopathy was based on different modalities of investigations which include, fine needle aspiration cytology (FNAC), core needle biopsy, flow cytometry, and open biopsy⁷. FNAC is reliable, safe and accurate test as first line for evaluation of cervical lymphadenopathy. It can differentiate inflammatory and infective processes from neoplastic ones and avoids unnecessary surgeries¹¹. In some cases biopsy is still required to reach a definitive diagnosis¹²

Globally, cervical lymphadenopathy has been documented as the most common type of peripheral lymphadenopathy¹³. It is a fairly common clinical entity that presents as a diagnostic challenge to the attending clinician¹⁴. Nationally, cervical lymphadenopathy is still one of the major public health problems in Yemen. A majority of cervical lymphadenopathy patients in Hadhramout-Yemen are in the first three decades. This study was conducted to assess age, sex, and categories of enlarged cervical lymph nodes among patients in Hadhramout-Yemen.

Materials and Methods:

This is a descriptive, retrospective study was carried out in Hadhramout governorate -Yemen, between January 2009 and June 2014. All records of patients with enlarged cervical lymph nodes were included in this study. The available data were obtained from request cards and case files from national center for public health laboratory-Hadhramout branch, and private histopathology laboratories in Al-Mukalla city.

Data collection included age, sex, and pathology diagnosis.

Fine needle aspiration cytology (FNAC) and/or histopathology examination were carried out in all cases; open biopsy was done in those cases where FNAC was inconclusive.

Fine needle aspiration cytology was performed with using a 24G gauge needle attached to a 10 ml syringe, without local anaesthesia. Slides of the FNAC were stained by May-Grunewald Giemsa (MGG) and hematoxylin and eosin (H & E) stains. Special stains including Ziehl Neelsen were employed whenever indicated.

Surgical excision biopsies were fixed in 10% formalin; The nodes were sectioned at 5-mm intervals and submitted for processing. Four- to five-micron thick sections were cut with a microtome, and stained with haematoxylin and eosin. Diagnosis of tuberculosis was confirmed by demonstration of caseating granuloma on histopathological examination.

All cases were divided into 2 broad categories: neoplastic and non-neoplastic lesions and sub-grouped into specific diagnosis.

Data was analysis by using SPSS statistical program version 19.

Results:

A total of 838 patients with cervical lymphadenopathy reported during 2009-2014 were included in this study, their ages ranging from 1 to 100 years old with a median age of 20 years; there were 423 (50.5%) female & 415 (49.5) male. The majority of the cases (n= 575; 68.7%) were seen in the first three decades, and the elderly age group (>70 years) constituted 2.7% (Figure 1).

Of the 838 patients with cervical lymphadenopathy, 644 cases (76.8%) were non-neoplastic lesions and 194 cases (23.2%) were malignant.

Non-neoplastic lesions were common in relatively younger patient with a mean age of 19.8 years (SD \pm 15.09) and malignant lesions were common in the older with a mean age of 45.5 years (SD \pm 20.88). There is a strong association between different age groups and case broad categories (Non-neoplastic & Neoplastic lesions) (Table1).

The most common cause of cervical lymphadenopathy in this study was reactive lymphoid hyperplasia (n= 385; 45.9 %), followed by tuberculosis lymphadenitis (n=191; 22.8%), lymphoma (n= 121; 14.4%) and metastatic carcinoma (n=73; 8.7%) respectively (Table 2).

Reactive lymphoid hyperplasia was most common among age groups (1-10 years) 36.9%, followed by age groups (11-20 years) 28.8 %, and age groups (21-30) 16.4% respectively (Table 2).

Tuberculosis lymphadenitis was common among age group (11-20 years) 29.3%, followed by age group (21-30 years) 28.3% & age group (1-10 years) 17.3% respectively; females were more frequently affected (55%) than males (45%) (Table 3&4)

Suppurative lymphadenitis found in 55 (6.6%) of cases, and more common in age groups between (1-20 years) 78.2%.

Out of 121 lymphoma cases; 64 were Hodgkin lymphoma (HL) accounting for 52.9 % of cases, and 57 (47.1 %) were non- Hodgkin lymphoma (NHL). HL was seen more common in young age groups (11-30 years) 46.8 %, while NHL was more seen in older patients with age group (61-70 years) 26.3 % followed by age group (51-60 years) 21.1 %.

There were 73 cases of metastatic lymph nodes which accounted for 37.6 % of neoplastic cases. Met-

astatic carcinoma was seen more common among age groups 51-60 years (27.4 %) followed by age groups 61-70 years (21.9 %); and more common in male 58.9% than females 41.1 %, with male to female ratio 1.4:1 (Table 3&4) Among the various types of tumors metastasizing the cervical lymph nodes, squamous cell carcinoma was the commonest 38 (52.1%); of these nasopharyngeal carcinoma found in 28 cases (38.4%) and 10 (13.7%) were squamous cell carcinoma from oral cavity and hypopharynx, followed by poorly differentiated carcinoma in 16 cases (21.9%), and papillary carcinoma of thyroid in13 (17.8%) (Table5).

Other specific patterns of lymphadenopathies were found in 13 (1.6 %) of all cases; five cases were toxoplasmosis, 3 cases were Histiocytic necrotizing lymphadenitis, 3 cases had necrotic foci with neutrophils suggestive of cat-scratch disease, and two cases were diagnoses as atypical lymphoid hyperplasia need further investigations and follow-up.

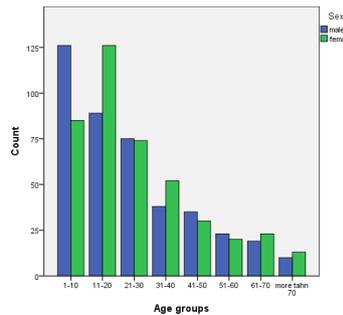


Fig. 1: Distribution of patients with cervical lymphadenopathy by age group and sex

Table 1: Association between different age groups and case broad categories (Non Neoplastic, Neoplastic)

| Age groups | Diagnosis | | | | Total | Chi-sq | P-value |
|--------------|----------------|------------|------------|------------|------------|--------|---------|
| | Non Neoplastic | | Neoplastic | | | | |
| | Frequency | % | Frequency | % | | | |
| 1-10 | 202 | 31.3 | 9 | 4.6 | 211 | 269.4 | 0.0001 |
| 11-20 | 192 | 29.8 | 23 | 11.8 | 215 | | |
| 21-30 | 127 | 19.7 | 22 | 11.3 | 149 | | |
| 31-40 | 60 | 9.3 | 30 | 15.4 | 90 | | |
| 41-50 | 40 | 6.2 | 25 | 12.8 | 65 | | |
| 51-60 | 8 | 1.2 | 35 | 18 | 43 | | |
| 61-70 | 8 | 1.2 | 34 | 17.5 | 42 | | |
| more than 70 | 7 | 1 | 16 | 8.2 | 23 | | |
| Total | 644 | 100 | 194 | 100 | 838 | | |

Highly significant association P-Value 0.0001

Table 2: Pathological diagnosis of patients with cervical lymphadenopathy:

| Diagnosis | Frequency | Percent |
|-------------------------------|------------|-------------|
| Reactive lymphoid hyperplasia | 385 | 45.9 |
| suppurative lymphadenitis | 55 | 6.6 |
| TB lymphadenitis | 191 | 22.8 |
| Lymphoma | 121 | 14.4 |
| Metastatic carcinoma | 73 | 8.7 |
| Others | 13 | 1.6 |
| Total | 838 | 100% |

Table 3: Pathological diagnosis of cervical lymphadenopathy by different age groups.

| Diagnosis | Age groups | | | | | | | | Total |
|---------------------------|------------------------|------------------------|------------------------|-----------------------|----------------------|----------------------|--------------------|----------------------|-----------------------|
| | 1-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | >70 | |
| Reactive hyperplasia | 142 (36.9%) | 111 (28.8%) | 63 (16.4%) | 37 (9.6%) | 23 (6%) | 6 (1.6%) | 3 (0.8%) | 0 (0.00%) | 385 (100%) |
| Suppurative lymphadenitis | 22 (40%) | 21 (38.2%) | 7 (12.7%) | 1 (1.8%) | 1 (1.8%) | 0 (0.00%) | 0 (0.00%) | 3 (5.5%) | 55 (100%) |
| TB lymphadenitis | 33 (17.3%) | 56 (29.3%) | 54 (28.3%) | 21 (11%) | 16 (8.4%) | 2 (1%) | 5 (2.6%) | 4 (2.1%) | 191 (100%) |
| Lymphoma | 8 (6.6%) | 18 (14.9%) | 18 (14.9%) | 21 (17.4%) | 14 (11.6%) | 15 (12.4%) | 18 (14.9%) | 9 (7.4%) | 121 (100%) |
| Metastatic carcinoma | 1 (1.4%) | 5 (6.8%) | 4 (5.5%) | 9 (12.3%) | 11 (15.1%) | 20 (27.4%) | 16 (21.9%) | 7 (9.6%) | 73 (100%) |
| Others | 5 (38.5%) | 4 (30.8%) | 3 (23.1%) | 1 (7.7%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 13 (100%) |
| Total | 211 (25.2%) | 215 (25.7%) | 149 (17.8%) | 90 (10.7%) | 65 (7.8%) | 43 (5.1%) | 42 (5%) | 23 (2.7%) | 838 (100%) |

Table 4: Sex distribution of the cervical lymph node lesions

| Gender | Diagnosis | | | | | | Total |
|--------------|-------------------------------|---------------------------|----------------------------|-------------------|----------------------|------------------|-------------------|
| | Reactive lymphoid hyperplasia | Suppurative lymphadenitis | Tuberculosis lymphadenitis | Lymphoma | Metastatic carcinoma | Others | |
| Male | 192 (49.9%) | 22 (40%) | 86 (45%) | 67 (55.4) | 43 (58.9%) | 5 (38.5%) | 415 (49.5%) |
| Female | 193 (50.1%) | 33 (60) | 105 (55%) | 54 (44.6%) | 30 (41.1%) | 8 (61.5%) | 423 (50.5%) |
| Total | 385 (100%) | 55 (100%) | 191 (110%) | 121 (100%) | 73 (100%) | 13 (100%) | 838 (100%) |

Table 5: Distribution of metastatic carcinoma

| Diagnosis | Frequency | Percent |
|---------------------------------|-----------|--------------|
| Nasopharyngeal carcinoma | 28 | 38.4 |
| Poorly differentiated carcinoma | 16 | 21.9 |
| papillary carcinoma of thyroid | 13 | 17.8 |
| Squamous cell carcinoma | 10 | 13.7 |
| Medullary carcinoma of thyroid | 2 | 2.7 |
| Retinoblastoma | 1 | 1.4 |
| Adenocarcinoma | 1 | 1.4 |
| breast carcinoma | 1 | 1.4 |
| small cell carcinoma of lung | 1 | 1.4 |
| Total | 73 | 100.0 |

Discussion:

Patients presenting with enlargement of the lymph nodes is one of the most common problems in clinical practice¹⁵. This study was conducted to find out the frequency of different pathologies causing enlarged cervical lymph nodes.

In our study cervical lymphadenopathy was most commonly seen in children and young adults. This is in accordance with a study of Olu-eddo et al (2011) who reported that most of the patients with primary cervical lymphadenitis were children and young adults¹³.

In the present study non-neoplastic lesions of cervical lymphadenopathy represented in 76.8% of cases, while 23.2% were neoplastic lesions. These findings are in agreement with the findings of Rahman et al (2013) who found an incidence of non-neoplastic and neoplastic lesions was 75.62 % and 24.37%) respectively⁷.

Maheshwari et al (2015) and Biswas G et al (2013) in their studies recorded an incidence of non-neoplastic lesions were 71 % and 71.6 % respectively^{14, 16}.

Moreover, non specific reactive lymphadenopathy has been documented as a common cause of peripheral lymph node enlargement in the tropics¹⁷.

Reactive lymphoid hyperplasia constituted the most common cause of cervical lymphadenopathy in the present study (n= 385; 45.9 %), this is in accordance with the study by Moore SW et al who found 47.8% of cases were nonspecific reactive lymphoid hyperplasia¹⁸. Other study conducted by Zahir et al (2009) reported 60.17% of cervical lymph node biopsies were reactive lymphadenopathy¹⁹.

In agreement with previous study, the highest incidence of reactive hyperplasia was seen in first two decades of life (65.7%)²⁰.

In developing countries where the incidence of tuberculosis is high, tuberculosis lymphadenitis is one of the most frequent causes of lymphadenopathy²¹.

Various studies reported that cervical lymphadenopathy was the most common form of Extra-pulmonary tuberculosis (EPTB)^{22,23}. In our study tuberculosis is the second most common cause of cervical lymphadenopathy, which represented in 29.6 % of the non neoplastic cases. This in agreement with study conducted in Korea, tuberculosis was present in 22.4 % of the cases²⁴. Sibanda et al & Moore et al reported in their studies 26.7% & 33.3% of the cases respectively were TB as second most common cause of cervical lymphadenopathy^{18,25}.

In contrary, other studies reported tuberculosis as the most common cause of cervical lymphadenopathy, followed by reactive lymphadenopathy^{7,26,27}.

In agreement with other studies, tuberculosis was seen most frequently in second and third decade of life (57.6%) with female preponderance^{7,28}.

In the present study, malignancy occurred in 23.2 % of the cases with lymphoma 14.4% and metastatic tumors 8.7%. Similar study by Rahman et al reported malignancy in 24.3% cases with lymphoma 13.1% and metastatic tumors 11.2%⁷. Zahir et al & Al-Ghathiy et al also found malignancy in 22.1 % & 22.5% of the cases respectively^{19,29}.

Lymphoma was the third commonest specific cause of cervical lymphadenopathy in present study, constituting 14.4 % cases with Hodgkin lymphoma (HL) accounting for 7.6 of cases, and 6.8% were non-Hodgkin lymphoma (NHL). This is in agreement with study by Khan et al who reported lymphoma in 14.66% of the cases³⁰, but lower than the 26% reported by Olu-Eddo et al¹⁷.

In the present study, metastatic tumors was the fourth common cause of cervical lymphadenopathy constituting 8.7% of all cases, which is similar to the study of Shrestha AK et al who reported 4.1 % of cervical lymphadenopathy was metastatic lesions⁶. In

agreement with others, majority of the patients (74%) were above the age of 40 years^{6,13,17}.

Out of 73 metastatic lesions, squamous cell carcinomas, poorly differentiated carcinoma of unknown origin and papillary carcinoma of thyroid were common comprising 52.1%, 21.9% & 17.8% respectively. Similar study by Olu-eddo et al who found squamous cell carcinoma was the commonest type of metastatic lesion in the cervical lymph nodes constituting 70 % of cases of metastatic cancer¹³.

Like most other squamous cell carcinomas (SCC) of the head and neck primaries, lymphatic drainage of the nasopharynx is predominantly to the cervical lymph nodes. However, nasopharyngeal carcinoma (NPC) has the highest preponderance for regional lymph node metastasis among head and neck SCC^{31,32}. In our study 28 (38.4 %) of metastatic tumors to cervical lymph nodes were nasopharyngeal carcinoma. This is in accordance with a study by Khan et al who reported that 36.3% of the cases had primary in the nasopharynx³⁰. Adoga et al reported 51.7% of the cases had primary in the nasopharynx³³.

Conclusion:

Tuberculosis was a common cause of cervical lymphadenopathy in our country, comparable to other third world countries. Young females were frequently affected by TB as compared to males. In both HLs and NHLs males were frequently affected than females. Among metastatic tumors, squamous cell carcinoma was the commonest type of metastatic lesion in the cervical lymph nodes.

References:

1. Delves PJ, Roitt IM: The immune system. First of two parts. *N Engl J Med* 2000; 343:37-49.
2. Pangalis GA, Theodoros P. Clinical approach to lymphadenopathy. *Seminars in Oncology*, (Dec.) 1993; Vol 20, No.6:570-582.
3. Ferrer R. Lymphadenopathy: differential diagnosis and evaluation. *Am Fam Physician*. 1998 Oct 15; 58(6):1313-20. Review
4. Kamat GC. A ten-year histopathological study of generalized lymphadenopathy in India. *S Afr Fam Pract* 2011;53(3):267-270.
5. Jaimin P and Pai P. Spectrum of pathologic lesions in superficial lymph node biopsies-A one and half year study. *IJBAR* (2014) 05 (09).
6. Shrestha AK, Chalise PR, Shrestha ML. Lymph node biopsies: a hospital based retrospective study. *J Nepal Med Assoc* 2009; 48: 306-309.

7. Rahman Md., Biswas Md., Siddika S, Sikder A. Histomorphological pattern of cervical lymphadenopathy. *J Enam Med Col* 2013; 3(1): 13- 17.
8. Khan I, Khattak EG, Muhammad I et.al. Cervical lymphadenopathy: an audit of 116 cases. *ISRA medical journal* 2015;7(1):6-9 .
9. Thomas JO, Ladipo JK, Yawe T. Histopathology of lymphadenopathy in a tropical country. *East Afr Med J* 1995; 72(11): 703-705.
10. Obafunwa JO, Olomu IN, Onyia NJ. Primary peripheral lymphadenopathy in Jos, Nigeria. *West Afr J Med* 1992;11(1): 25-28.
11. Advani SK, Dahar A, Aqil S. Role of fine needle aspiration cytology (FNAC) in neck masses / cervical lymphadenopathy. *Pak. J Chest Med.* 2008. Jul-Sep. 14(3): 9-14.
12. Spinelli C, Ricci E, Berti P, Miccoli P. Neck masses in childhood. Surgical experience in 154 cases. *Minerva Pediatr.* 1990 May; 42(5): 169-72.
13. Olu-eddo AN, Omoti CE. Diagnostic evaluation of primary cervical adenopathies in a developing country. *Pan Afr Med J.* 2011;10:52)
14. Maheshwari A, Padhy RK, Dash BK. A Clinicopathological Study of Cervical Lymphadenopathy. *Journal of Evolution of Medical and Dental Sciences.* 2015; Vol. 4, Issue 20, March 09: 3497-3507.
15. Leung AK, Robson WL. Childhood cervical lymphadenopathy. *J Pediatr Health Care* 2004; 18(1): 3-7.
16. Biswas G, Das A, Haldar D, Mukherjee A, Dutta S, Sinha R. Clinico-Pathological Correlates of Cervical Lymphadenopathy: A Hospital Based Study. *Indian J Otolaryngol Head Neck Surg.* 2013; 65 (Suppl 1):S42–S47.
17. Olu-Eddo AN, Ohanaka CE. Peripheral Lymphadenopathy in Nigerian adults. *J Pak Med Assoc.* 2006 Sep;56(9):405-8.
18. Moore SW, Schneider JW, Schaaf HS. Diagnostic aspects of cervical lymphadenopathy in children in the developing world: A study of 1877 surgical specimens. *Pediatr Surg Int* 2003;19:240-4.
19. Zahir ST, Azimi A. Histopathologic findings of lymph node biopsy cases in comparison with clinical features. *Pak J Med Sci* 2009;25(5):728-33.
20. Khajuria R, Goswami KC, Singh K, Dubey VK. Pattern of Lymphadenopathy on Fine Needle Aspiration cytology in Jammu. *JK Science Journal of Medical Education and Research* 2006; 8:157-159.
21. Gupta A K, Nayar M, and Chandra M. “Critical appraisal of fine needle aspiration cytology in tuberculous lymphadenitis,” *Acta Cytologica*, vol. 36, no. 3, pp. 391–394, 1992.
22. Ahmed HG, Nassar AS, Ginawi I. Screening for Tuberculosis and Its Histological Pattern in Patients with Enlarged Lymph Node. *Patholog Res Int.* 2011;2011:417635. doi: 10.4061/2011/417635. Epub 2011 May 12.
23. Alrajhi AA, Al-Barrak. AA. Extrapulmonary tuberculosis, epidemiology and patterns in Saudi Arabia. *Saudi Med J* 2002; Vol. 23 (5): 503-508.
24. Song JY, Cheong HJ, Kee SY et al. Disease spectrum of cervical lymphadenitis: analysis based on ultrasound-guided core-needle gun biopsy. *J Infect.* 2007 Oct;55(4):310-6.
25. Sibanda EN, Stanczuk G. Lymph node pathology in Zimbabwe: a review of 2194 specimens. *Q J Med* 1993; 86(12): 811-817.
26. Vedi, J. N., Patel, S. & Ghormare, A.: Clinico-pathological study in patients of cervical lymphadenopathy: *Odisha Journal of Otorhinolaryngology & Head & Neck Surgery*: 6(1): 14-17: 2012.
27. Ismail M, Muhammad M. Frequency of tuberculosis in cervical lymphadenopathy. *J Postgrad Med Inst* 2013; 27(3):342-6.
28. Fazal-I-wahid, Habib-Ur-Rehman, Ahmad I. Extrapulmonary tuberculosis in patients with cervical lymphadenopathy. *J Pak Med Assoc.* 2013 Sep; 63(9):1094-7.
29. Al-Ghaithy ZM, Merdad AA, Meccawy AM. Cervical lymph node biopsies in King Abdul Aziz University Hospital. *J KAU Med Sci* 1999; 7(2): 29-35
30. Khan A, Khan I, Khan MA. Cervical Lymphadenopathy and Ratio of Malignancy *J.Med. Sci. (Peshawar, Print)* October 2013, Vol. 21, No. 4: 168-170.
31. Sham JS, Choy D, Wei WI. Nasopharyngeal carcinoma: orderly neck node spread. *Int J Radiat Oncol Biol Phys.* 1990;19(4):929–933.
32. Francis CH Ho, Ivan WK Tham, Arul Earnest, Khai Mun Lee, Jiade J Lu. Patterns of regional lymph node metastasis of nasopharyngeal carcinoma: A meta-analysis of clinical evidence. *BMC Cancer.* 2012; 12: 98.
33. Adoga AA, Silas OA, Nimkur TL. Open cervical lymph node biopsy for head and neck cancers: any benefit?. *Head & Neck Oncology* 2009, April; 1: 9-13.