*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*
*e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 4 Ver. 12 (April. 2018), PP 05-12*
*www.iosrjournals.org*

# Evaluation of Various Disorders diagnosed on Guided FNACs in a Rural Tertiary Care Hospital, Konkanbelt of Maharashtra, India

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***Abstract:***
***Background:****Keeping in view of the importance of guided FNACs, the aims of the study were: 1.) To establish the incidence of guided FNACs in our institute. 2.) To find out utility, adequacy & usefulness of guided FNACs in our institute. 3.) To establish the spectrum of various benign & malignant disorders of different organs with the use of guided FNACs in our institute. 4.) To correlate guided FNACs with guided biopsies of different organs where-ever possible.*
***Methods:***
*It was a 3 and 1/2 years cross sectional, hospital based, retrospective study from January 2014 to June 2017 including 195 cases of guided FNACs of different organs.All the Guided FNACs were done by radiologist in radiology department of the institute. Guided biopsies were also done by radiologist wherever requested by surgeon along with guided FNACs of same organ.Already prepared guided FNAC smears & guided biopsies were received in pathology department.Staining of these smears was done with different stains like H&E, PAP and Giemsaroutinely as per the standard staining procedures.Special stains like Ziehl-Neelsen(ZN) stain were also done wherever required.All these smears were screened and reported by pathologist.The cases of guided FNACs in whom guided biopsies were also done, the biopsies were received, were grossed, were undergone tissue processing and routine staining with H&E were done.All the guided biopsies were examined and reported by pathologist.The correlation of impression of guided FNACs and guided biopsies was done where-ever possible.*
***Results:***
*USG was the most frequently used modality for guided FNAC than CT in present study.Amongst the USG guided FNACs, maximum samples obtained the adequate material for the diagnosis of different diseases.*
*Female preponderance was seen in present study with Male to Female ratio as 1: 0.57. Most commonly affected patients with different diseases diagnosed were in an age group of 41-50 years.*
*Maximum number of guided FNACs were obtained in different organs with decreasing order of frequency as breast lesions followed by thyroid, liver, lung, lymph-nodes and ovaries. Amongst the different organs which had undergone guided FNACs, frequency of diagnosing malignancy was more as compared to benign lesions, except in thyroid and mediastinal mass lesions.*
*About 57.43% cases underwent USG guided biopsies, which helped obtaincyto-histological correlation, that showed higher concordance rate (59.82%).*
***Conclusion:***
*Guided FNACs are safe, accurate, less time consuming procedures, efficacious method and provide preoperative diagnosis which helps in treatment modality of the patient.*
*Guided FNACs are readily accepted, rapidly growing and an important diagnostic technique which can be used for rendering a cyto-histological diagnosis in lesions of various organs.*
*Most common spectrum of malignant lesions of various different organs with adequate sample material got diagnosed in our institute.*
*Guided FNACs provide high diagnostic accuracy & high sensitivity (95.71%) on cyto–histopathological correlation with guided biopsies, when both are performed together.*
***Keywords:****USG, CT, FNAC, H&E*

Date of Submission: 04-04-2018 Date of acceptance: 19-04-2018

## I. Introduction

USG remains underutilised tool for guidance of FNACs mainly because of lack of experience in this technique [1].

FNAC is the diagnostic tool with minimum risk, less discomfort to patients with an added advantage of multiple aspirations at one setting.[2]

USG guided FNACs are highly accurate and safe procedures which can be done on an outpatient basis with routinely available equipments [1].USG-FNAC has become a very powerful diagnostic tool nowadays.[3]

Limited Indian studies are available regarding the diagnostic yield and safety profile of the procedure of CT guided FNACs.[4]

Modern diagnostic imaging technique mainly USG enables detection and location of site of lesion which are not easily accessible to blind FNAC procedures.[5]USG can precisely guide FNACs and Biopsy in lesions as small as 1 cm and lesions of critical anatomical areas.[5]

CT guided FNAC plays a crucial role in diagnosing organ mass lesions in which accurate needle placement is possible by avoiding injury to surrounding structures, limiting the complication of procedure.[4]USG or CT guided FNAC is an accurate method for a definite diagnose of local lesions.[2]

Guided FNAC has made significant contribution to preoperative and intraoperative diagnosis of cancer patients.[6]USG guided FNAC is widely accepted diagnostic procedure in many neoplastic and non-neoplastic disorders of different organs.[1]

Benefit of this technique is it's high diagnostic accuracy leading to obsolete use of older technique of blind percutaneous biopsy using a core needle.[2]It has proven to be superior to core needle and open biopsy with an advantage of minimal complication and early diagnose of the lesion. [2]

Adequate sampling, experience and caution in interpreting the aspirate, and a close working relationship between clinician, sonologists and cytopathologists are factors essential for its success.[1]

**Inclusion criteria:**
All the CT & USG guided FNACs of different organs were included in the present study.

**Exclusion criteria:**
1.USG / CT guided tapping of different body fluids like pleural fluid, ascitic fluid, peritoneal fluid.
2. All non-guided FNACs, i. e. (Blind FNACs) of different organs were excluded from the present study.

## II. Results

USG was the most frequently used modality for guided FNAC than CT in present study. Amongst the USG guided FNACs, maximum of samples obtained the adequate material for the diagnosis of different diseases. Female preponderance was seen in present study with Male to Female ratio as 1: 0.57. Most commonly affected patients with different diseases diagnosed were in an age group of 41-50 years. Amongst the different organs which had undergone guided FNACs, frequency of diagnosing malignancy was more as compared to benign lesions in present study, except in thyroid and mediastinal mass lesions.

Distribution of diseases diagnosed in maximum numbers in different organs on guided FNACs were as follows –

- Breast –Ductal carcinoma (23.52%)
- Thyroid-Colloid goitre (36.67%)
- Liver –Hepatocellular carcinoma (66.67%)
- Lung–Positive for epithelial malignancy, was most frequently given impression on guided FNACs (31.85%)
- Lymph node – Metastasis of different malignancies to lymph node
- Ovary - Positive for epithelial malignancywas most frequently given impression on guided FNACs (37.5%)
- Pancreas – Adenocarcinoma
- Bone, Abdominal swelling, Miscellaneous sites, Gall bladder – Malignant lesions were most commonly diagnosed.

About 57.43% cases also underwent USG guided biopsies, obtaining cyto-histological correlation. Overall cyto-histological correlation of guided FNACs & guided biopsies show higher concordance rate (59.82%) in present study.

The guided FNAC along with guided biopsy were highly sensitive (95.71%) in diagnosis of different organs when both done together with higher diagnostic accuracy.

## III. Discussion

**Table 1 :-** Modality used for guided FNACs

| **Present study (2018)** | **Suva Chetal M, et al (2016) [7]** | **Avinash Mane, et al (2015)[8]** |
|---|---|---|
| USG – 168 (86.15%)<br><br>CT – 27 (13.84%) | USG – 97 (97.0%)<br><br>CT – 03 (3.0%) | USG – 48 (92.30%)<br><br>CT – 04 (7.69%) |

USG was the most commonly used modality for guided FNACs in our study, which was similarly seen in other studies. This was seen because we have well equipped set up for guided FNACs with adequate availability of instruments & expertise required for the procedure.

**Table 2 :-** Adequacy of sampling of guided FNACs for diagnosis of various diseases

| | |
|---|---|
| **Present study (2018)** | Adequate – 170<br>Inadequate – 25 |
| **NeetuAgarwal (2014)[9]** | Adequate – 110<br>Inadequate - 15 |
| **S.Goel, et al (2010)[10]** | Adequate – 65<br>Inadequate - 13 |
| **Avinash Mane, et al (2015)[8]** | Adequate – 47<br>Inadequate - 5 |
| **Sudha P. Meena, et al (2016)[11]** | Adequate – 218<br>Inadequate – 20 |
| **Khalid Ahmad Al-Sindi, et al (2013)[12]** | Adequate – 183<br>Inadequate – 17 |
| **MoumitaSengupta, et al (2014)[13]** | Adequate – 68<br>Inadequate - 06 |
| **AS Tuladhar, et al (2012)[14]** | Adequate – 179<br>Inadequate - 15 |
| **Sumita Das (Bala), et al (2015)[15]** | Adequate – 112<br>Inadequate - 08 |
| **S. Shamshad Ahmad, et al (2006)[16]** | Adequate – 187<br>Inadequate - 13 |

Adequate material was obtained during guided FNACs, which was helpful for the pathologist for the proper diagnosis of the various diseases of different organs .
Our findings were similar with other comparative studies. This was seen because we have well equipped set up for guided FNACs with adequate availability of instruments & expertise required for the procedure as well as for diagnosis of various diseases.

**Table 3 :-** Gender-wise distribution of cases which had undergone guided FNACs

| **Present study (2018)** | **S. Shamshad Ahmad, et al (2006)[16]** | **Sagale M.S., et al (2014)[17]** | **JignashaMungra , et al (2017)[18]** | **MoumitaSengupta, et al (2014)[13]** |
|---|---|---|---|---|
| Male -71<br><br>Female -124 | Male -72<br><br>Female -128 | Male -01<br><br>Female -69 | Male-47<br><br>Female -42 | Male -58<br><br>Female -130 |

Present study showed female preponderance, which was similar finding with other studies.
This may be because we obtained maximum number of guided FNACs done in breast lesions which are seen more commonly in females.

**Table 4 :-** Age-wise distribution of cases which had undergone guided FNACs

| | |
|---|---|
| **Present study (2018)** | 41-50 years |
| **NeetuAgarwal, et al (2014)[9]** | 41-50 years |
| **JignashaMungra, et al (2017)[18]** | 41-60 years |
| **ManasMadan, et al (2010)[19]** | 41-70 years |
| **Shuchismita, et al (2017) [20]** | 51-60 years |
| **Sudha P. Meena, et al (2016)[11]** | 51-60 years |
| **ShashiBhushan Tailor, et al (2016)[21]** | 61-70 years |
| **Suva Chetal M, et al (2016)[7]** | 50-59 years |
| **Lakshmi S, et al (2015)[22]** | 31-40 years |

| | |
|---|---|
| **E. Jayashankar, et al (2010)[23]** | 60-69 years |

Most commonly, the patients who underwent guided FNACs, werein an age group of 41-50 years in the present study which showed similar results with other studies.

**Table 5 :-** Site wise distribution of cases which had undergone guided FNACs

| **Present study (2018)** | **Suva Chetal M, et al (2016)[7]** | **A.S. Tuladhar, et al (2012)[14]** | **Parajuli S., et al (2011)[24]** | **R.C.Adhikari, et al (2010)[25]** | **Bilquis A.Suleman, et al (2004)[26]** |
|---|---|---|---|---|---|
| **Organs which had undergone study in decreasing order of frequency** | | | | | |
| **Breast, Thyroid, Liver, Lung, Lymph node, Ovary, Bones, Abdominal swelling** | Liver, Gall bladder, Pancreas, Large bowel, Small bowel, Stomach, Kidney, Adrenal gland | Liver, Lung, Intra-abd. LN, Gall bladder, Ovary and adnexa, Pancreas, Stomach, Omentum, Mediastinum | Intra-abdominal lesions – Liver, Gall bladder Lymph node, GIT, Ovary, Pancreas, Omentum. Intra-thoracic lesions- Lung, Para-hilar mass, Para-tracheal lymph node. | Liver, Lung, Lymph node, Ovary, Omentum, Pancreas, Kidney, Gall bladder, Mediastinum, Pelvic region Iliac Fossa. | Liver, Lymph node, Retro peritoneum Gall bladder, Pancreas, Epigastric mass, Ovary |

Present study showed that the organs which had undergone guided FNACs were in decreasing order of frequency as breast, thyroid, liver, lung, lymph nodes, ovary.
Other studies showed that most of the organs were similarly included asin the present study.

**Table 6 :–** Distribution of benign & malignant lesions which diagnosed on guided FNACs

| **Author name** | **Benign lesions** | **Malignant lesions** |
|---|---|---|
| **Present study (2018)** | 53 (27.18%) | 97 (49.74%) |
| **Suchismita, et al (2017)[19]** | 2 (3.03%) | 64 (96.96%) |
| **Suva Chetal M, et al (2016)[7]** | 8 (8.0%) | 78 (78.0%) |
| **ShashiBhushan Tailor, et al (2016)[21]** | 11 (14.10%) | 67 (85.89%) |
| **SudhaP. Meena, et al (2016)[11]** | 7 (2.94%) | 159 (66.80%) |
| **Avinash Mane, et al (2015)[8]** | 5 (9.61%) | 42 (80.77%) |
| **Sumita Das (Bala) (2015)[15]** | 13 (10.83%) | 107 (89.17%) |
| **Abdul Sattar, et al (2014)[27]** | 120 (2667%) | 320 (71.11%) |
| **MoumitaSengupta, et al (2014)[13]** | 24 (32.43%) | 44 (59.45%) |
| **Shrestha M.K., et al (2014)[28]** | 12 (4.67%) | 212 (82.49%) |
| **A.S.Tuladhar, et al (2012)[14]** | 13 (6.70%) | 153 (78.86%) |
| **E.Jayashankar, et al (2011)[23]** | 12 (20.0%) | 41 (80.0%) |
| **R.C.Adhikari, et al (2010)[25]** | 10 (3.12%) | 224 (70.0%) |
| **S. Shamshad, et al (2006)[16]** | 61 (30.5%) | 115 (57.5%) |

Malignant lesions of different organs were most commonly diagnosed with guided FNACs in present study, which was similar finding with other studies.

This may be because, our institution is a rural outreach centre for cancer hospital. So that many cancer patients are referred to our hospital for diagnosis, treatment & follow-up.

**Table 7 –**Conditions diagnosed on guided FNACs of breast lesions

| **Sr. No.** | **Author name** | **Benign lesions** | **Malignant lesions** |
|---|---|---|---|
| **1** | **Present study (2018)** | Fibroadenoma | Ductal carcinoma |
| **2** | **Sagale M.S., et al (2014)[17]** | Fibroadenoma, Fibrocystic disease | - |

Ductal carcinoma was the most commonly diagnosed breast lesions in present study. Other studies showBenign lesions likeFibroadenoma& Fibrocystic disease as common lesions.

**Table 8 -** Conditions diagnosed on guided FNACs of thyroid lesions

| Sr. No. | Author name | Benign lesions | Malignant lesions |
|---|---|---|---|
| 1 | **Present study (2018)** | Colloid goitre | Suspicious of follicular neoplasm |
| 2 | **Aeshta Singh, et al (2016)[29]** | Colloid goitre | Papillary carcinoma |
| 3 | **Khalid Ahmad Al-Sindhi, et al (2013)[12]** | Colloid goitre | Papillary carcinoma |
| 4 | **Lakshmi S, et al (2015)[22]** | Hashimoto's thyroid, Nodular goitre | - |

Colloid goitre was most commonly diagnosed thyroid lesion in present study which was similar with most of the other studies.

**Table 9-** Conditionsdiagnosed on guided FNACs of liver lesions

| Sr. No. | Author name | Benign lesions | Malignant lesions |
|---|---|---|---|
| 1 | **Present study** | Regenerative inflammatory cells with necrotic tissue | Hepato-cellular carcinoma |
| 2 | **Parajuli S, et al (2011)[24]** | Liver abscess | Hepato-cellular carcinoma |
| 3 | **ShashiBhushan, et al (2016)[21]** | Reactive changes | Metastatic adeno carcinoma |
| 4 | **Sudha P. Meena, et al (2016)[11]** | Focal nodular hyperplasia | Metastatic adeno carcinoma |
| 5 | **Abdul Sattar, et al (2014)[27]** | Liver abscess | Metastatic adeno carcinoma |

Hepato – cellular carcinoma was most commonly diagnosed liver lesion than metastasis in our study. Other studies showed metastatic adenocarcinoma as the most common liver lesions. The study ofParajuli et al. (2011) shows similar findings as the present study.

**Table 10-** Conditions diagnosed on guided FNACs of lung lesions

| Sr. No. | Author name | Benign lesions | Malignant lesions |
|---|---|---|---|
| 1 | **Present study (2018)** | Benign mesothelioma | Positive for epithelial malignancy |
| 2 | **Suchismita, et al (2017)[20]** | Non-neoplastic resolution phase of pneumonia | Granulomatous inflammation |
| 3 | **Sumita Das (Bala), et al (2015)[15]** | - | Squamous cell carcinoma, Adeno carcinoma |
| 4 | **Shrestha M.K., et al (2014)[28]** | Benign aspiration | Adeno carcinoma |
| 5 | **A.S.Tuladhar, et al (2012)[14]** | - | Adeno carcinoma |
| 6 | **Parajuli S, et al (2011)[24]** | Tuberculosis | Non-small cell carcinoma |

Positive for epithelial malignancies was most common impression of lung lesions in present study. Other studies show adenocarcinoma as their more common impression.

**Table 11 –** Conditions diagnosed on guided FNACs of lymph node lesions

| Sr. No. | Author name | Benign lesions | Malignant lesions |
|---|---|---|---|
| 1 | **Present study (2018)** | Reactive lymph node | Metastatic malignancy |
| 2 | **A.S.Tuladhar, et al (2012)[14]** | Tuberculosis | Metastatic adeno carcinoma |
| 3 | **Parajuli S, et al (2011)[24]** | Tuberculosis | Non-Hodigkins lymphoma |
| 4 | **R.C.Adhikari, et al (2010)[25]** | Tubercular lymphadenitis | Metastatic adeno carcinoma |

Metastasis of malignancies to lymph nodes were more common in present study. Other studiesshowed that metastatic adenocarcinoma and tuberculosis were more common lesions in their studies.

**Table 12** – Conditions diagnosed on guided FNACs of ovarian lesions

| Sr. No. | Author name | Benign lesions | Malignant lesions |
|---|---|---|---|
| 1 | **Present study (2018)** | Granulomatous -ovarian lesion | Positive for epithelial malignancy |
| 2 | **NeetuAgarwal, et al (2014)[9]** | Serous Cystadenoma | Serous Cystadeno carcinoma |
| 3 | **S.Goel, et al (2010)[10]** | Serous Cystadenoma | Serous Cystadeno carcinoma |
| 4 | **R.C.Adhikari, et al (2010)[25]** | - | Adeno carcinoma |

In our study, ovarian lesions showed Positive for epithelial malignancy. Other studies show such similar findings.

**Table 13 -** Diagnostic parameters calculated oncyto-histopathological correlation

| Author name | Sensitivity | Specificity | PPV | NPV | Diagnostic accuracy |
|---|---|---|---|---|---|
| **Present study (2018)** | 95.71% | 7.14% | 63.20% | 50% | 63.5% |
| **VaibhavShrivastava, et al (2017)[30]** | 97.77% | 25% | 92.01% | 50% | 90% |
| **Sagale M.S., et al (2014)[17]** | 96.94% | 94.73% | 89.43% | 96.42% | 96.42% |
| **Khalid Ahmad Al-Sindhi, et al (2013)[12]** | 93% | 86% | 37% | 99% | 86% |
| **Aeshita Singh, et al (2016)[29]** | 76.92% | 82.93% | 55.56% | 92.86% | _ |
| **S.Goel, et al (2010)[10]** | 85% | 100% | _ | _ | 93.88% |
| **S. ShamshadAhmad,et al (2010)[16]** | 94.11% | 100% | _ | _ | 95.7% |
| **NeetuAgarwal, et al (2014)[9]** | 77.2% | 97.97% | _ | _ | _ |
| **ShresthaM.K., et al (2014)[28]** | 84.5% | 76% | _ | _ | _ |
| **E. Jayashankar, et al (2011)[23]** | 84% | 76% | _ | _ | _ |

Present study showed higher sensitivity with the cyto- histopathologicalcorrelation. Our findings were similar with the other studies.

**Table 14 :-** Statistical calculation table in total 112 cases

| | **Histopathology ( Guided biopsy)** | | |
|---|---|---|---|
| **Cytopathology(Guided FNAC)** | T.P.<br>67 | F.P.<br>39 | 106 |
| | F.N.<br>03 | T.N.<br>03 | 06 |
| | 70 | 42 | Total<br>112 |

**Calculation of diagnostic parameters on correlation:**

1) Sensitivity = T.P. / (T.P + F.N.) X 100 = [67/ (67+03)] X100 = 95.71%
2) Specificity = T.N. / (F.N. + F.P.) X 100 = [03/ (03+39)] X100 = 7.14%
3) Positive predictive value: PPV = T.P / (T.P. + F.P.) X 100 = [67/ (67+39)] X100 = 63.20%
4) Negative predictive value: NPV = T.N. / (T.N. + F.N.) X 100 = [03/ (03+03)] X100 = 50.0%
5) Diagnostic accuracy = (T.P + T.N) / (T.P+T.N + F.P+ F.N) X 100 = [(67 + 03)/ (67+03+39+03)] X100 = 62.5%

With correlation of the guided FNAC and Biopsy in over all 112 cases , out of total 195 cases included in study, the diagnostic parameters showed the results as follows :

1. Sensitivity - 95.71%
2. Specificity - 7.14%
3. Positive predictive value: PPV - 63.20%
4. Negative predictive value: NPV - 50%
5. Diagnostic accuracy - 62.5%

This indicates there was maximum sensitivity with the correlation of guided FNAC and guided Biopsy which was about 95.71% along with the diagnostic accuracy of 62.5%.

**Table 15** :- Diagnostic parameters of correlation of guided FNAC and guided Biopsy in different organs in present study

| Sr. No. | Organ | Sensitivity | Specificity | PPV | NPV | Diagnostic accuracy |
|---|---|---|---|---|---|---|
| **1** | **Breast** | 93.75% | 0.0% | 83.33% | 0.0% | 78.94% |
| **2** | **Thyroid** | 100% | 0.0% | 50.0% | 0.0% | 50.0% |
| **3** | **Liver** | 100% | 0.0% | 52.63% | 0.0% | 52.63% |
| **4** | **Lung** | 100% | 0.0% | 64.70% | 0.0% | 64.70% |
| **5** | **Lymph node** | 100% | 0.0% | 66.67% | 0.0% | 66.67% |
| **6** | **Ovary + Pelvic mass** | 87.5% | 14.29% | 53.84% | 50.0% | 53.33% |
| **7** | **Bones** | 100% | 0.0% | 50.0% | 0.0% | 50.0% |
| **8** | **Abdominal swelling** | 85.71% | 100% | 85.71% | 66.67% | 85.71% |
| **9** | **Miscellaneous sites** | 100% | 0.0% | 62.5% | 0.0% | 62.5% |

## IV. Conclusion

Guided FNACs are safe, less time consuming procedures, efficacious method, also available in rural set up of hospitals and provide preoperative diagnosis which helps in prompt treatment modality of the patient.

GuidedFNACs are readily accepted, rapidly growing and an important diagnostic technique which can be used for rendering a correlative cyto-histological diagnosis in lesions of various organs.

Most commonly, the spectrum of malignant lesions of various different organs with adequate sample material got properly diagnosed in our institute.

Guided FNACs provide high diagnostic accuracy & high sensitivity on cyto–histopathological correlation with guided biopsies, when both are performed together.

## V. Acknowledgement

We are thankful to Dr.Suvarna N. Patil, Medical Director for sanction of this project and Dr. R.H. Deshpande for his permission. Last but not the least; we are thankful to the numerous patients involved in this study.

## References

[1] R.P.Kedar, V.H. Patel, S.A. Merchant, V Aggerwal, AA Pandit, Ultrasound guided aspiration cytology – a valuable diagnostic aid. Journal of Postgraduate Medicine 1991; 37(2): 87-7.

[2] Sailesh Ray , Mimi Gangopadhyay, ArghyaBandyopadhyay, KaushikMajumdar, NilanjanaChaudhury, et al. USG guided FNAC of ovarian mass lesions: A cyto-histopathological correlation, with emphasis on its role in pre-operativemanagement guidelines. J Turk GerGynecol Assoc. 2014; 15(1): 6–2.

[3] Greogor Schafer, Alexander MM Eggerment, Christian A Voit, et al. Ultrasound – Guided FNAC Cytology of Lymph Nodes in Melanoma. Expert Rev Dermatol 2013; 8(2): 145-3.

[4] VK. Jain, M. Mishra, A.K Singh, S. Gupta, N. Jain, et al. Diagnostic Yield of Computed Tomography-guided Percutaneous Fine needle Aspiration Cytology of Radiological Suspected Cases of lung Mass Lesions. Indian J Chest Dis Allied Sci 2012;54:265-266

[5] Hemalatha A.L., SumanaSindhuram V., Sushma S., Suma J.K., Varna and AnubhaAditya, et al. Ultrasound Guided Fine Needle Aspiration of cytology of Abdominal-Pelvic Masses- the pathologists' Perspective. Journal of clinical and Diagnostic Research.2013; 7(2): 273-7.

[6] Ahmed A. E.L. Naggar, Mohamed N.A., WaleedElnabawey, HanyKhattab, Khaled Abdel Azim and AmrMostsafa, et al. Role of ultrasound guided fine needle biopsy, EUS and serum CA19-9 level in diagnosis of Pancreatic Masses. Journal of American science 2012 ; 8(10): 58-4.

[7] Suva Chetal M, et al. Study of image guided FNAC in intra-abdominal mass lesion at tertiary care hospital, Jamnagar, Gujarat, India, Indian Journal of Basic and Applied Medical Research 2016; 6(1): 40-51.

[8] Avinash Mane, Sujata R. Kanetkar, SnehalSaini, NeeravSaini, et al. Role of image guided fine needle aspiration cytology in cases of hepatic mass lesions.International J. of Healthcare and Biomedical Research. 2015; 3(3): 149-5.

[9] NeetuAgarwal, ShiwaniGarg, NeeruAggarwal, P. M. Santwani, et al. Ovarian Neoplasm: Diagnostic Accuracy of Ultrasound Guided Fine Needle Aspiration Cytology with Histopathological Correlation. 2014; 13(7): 24-8.

[10] S.Goel, D.Agarwal, M.Naim, T. Khan, Ekrammulah, et al. Ultrasound Guided Fine Needle Aspiration Cytology In Ovarian Neoplasms: An Assessment Of Diagnostic Accuracy And Efficacy And Role In Clinical Management. The Internal Journal of Pathology 2010; 11(2): 1-6.

[11] Sudha P. Meena, PriyankaPatangla, Naresh N. Ral, et al. Diagnostic Utility of USG-Guided FNAC in Hepatic Lesions. Evid. Based Med. Healthc, 2016; 3(52): 2699-702.

[12] Khalid Ahmad Al-Sindi, MulazimHussainBukhari, KanwalSaba, Wajid Ali, MadihaArshad, NasirRazaZaidi, et al. Evaluation of non-palpable thyroid nodules by ultra sound guided fine needle aspiration cytology. Nutral Science 2013; 5(2): 214-20.

[13] MoumitaSengupta, KaushikSaha, et al. Computed tomography guided fine needle aspiration cytology of pulmonary mass lesions in a tertiary care hospital: A two-year prospective study. Med J DY PatilUniv 2014;7(2):177-81.

[14] A.S.Tuladhar, R.C.Adhilari, S.Shrestha, S.K. Sharma, S Pradhan,A. Shrestha and A.A.GiriTuladhar, et al. Role of USG guided FNAC in diagnosis of abdominal and thoracic lesions. Nepal Med Coll J 2012; 14(4); 271-74.

[15] Sumita Das (Bala), SambitDasgupta, Anjan Kumar Das, Swagata Bhattacharyya. IndranathGhosh, et al. Lung SOL- Cytology and histological correlation in a tertiary care centre. IOSR Journal of Dental and Medical Sciences 2015; 14(6):18-24.

[16] S. Shamshad Ahmad, KafilAkhtar, S. ShakeelAkhtar, AndleebAbrari Alia Nasir, M. Khalid, Tariq Mansoor, et al. Ultrasound Guided Fine Needle Aspiration Biopsy of Abdominal Masses. JK Science 2006; 8(4): 200-4.

[17] Sagale M.S., Jadhav M.V., et al. Ultrasonographically guided fine needle aspiration cytology of breast. Indian Journal of Basic and Applied Medical Research 2014; 3(2):706-11.

[18] JignashaMungra, DharaTrivedi, Pravina M. Santwani, et al. Ultra Sound guided fine needle aspiration in Diagnosis of Malignant Hepatic Lesion – 3 Year Study.JCytol. 2011 Oct-Dec; 28(4): 178–184.

[19] Madan M., HemaBannur, et al. Evaluation of Fine Needle Aspiration Cytology in the Diagnosis of Lung Lesions. Turkish Journal of Pathology 2010; 26(1): 1-6.

[20] Suchismita, Singh G.R., G. Atul, G. Ruchi, A. Pooja, N. Shamrendra, et al. CT Guided fine needle aspiration cytology of localised lung lesions : cytological versus radiological correlation. Indian Journal of Applied Research 2017; 7(5):79-6.

[21] ShashiBhushan Tailor, Dharm Chand Kothari, et al. Ultrasound Guided Fine-Needle Aspiration Cytology of Liver Lesions: A Prospective Study.International Journal of Scientific Study 2016; 3(11): 249-4.

[22] Lakshmi S., Latha B., Nirmala C., et al. Spectrum of thyroid lesions on fine needle aspiration cytology. Journal of international medicine and dentistry2014; 2(1): 53-62.

[23] E. Jayashankar, B. Pavani, Eshwar Chandra, Ravinder Reddy, M. Srinivas, Ashwin Shah, et al. Computed Tomography Guided Percutaneous Thoracic: Fine Needle Aspiration Cytology in Lung and Mediastinum. J CytoHistol 2011; 1(3): 1-3.

[24] Parajuli S., Tuladhar A., Basnet R.B., et al. Ultrasound and computed tomography guided Fine Needle Aspiration In diagnosing intra-abdominal and intra-thoracic lesions. Journal of Pathology of Nepal 2011; 1: 17-1.

[25] R.C. Adhikari, A.Tuladhar, S.Shrestha and S.K. Sharma, et al. Deep-seated thoracic and abdominal lesions : usefulness of ultrasound guided fine needle aspiration cytology, a 3 year experience. Nepal Med Coll J 2010; 12(1):20-5.
[26] Suleman B.A., Atif N., Ahmad S, Chughtai N, et al. Analysis of 210 Cases of Radiologically Guided FNAC of Intra-abdominal Masses. Proceeding S.Z.P.G.M.I. 2004; 18(1): 35-4.
[27] Abdul Sattar, Abdul Majeed Khan, SadiaAnjum, Abbas Naqvi, et al. Role of Ultrasound Guided Fine Needle Aspiration Cytology in Diagnosis of Space Occupying Lesions of Liver. J Ayub Med Coll Abbottabad 2014;26(3): 334-36.
[28] Shrestha M.K., Ghartimagar D., Ghosh A., et al. Computed tomogram guided fine-needle aspiration cytology of lung and mediastinal masses with cytological correlation: A study of 257 cases in Western region of Nepal. Nepal Med Coll J 2014; 16(1): 80-3.
[29] Aeshita Singh, Pratapsingh H. Parihar, et al. Role of High Resolution Ultrasonography and Color Doppler in Assessment of Thyroid Swelling in Correlation with USG Guided FNAC. International Journal of Anatomy, Radiology and Surgery, 2016; 5(1):40-4.
[30] VaibhavShrivastava, Sanjay Singh, Aklesh Kumar Maurya, Mayurika Singh, Sabin Sam, Surendra Kumar Gupta, et al. The accuracy of USG and USG guided FNAC axilla in predicting nodal metastasis in a clinically lymph node negative cancer breast patient.International Journal of Research in Medical Sciences 2017; 5(1):196-200.

Shweta Joshi-Warpe " Evaluation of Various Disorders diagnosed on Guided FNACs in a Rural Tertiary Care Hospital, Konkan belt of Maharashtra, India"IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 4, 2018, pp 05-12.