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Serous Effusion Cytology in Sudanese Patients

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Abstract

The purpose of this study was to determine the etiology and cytological patterns of serous effusions among Sudanese patients.

***Methods and Results*:** This descriptive study was carried out in hospitals of Khartoum state in the period from February 2019 to June 2020. One hundred and seventy-eight patients "clinically and/or radiological" diagnosed as having an accumulation of serous effusions were included in this study. Smears were prepared and stained according to the conventional pap staining procedure.

The majority of the study population (121[68%]) had malignant effusion (MEs), and the other group (57[32%]) - benign effusions (BEs). Among patients with MEs, breast cancer was the major etiology (75[62%]), followed by lung (23[19%]), GIT (12[9.9%]), and thyroid cancers (11[9.1%]), while among patients with BEs, parapneumonic conditions were the main factor (28[49.1%]), followed by tuberculosis (18[31.6%]) and pulmonary embolism (11[19.3%]). The majority of patients with MEs were pleural effusion (109[90.1%]), followed by peritoneal effusion (12[9.9%]), whereas no patients in this group had pericardial effusion. Pleural effusion (29[50.9%]) was also the major one among patients with BEs, followed by peritoneal (21[36.8%]) and pericardial effusions (7[3.9%]).

Conclusion: Malignant serous effusion is commonly seen among patients with malignant tumors; pleural effusions presented a large proportion, especially among females with breast cancer. Thoracentesis and cytological methods (i.e., conventional smear and cell block technique) should be the first line for the diagnosis of malignant pleural effusions, along with confirmatory adjunct techniques such as immunohistochemistry and immunocytochemistry.**(International Journal of Biomedicine. 2022;12(1):160-163.)**

Key Words: serous effusion • malignancy • cytology • malignant effusion • benign effusion

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Abbreviations

ME, malignant effusion: **BE**, benign effusion; **MPE**, malignant pleural effusions

Introduction

The pleural, pericardial, and peritoneal cavities are serous cavities. The visceral and parietal surfaces of each cavity are lined by the mesothelium. Each cavity contains only a small volume of lubricant fluid known as serous fluid. This fluid facilitates the movement of the lungs, heart, and digestive tract.[1] Different pathological conditions may lead to excess accumulation of fluid in body cavities; inflammatory conditions and malignant tumors "primary and/or secondary" are considered to be the major underlying causes.[2,3] Many types of tumors, especially carcinomas, may spread and find their way to serous membranes, and they become disseminated with the effusion. Many studies reveal that patients with lung

and breast cancers are more likely to develop pleural effusion during their disease course. Adenocarcinomas of the breast, lung, ovary, and GIT are the commonest primary, malignant tumors with high susceptibility to metastasize in the serous cavities.[4] The incidences of BEs are twofold common than MEs and have different causes and expressions.[5] BEs can be associated with a wide scale of pathological conditions; congestive heart failure is the most common one.[6] Other causes include rheumatoid disease, systemic lupus erythematosus, pulmonary infarct, pneumonia, pneumothorax, tuberculosis, hepatic cirrhosis, and viral infections.

In Sudan, the major underlying causes of serous effusions vary from inflammatory conditions to metastasized tumors, while cases of primary malignant mesothelioma were not reported among patients.[7] Although the liquid-based approach has advantages, such as uniform fixation and clearer background, because the cellular and background features essential for morphological assessment and diagnosis are better maintained in cytospin, it is thought to be better to utilize this approach in conjunction with conventional cytological technique.[3]

The purpose of this study was to determine the etiology and cytological patterns of serous effusions among Sudanese patients.

Materials and Methods

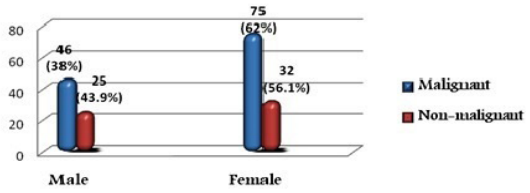
This descriptive study was carried out in hospitals of Khartoum state in the period from February 2019 to June 2020. One hundred and seventy-eight patients "clinically and/or radiological" diagnosed as having an accumulation of serous effusions were included in this study. From these patients, 178 cytological specimens' effusions were collected. Patients with effusion accumulation were subjected to needle aspiration to collect samples; the collected effusions were then delivered to the laboratory. Smears were prepared and stained according to the conventional pap staining procedure. The collected effusions were centrifuged at 2000 rpm for 7 minutes from the deposited cells; smears were prepared and fixed while they were wet by 95% ethyl alcohol. They were then hydrated through downward grades of ethyl alcohol concentrations (absolute, 90%, 80%, and 75%) to distilled water for 2 minutes/stage. Nuclei were stained with Harris Hematoxylin for 5 minutes, differentiated in 1% acid alcohol 5-7 seconds controlled microscopically, and rinsed in distilled water. Next, the smear was blued in alkaline water for 5 seconds, then dehydrated in ascending grades of alcohol concentrations for 2 minutes/stage. The cytoplasm was counter-stained with orange G6 for 2 minutes, rinsed in 95% alcohol, then treated with Eosin Azour 50 for 3 minutes, Dehydrated, cleared, and mounted in DPX. Data regarding the population that participated in this study, such as age, gender, clinical data, and other laboratory findings, were collected by checklist method. The disease factors data underlying the causes of BEs and MEs were collected from the patient's medical records.

Statistical analysis was performed using the standard Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp). Written informed consent was obtained from all participants.

Results

In this study, a descriptive analysis for serous effusions among 178 Sudanese patients (age ranged from 20 to 78, with a mean age of 58 years) was carried out. Two groups of individuals were classified according to the diagnostic yields of their effusions. The majority of the study population (121[68%]) had MEs, and the other group (57[32%]) - non-malignant effusions. Most patients with MEs were female - 75(62%), while males constituted 46(38%). In the patients with BEs, most were female - 32(56.1%) vs. 25(43.9%) male. Table/Figure 1 presents the distribution of the study population by malignancy and gender. In patients with MEs, the majority of patients were in the age group of 36-50 years (44[36.4%]), followed by the age groups of 51-65 (42[34.7%]), 66+ (21[17.4%]), and 20-35 years (14[11.6%]). In contrast, among patients with BEs, the majority of patients were in the age group of 51-65 years (22[38.6%]), followed by the age groups of 36-50(20[35.1%]), 20-35(10[17.5%]), and 66+(5[8.8%]) years.

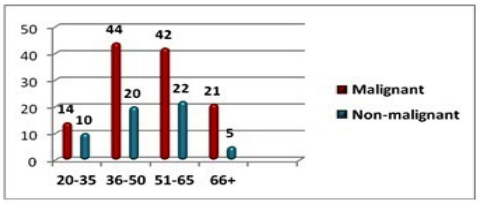
Gender	Malignant		Non-malignant		Total	
	No.	%	No.	%	No.	%
Female	75	62.0%	32	56.1%	107	60.1%
Male	46	38.0%	25	43.9%	71	39.9%
Total	121	68.0%	57	32.0%	178	100.0%



Table/Fig 1. *The distribution of the study population by malignancy and gender.*

Table/Figure 2 presents the distribution of the study population by malignancy and age.

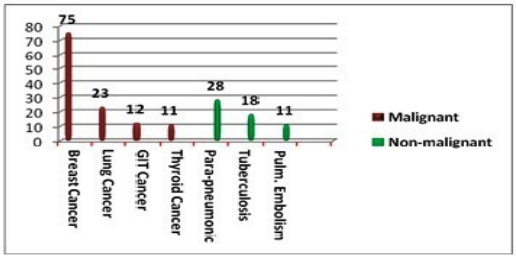
Age	Malignant		Non-malignant		Total	
	No.	%	No.	%	No.	%
20-35	14	11.6%	10	17.5%	24	13.5%
36-50	44	36.4%	20	35.1%	64	36.0%
51-65	42	34.7%	22	38.6%	64	36.0%
66+	21	17.4%	5	8.8%	26	14.6%
Total	121	68.0%	57	32.0%	178	100.0%



Table/Fig. 2. *The distribution of the study population by malignancy and age.*

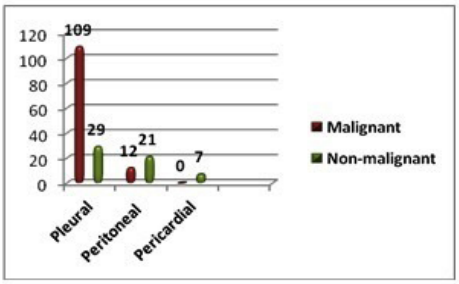
Among patients with MEs, breast cancer was the major etiology (75[62%]), followed by lung (23[19%]), GIT (12[9.9%]), and thyroid cancers (11[9.1%]), while among patients with BEs, parapneumonic conditions were the main factor (28[49.1%]), followed by tuberculosis (18[31.6%]) and pulmonary embolism(11[19.3%]) (Table/Figure 3). Table/Figure 4 presents the distribution of the study population by malignancy and effusion site. The majority of patients with MEs were pleural effusion (109[90.1%]), followed by peritoneal effusion (12[9.9%]), whereas no patients in this group had pericardial effusion. Pleural effusion (29[50.9%]) was also the major one among patients with BEs, followed by peritoneal (21[36.8%]) and pericardial effusions (7[3.9%]).

Aetiology	Malignant		Non-malignant		Total	
	No.	%	No.	%	No.	%
Breast Cancer	75	62.0%	0	.0%	75	42.1%
Lung Cancer	23	19.0%	0	.0%	23	12.9%
GIT Cancer	12	9.9%	0	.0%	12	6.7%
Thyroid Cancer	11	9.1%	0	.0%	11	6.2%
Para-pneumonic	0	.0%	28	49.1%	28	15.7%
Tuberculosis	0	.0%	18	31.6%	18	10.1%
Pulm. Embolism	0	.0%	11	19.3%	11	6.2%
Total	121	68.0%	57	32.0%	178	100.0%



Table/Fig.3. *The distribution of the study population by malignancy and etiology.*

Effusion site	Malignant		Non-malignant		Total	
	No.	%	No.	%	No.	%
Pleural	109	90.1%	29	50.9%	138	77.5%
Peritoneal	12	9.9%	21	36.8%	33	18.5%
Pericardial	0	0.0%	7	3.9%	7	3.9%
Total	121	68.0%	57	32.0%	178	100.0%



Table/Fig 4. *The distribution of the study population by malignancy and effusion site.*

Discussion

Serous effusion cytology is widely employed in the initial evaluation of the etiology of effusions with high diagnostic sensitivity.[8] This study evaluates the rate of incidence of serous effusions and describes its onset pattern among Sudanese patients. Out of 178(100%) patients with accumulated serous effusion, MEs due to metastatic malignant cells were detected in 121(68%) patients; this relatively high percentage was due to increased incidence of malignant cases, which resulted in the disease being metastasized to different body cavities, causing MEs. These findings support several studies that reported that malignant serous effusion commonly occurs as a secondary manifestation due to the metastatic involvements of malignant cells from diverse body organs to different body cavities.[9-11] Also, the present study finds that the majority of study patients with MEs were females 75(62.0%), and we assume this is associated with the increased incidence of breast cancer among Sudanese females. This finding agrees with a study by Amany et al.,[12] Shalabi et al.,[13] and Abbas et al.,[14] who concluded that breast cancer continues to be the most common cancer among women in Sudan, as well as with Aydogmus et al.[15] and Tremblay et al.,[16] who concluded that breast cancer is the second most common cause, after lung cancer, of MPEs, accounting for approximately one-third of all MPEs.

The present results showed that the accumulation of malignant serous effusion was detected mainly in the pleural cavity. Our results agree with other studies conducted by Antony et al.[17] and Sahn,[18] which elucidate the increased incidence of malignant serous effusion, especially in the pleural cavity.

Conclusion

Based on this study and review of other studies, it could be concluded that malignant serous effusion is commonly seen among patients with malignant tumors; pleural effusions presented a large proportion, especially among females with breast cancer. Therefore, more efforts in awareness of breast cancer should be given to the populations so as to decrease the late cases, which are represented with malignant effusions. Thoracentesis and cytological methods (i.e., conventional smear and cell block technique) should be the first line for the diagnosis of MPEs, along with confirmatory adjunct techniques such as immunohistochemistry and immunocytochemistry.

Competing Interests

The authors declare that they have no competing interests.

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