Effusion causes and management in a series of patients from Northern Saudi Arabia

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ABSTRACT

Background: Management of patients with different forms of effusions represents a major challenge for many health caregivers. The present study aimed to explore the effusion causes and management in a series of patients from Northern Saudi Arabia.

Methodology: In this descriptive retrospective study, data referred to 60 patients presented with exudative and trasudative effusions were reclaimed. Effusion was categorized into two types according to Light’s criteria.

Results: Exudate effusion was identified in 27/60 (45%) of the patients, hence, transudate was revealed in 33/60 (55%) patients. The majority of males were identified with exudate 16/22 (73%), hence, most females were identified with exudate 21/38 (55%). The risk of exude effusion among males and the relative risk (RR), and 95% confidence interval (95%CI) was 1.6257 (1.0509 to 2.5149), P = 0.0290, z statistic = 2.183. The risk of transude effusion among females, RR (95%CI) = 2.0263 (0.9669 to 4.2467), P = 0.0614, z statistic = 2.183, 1.871.

Conclusion:
Transudate effusion is more common and predominantly among males, whereas, exudate is more common among females. The most common causes of effusions in northern Saudi Arabia are cancers.

Keywords: Effusion, Exudate, Transudate, Saudi Arabia, Ha’il

1. INTRODUCTION
The accumulation of fluids in the body cavities is known as effusion comprising major types, pleural effusion, peritoneal effusion (ascites), and pericardial effusion. These effusions occur in association with several pathological conditions. Accurate and fast diagnosis of conditions connected to these effusions determines the level of the subsequent patient management (Kopcinovic and Culej, 2014; Rudler et al., 2020).

In pleural effusion, the fluid accumulates in the pleural cavity, which is a serous membrane that surrounds the lungs separating them from the thoracic enclosure. Transudate is the most common type of effusion that occurs in pleural and its formation is associated with several factors most of them influence the balance of production and absorption of the fluid (Adeyinka and Kondamudi, 2020). Though many causes of pleural effusion were known about 20% of the causes still obscure (Ferreiro et al., 2020).

Peritoneal effusion usually occurs in the serous membrane surrounding the viscera and more likely to be exudate type (Zhu et al., 2020). Peritoneal effusion is associated with many pathological conditions including liver diseases, cancers, and diverse infectious conditions (Salman et al., 2020).

In pericardial effusion, the fluid accumulates in the pericardial sac, a single-layered membrane surrounding the heart. Numerous conditions are associated with pericardial effusion including cardiac problems, infections, inflammatory, neoplastic, liver diseases, renal diseases, and others (Willner et al., 2020).

However, the management of effusion is determined by several factors including the management of the accumulated fluid and the underline cause (Bateman et al., 2020). With the absence of adherent to particular guidelines, the management may greatly vary in different healthcare settings. Consequently, the present study aimed to explore the effusion causes and management in a series of patients from Northern Saudi Arabia.

2. MATERIALS AND METHODS
In this descriptive retrospective study, data referred to 60 patients presented with exudate and transudate effusions were reclaimed. All data referred to the patients seen in King Khalid Hospital, Ha’il city, Saudi Arabia, between February 2018 and December 2019. All patients with complete records were included in the analysis. The obtained variables were arranged in a standard data-sheet before its inclusion on SPSS software for statistical analysis. The essential data included demographical characteristics such as age, sex, and clinical data including; diagnosis, effusion type, possible causes, and outcomes. Effusion was categorized into two types according to Light’s criteria (Light et al., 1972): a-Exudate with protein content more than 3.0 g/dl; b-Transudate with protein content < 3.0g/dl.

Data analysis
All data were analyzed using in the SPSS software. Besides the generation of percentages, frequencies, cross-tabulations, relative risks, and P-values were obtained adopting a 95% confidence interval. Chi-square test was employed (P-value < 0.05) was considered significant.

Ethical consent
Ethical approval for this study was obtained from the ethical committee of the College of Medicine, University of Hail. Ethical standards of the 1964 Helsinki declaration and its consistent following reforms were followed in this study.

3. RESULTS
In this study, data referred to 60 patients previously admitted with effusions were investigated. The patients aged between 5 to 98 years with a mean age of 64±1.7 years 22(37%) were males and 38(63%) were females. Most of the patients were aged 60 to 79 years in 28/60(46.7%). Most males were age 60-69 years, 6/22(27%), whereas, most females were aged 70-79 years, 11/38(29%), as indicated in Table 1, Fig 1.

Exudate effusion was identified in 27/60(45%) of the patients, hence, transudate was revealed in 33/60(55%) patients. The majority of males were identified with transudate 16/22(73%), hence, most females were identified with exudate 21/38(55%). The risk
of exude effusion among males and the relative risk (RR), and 95% confidence interval 95%CI) was $1.6257$ (1.0509 to 2.5149), $P = 0.0290$, $z$ statistic = 2.183. The risk of transude effusion among females, RR (95%CI) = $2.0263$ (0.9669 to 4.2467), $P = 0.0614$, $z$ statistic = 2.183, 1.871, as indicated in Table 1, Fig 1.

Table 1. Distribution of the study subjects by sex, age and effusion type

<table>
<thead>
<tr>
<th>Category</th>
<th>Variable</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>≤49 years</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>50-59</td>
<td>3</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>60-69</td>
<td>6</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>70-79</td>
<td>3</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>≥80</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>22</td>
<td>38</td>
<td>60</td>
</tr>
<tr>
<td>Effusion type</td>
<td>Exudate</td>
<td>6</td>
<td>21</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Transudate</td>
<td>16</td>
<td>17</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>22</td>
<td>38</td>
<td>60</td>
</tr>
</tbody>
</table>

Figure 1. The study subjects by sex, age and effusion type

The possible underline causes were summarized in Table 2, Fig. 2. The most encountered illnesses connected to the effusions in this series of patients were breast cancer followed by renal failure, CHF, pneumonia, and liver cirrhosis, demonstrating 9/60(15%), 7/60(12%), 7/60(12%), 6/60(10%), and 4/60(7%), respectively. For exudate effusion, most cases were found with breast cancer, followed by pneumonia, and liver cirrhosis, constituting 9/27(33.3%), 5/27(18.5%), and 4/27(15%), in that order. For transudate most cases were seen with, CHF and renal failure, representing 7/33(21%), and 5/33(15%), correspondingly.

Table 2. Effusion type by accompanied diseases

<table>
<thead>
<tr>
<th>Causes</th>
<th>Exudate</th>
<th>Transudate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast cancer</td>
<td>9</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Renal failure</td>
<td>2</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>CHF</td>
<td>0</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Liver cirrhosis</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>
Lung cancer & 2 & 1 & 3 \\
CVA & 0 & 3 & 3 \\
DCM & 0 & 3 & 3 \\
IHD & 0 & 2 & 2 \\
LVD & 0 & 2 & 2 \\
Lymphoma & 1 & 1 & 2 \\
Uterine cancer & 2 & 0 & 2 \\
Prostate cancer & 0 & 1 & 1 \\
Tuberculosis & 1 & 0 & 1 \\
HCC & 1 & 0 & 1 \\
HE & 0 & 1 & 1 \\
Vocal cord nodule & 0 & 1 & 1 \\
Idiopathic & 0 & 5 & 5 \\
Total & 27 & 33 & 60

**CHF**: Congestive heart failure; **CVA**: Cerebrovascular accident; **DCM**: Dilated cardiomyopathy; **IHD**: Ischemic heart disease; **LVD**: Left ventricular dysfunction; **HCC**: Hepatocellular carcinoma; **HE**: Hepatic encephalopathy

**Figure 2.** Effusion type by possible underline causes

Table 3, Fig 3, summarized the distribution of the patients by Medical management, outcomes, and effusion type. Most patients were managed by tapping followed by chest tube and mechanical ventilator, representing 51/60(85%), 6/60(10%), and 3/60(5%), in this order. About 5/27(19%) of those with exudate were treated by a chest tube. For outcomes, about 40/60(67%) of the patients cured, 9/60(15%) died, and 8/60(13.3%) set as DAMA. For patients with exudate, 4/27(15%) died and 3/27(11%) were DAMA. For patients with transudate, 5/33(15%) died and 5/33(15%) were DAMA.

**Table 3.** Distribution of the patients by Medical management, outcomes, and effusion type

<table>
<thead>
<tr>
<th>Category</th>
<th>Variable</th>
<th>Exudate</th>
<th>Transudate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical management</td>
<td>Tapping</td>
<td>21</td>
<td>30</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>Chest tube</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Mechanical ventilator</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>27</td>
<td>33</td>
<td>60</td>
</tr>
</tbody>
</table>
4. DISCUSSION

Management of patients with different forms of effusions represents a major challenge for many health caregivers, particularly in the absence of distinct guidelines. Accurate and timely diagnosis represents the hallmark for better outcomes in such patients. However, the present study was a focus on effusions causes and management in a series of patients from Northern Saudi Arabia.

In the present study, most of the patients were attending with transudate effusions. Moreover, the effusions were more frequent among females, particularly exudate effusion. With the lack of literature in this context, it was reported that pleural disorders are frequently occurring in females due to conditions linked to gynecologic or obstetric disorders (Argento et al., 2019). However, the predominance of exudate effusion among women and transudate effusion among men requires further assessment.

Nevertheless, the great majority of the recognized underline causes were cancers. Malignant associated effusions are common and usually accompanied by serious manifestations often indicating advanced cancerous grades. Besides mesothelioma and metastatic cancers to serous cavities, lung, breast, hematological, and gastrointestinal cancers are the most frequent malignancies associated with effusions (Imazio et al., 2020). A meta-analysis has indicated that about 55.6% of pleural effusions were caused by malignant pathogenesis, of which lung cancer representing 61.1% (Botana et al., 2020).

In the present study, the nine cases of breast cancer were identified with exudate effusion. Studies have shown that exudative effusion is commonly associated with cancers particularly lung cancer followed by breast cancer (Jany et al., 2019; Skok et al., 2019).

Some patients in this series were identified with renal failure and congestive heart failure. Several studies have linked the effusions, particularly pleural effusion to congestive heart failure, as well as, to chronic kidney disease (Colella et al., 2017; Walker et al., 2017).

Concerning management, most patients were treated with tapping and chest tubes in this hospital. Optimum overall management of effusion requires to be organized following meticulous accurate diagnosis. Recently, several therapeutic options were implemented in different healthcare systems (Jany et al., 2019). However, the first-line options such as chest drain insertion, therapeutic thoracentesis, and talc pleurodesis, with indwelling pleural catheter insertion gaining less acceptability. Conversely, catheter insertion is an ever more tolerable first-line management (Ferreiro et al., 2017). However, what was done was still behind
the new procedures involved in such patients. Future enhancement is expected since health affairs in Saudi Arabia are continuously in progress in terms of infrastructure and treatment guidelines reforming.

About 9(15%) of the patients have died, which indicates a high burden rate. This might be attributed to timing, diagnostic accuracy, and management settings.

5. CONCLUSION
Transudate effusion is more common and predominantly among males, whereas, exudate is more common among females. The most common causes of effusions in northern Saudi Arabia are cancers. A high mortality rate might be attributed to the timing, diagnostic accuracy, and management settings.

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Funding
This study has not received any external funding.

Conflict of interest
The author declares that he has no conflict of interest.

Informed consent: Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Ethical approval: The study was approved by the Medical Ethics Committee of College of Medicine, University of Ha’il (ethical approval code: HREC 00095a/CM-UOH.02/20).

REFERENCE

