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SOCIODEMOGRAPHIC CHARACTERISTICS AND OUTCOMES FOLLOWING CLOSED THORACOSTOMY TUBE DRAINAGE IN A TERTIARY HOSPITAL IN OSOGBO

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ABSTRACT

INTRODUCTION

Closed thoracostomy tube with underwater seal drainage (CTTD) is a common life-saving procedure performed in the hospital setting. This study evaluates the socio-demographic characteristics of our patients who had CTTD, the indication for the procedure and outcome.

METHODS

A well-structured proforma was used to collect information on patients that had CTTD for various reasons during the period under study. The age, gender, urgency of CTTD intervention, duration of admission, the side of the chest involved, indication, number of days patient was on CTTD, characteristics of the effluent, and outcomes were the variables analysed.

RESULTS

A total number of 34 patients were recruited. The mean age was 43.15 ± 16.9 years. Majority of the patients 21 (61.8%) were females. The CTTD was left sided in 44.1%, right sided in 47.1% and bilateral in 8.8%. In 19(55.9%) patients, the procedure was as an urgent intervention. Majority, 14(41.2%), had pulmonary tuberculosis, 10(29.4%) had metastatic breast cancer, 5(14.7%) had pneumonia and 2(5.9%) had trauma. One patient (2.9%) each had decompensated chronic liver disease, subphrenic abscess and end stage renal disease. Patients were on CTTD for an average of 7 days. Majority, 20(58.8%), had serous effluent.

Mortality occurred in 3 (8.8%) patients; all had malignant and bloody effusion.

CONCLUSION

CTTD is a very common and important life-saving procedure performed more commonly as an emergency. Majority had infective causes as the etiology. The odds of mortality were higher amongst those with malignant pleural effusion and bloody effluent.

Keywords: Closed thoracostomy tube drainage; underwater seal drainage; pleural effusion

INTRODUCTION

Closed thoracostomy tube with underwater seal drainage (CTTD) is a frequently performed life-saving procedure in the hospital.¹ It is often performed in an emergency situation when there is a compromise of respiratory function due to collections in the pleural space. CTTD is a procedure with well-established indications and well-known complications. An indication for performing a CTTD is the presence of pleural effusion, which is defined as the accumulation of fluid in the pleural space.² It can be classified as a transudate or an exudate based on its composition and pathophysiology.^{3,4} The common causes of transudative effusion are heart failure, liver cirrhosis, and hypo-albuminemia; while the common causes of an exudative effusion are malignancy, emphysema, pneumonia and tuberculosis (TB). Other indications for

CTTD include empyema thoracis (purulent collection within the pleural space), pneumothorax (air within the pleural space) and haemothorax (blood within the pleural space). The complications are often avoidable or minimized especially when performed by properly trained personnel. The patients who undergo CTTD in our environment are often very ill or nutritionally drained due to late presentation as a result of ignorance or poverty.

In the management of these patients, of importance in overall prognosis and outcome is the primary pathology necessitating the CTTD. In some cases, thoracostomy drainage may be sufficient. However, there are situations that will require further interventions such as decortication or pleurodesis before the patient's clinical condition improves.⁵ The availability of resources for further intervention will determine the eventual morbidity and mortality outcome in such patient not just due directly to the CTTD itself, but resulting from other factors including the characteristics of the patients, type of effluent and whether the procedure is done as an elective or emergency and the duration of CTTD. All these contribute to the final outcome of the patients.

The aim of this study is to evaluate the socio-demographic and clinical characteristics of our patients who had CTTD for various indications and its outcome at the UNIOSUN Teaching Hospital, Osogbo, Nigeria.

METHODS

This was a prospective study of 34 patients who had closed thoracostomy tube with underwater seal drainage done from 2019-2021 at the UNIOSUN Teaching Hospital, Osogbo, Nigeria. A well designed proforma was used to collect information of patients with indication for CTTD. The proforma was filled for each patient by the surgeon that performed the procedure. The information in the proforma included: age, gender, urgency of the CTTD intervention, side of the CTTD, indication for the procedure, duration of admission, number of days on CTTD, the type of effluent and outcome.

Statistical analysis

The data collected were entered into a Microsoft Excel sheet, and analysed with statistical package for social sciences SPSS version 26. Normally distributed numerical data were analysed using mean and standard deviation, while median was used in presenting duration of admission and number of days on CTTD. Categorical variables were presented as proportion and percentages while charts were used to present the mortality. Logistic regression was used to determine odds ratio of each variable in predicting mortality. P value of <0.05 was considered significant at 95% confidence interval.

RESULTS

A total of 34 patients were recruited within the study period. The mean age was 43.15±16.9 years (age range 10-79 years). Majority, 21(61.8%) of the patients were females, while 13(38.2%) were males. The CTTD was left sided in 15 patients (44.1%), right sided in 16(47.1%) and bilateral in 3 patients (8.8%). It was performed as an urgent procedure in 19 patients (55.9%) while it was less urgent in 15 patients (44.1%).

Majority, 14(41.2%), had pleural effusion from pulmonary tuberculosis, 10(29.4%) had malignant pleural effusion majorly from metastatic breast cancer, 5(14.7%) had pleural collection from suspected pneumonia and 2(5.9%) had trauma. One patient (2.9%) each had decompensated chronic liver disease, subphrenic abscess and end stage renal disease.

The patients were on CTTD for an average of 7days. In terms of the nature of effluent, it was serous in 20(58.8%) patients, sero-sanguinous in 9(36.5%), bloody in 3(8.8%), patients, while frank pus and hemo-pneumothorax were seen in a patient (2.9%) (Table1). There were 3(8.8%) cases of mortality within the period of admission (Figure 1). For the mortality cases, their mean age was higher, they all had right-sided pleural effusion and they all had urgent CTTD. From the logistic regression analysis, female gender, urgent procedure, right-sided pleural collection, malignant pleural effusion and bloody effluent were associated with increased odds of mortality (Table 2).

Table 1: Demographic and clinical characteristics of participants

Variable	Frequency (n=34)	Percentage
Age (Mean±SD)	43.15±16.9	
Gender		
Male	13	38.2
Female	21	61.8
Side of CTTD		
Left	15	44.1
Right	16	47.1
Bilateral	3	8.8
Duration of admission (days)		
Median (Q1-Q3)	12.00(7.0-60.0)	
Type of surgery		
Emergency	19	55.9
Elective	15	44.1
Number of days on CTTD		
Median (Q1-Q3)	7.00(4.8-10.0)	
Indication		
Tuberculosis	14	41.2
Malignant	10	29.4
Pneumonia	5	14.7
Trauma	2	5.9
CLD	1	2.9
Subphrenic abscess	1	2.9
ESRD	1	2.9
Effluent		
Serous	20	58.8
Blood	3	8.8
Serous-sangionous	9	36.5
Frank pus	1	2.9
Heamo-pneumothorax	1	2.9

CLD: Chronic liver disease

ESRD: End-stage renal disease

DISCUSSION

In thoracic surgery, CTTD is the most frequently performed surgical procedure. However, being a life-saving procedure, expertise cuts across other specialities.¹ In centres where a thoracic surgical unit is unavailable, it is mostly performed by general surgeons, as was the case in our centre as at the time this study was conducted. Indications for the procedure varies across institution: while some have reported tuberculosis as the leading cause, others have reported malignant pleural

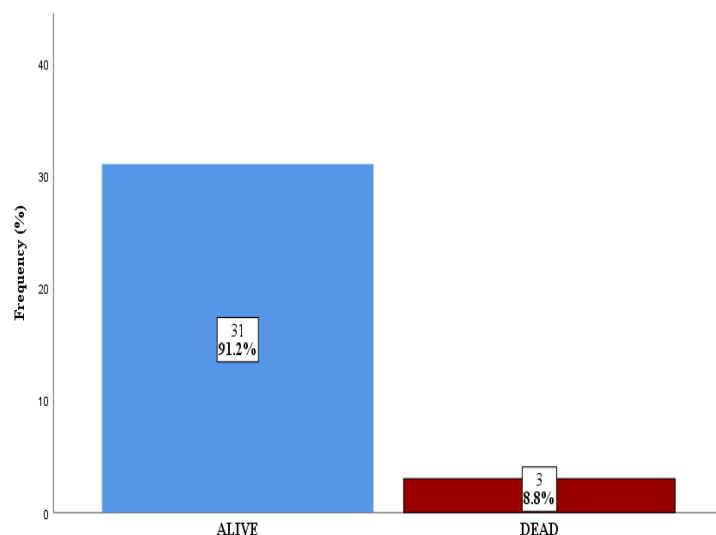


Figure 1: Mortality outcome among participants

effusion as the leading cause.⁶⁻¹⁰ The first documented description of a closed tube drainage was by Hewett in 1867, and the indication was empyema thoracis.¹ By and large, the practice of CTTD has improved over the years to the present day practice which involves the use of a suction device or a double/triple bottle system.¹¹

Physiologically, there is a normal fluid within the pleural space (about 10 to 20mls) which aids the process of respiration. Closed tube thoracostomy with under water seal drainage becomes necessary when there is an increase in the amount of this fluid or there is accumulation of blood, gas or pus within the pleural space. These are referred to as pleural effusion, haemothorax, pneumothorax and empyema thoracis respectively. Any of these pathologies leads to a significant reduction in lung compliance with the attendant compromise of ventilation. When this occurs, CTTD becomes a needed life-saving procedure in order to prevent respiratory failure. The ideal drainage set for CTTD is not readily available and affordable by patients in our centre, therefore we frequently resort to using improvised drainage systems in order to save lives.

From our study, the average age of the patients is 43 years; this is slightly higher than what was previously reported in our environment.^{1,8,10} The differences in age may be attributed to the

Table 2: Relationship between mortality outcome and selected characteristics

	Alive	Dead	95% CI	p-value
Age (Mean±SD)	42.42±17.4	50.67±7.8	1.030 (0.958-1.108)	0.420
Gender				
Male	12(92.3)	1(7.7)	1	0.855
Female	19(90.5)	2(9.5)	1.263(0.103-15.495)	
Side of CTTD				
Left	15(100.0)	0(0.0)	1	0.193
Right	13(81.3)	3(18.8)	4.310(0.793-10.094)	
Bilateral	3(100.0)	0(0.0)	1.001(0.943-1.274)	
Type of surgery				
Elective	15(100.0)	0(0.0)	1	0.381
Emergency	16(84.2)	3(15.8)	3.891(0.892-5.031)	
Indication				
Tuberculosis	14(100.0)	0(0.0)	1	0.109
Malignant	7(70.0)	3(30.0)	12.349 (0.981-25.401)	
Pneumonia	5(100.0)	0(0.0)	0.792 (0.329-2.901)	
Trauma	2(100.0)	0(0.0)	0.331(0.078-12.100)	
Chronic liver disease	1(100.0)	0(0.0)	0.331(0.078-12.100)	
Subphronic abscess	1(100.0)	0(0.0)	0.331(0.078-12.100)	
End stage renal disease	1(100.0)	0(0.0)	0.331(0.078-12.100)	
Effluent				
Serous effluent	18(90.0)	2(10.0)	1	0.294
Blood	2(66.7)	1(33.3)	4.500(0.271-7.493)	
Serous-sangionous	9(100.0)	0(0.0)	0.794(0.283-1.591)	
Frank pus	1(100.0)	0(0.0)	0.331(0.078-12.100)	
Heamo-pneumothorax	1(100.0)	0(0.0)	0.331(0.078-12.100)	

variation in the primary pathology responsible for the pleural collection in the different study populations.⁸ Majority of our patients had infective causes as the etiology of the pleural collection, with tuberculosis as the leading infective cause, similar to findings from other studies.^{7,8} In addition, we had a higher prevalence of CTTD in females. This could be attributed to the fact that majority of the patients with malignant pleural effusion were females with metastatic breast cancer. Others have reported higher incidence in males.^{12,13} Thus, gender preponderance is largely dependent on the underlying pathology whether infective, trauma (hemo-pneumothorax), malignant or other medical conditions, for example, end stage renal disease as reported in this study.

Also referred to as Tube Thoracostomy, CTTD is not totally free from complications which may vary from mild to life-threatening. The

complication rates vary but may be as low as 2-10% and as high as 25-30%.^{14,15} The side of the CTTD may not necessarily affect the outcome of the patient. However, the patients who had mortality from our study all presented with right-sided malignant pleural effusion from metastatic breast cancer.

In this study, majority of the patients had serous effluent and the odds ratio of mortality increases with female gender, right-sided location of the pleural effusion and bloody effluent. These were, however, not statistically significant.

The limitation of this study includes the small sample size. This is partly due to the fact that the study participants were recruited during the COVID-19 pandemic, during which services in the hospital were partly disrupted. In addition, long term follow up of the patients with regards

to the primary etiology was also not considered in the eventual outcome.

CONCLUSION

CTTD, which is an important life-saving procedure, was performed more commonly in females and also as an emergency in our setting, with the odds of mortality being higher in those who had right-sided malignant pleural effusion and bloody effluent. Pleural collection from pulmonary tuberculosis was the leading indication for CTTD in our setting.

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