



International Journal Of
**Recent Scientific
Research**

ISSN: 0976-3031

Volume: 7(2) February -2016

ACUTE CHEST SYNDROME IN SICKLE CELL DISEASE – THE PAIN MALADY
(1 YEAR TMH) EXPERIENCE

Sangita Kamath., Neeraj Jain and B S Rao



THE OFFICIAL PUBLICATION OF
INTERNATIONAL JOURNAL OF RECENT SCIENTIFIC RESEARCH (IJRSR)
<http://www.recentscientific.com/> recentscientific@gmail.com



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

International Journal of Recent Scientific Research
Vol. 7, Issue, 2, pp. 8940-8946, February, 2016

**International Journal
of Recent Scientific
Research**

RESEARCH ARTICLE

ACUTE CHEST SYNDROME IN SICKLE CELL DISEASE – THE PAIN MALADY (1 YEAR TMH) EXPERIENCE

Sangita Kamath., Neeraj Jain and B S Rao

Department of Medicine, Tata Main Hospital, Jamshedpur, Jharkhand, India

ARTICLE INFO

Article History:

Received 15th November, 2015

Received in revised form 21st
December, 2015

Accepted 06th January, 2016

Published online 28th
February, 2016

Keywords:

pressure ulcer, vitamin D
and elderly

ABSTRACT

Background: The diagnosis of acute chest syndrome (ACS) in sickle cell disease (SCD) presents an important challenge to the physician. It may present insidiously and non-specifically, often complicating other conditions. It is a frequent pulmonary complication of SCD and the major cause of hospitalization and mortality, accounting for 25% of deaths in patients with sickle cell disease. This syndrome is multifactorial in nature with underlying factors including fat embolism, bone infarction and infection with a wide range of organisms.

Methods and Materials: This was a retrospective cohort study done over 1 year period from 1st March 2014 – 28th February 2015 with an aim to study the clinical spectrum, laboratory findings, the precipitating factors and the outcome. Patients were divided into three groups on the basis of age (>12 -20 years, 21–40 years, >41 -60 years) with a view to assess the above parameters.

Observations: Of the total of 75 patients with sickle cell anaemia, there were 23 presentations of acute chest syndrome. Male to female sex ratio was 1:2. 78.3% of the patients were admitted for vaso-occlusive crisis (pain crisis) and developed ACS after hospital admission. The commonest clinical presentation were fever and dyspnoea (21.7%) in the patients of 12 to 20 years age group while those in the age group of 21 to 40 years commonly presented with shortness of breath (69.2%) followed by chest pain (56.5%). The commonest physical findings were tachypnoea and tachycardia in both age groups. No clinical finding was predictive of the severity of hypoxia. Infection was found to be the triggering factor in 8.6% of the cases. The average duration of crisis was 7.2 days (SD ± 2.53), while the mean length of hospitalization was 9.53 days. 3 (13.04%) patients required invasive ventilation. There were 2 deaths giving rise to the mortality of 8.7%.

Conclusion: ACS is an important cause of morbidity in sickle cell disease patients. The diagnosis can be challenging to the physicians due to its elusive nature. Clinical manifestations vary widely. It frequently complicates unrelated hospital admissions and hence the need for strict vigilance so that early management can be instituted and morbidity and mortality can be limited.

Copyright © Sangita Kamath, Neeraj Jain and B S Rao., 2016, this is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Amongst the various complications of sickle cell disease (SCD), Acute chest syndrome (ACS) is an important cause of morbidity and mortality. It is the second most common cause of hospitalization in patients with SCD after painful vaso-occlusive crises and is responsible for up to 25% of deaths occurring across all age ranges^{1,2,3}. ACS is the leading cause of death in adult sickle cell patients, who do not have prior evidence of chronic organ damage. It is a form of lung injury that can progress to adult respiratory distress syndrome⁴. Repeated events are associated with increased risk of chronic lung disease and early death. It is estimated that half of all patients with sickle cell anemia will develop ACS at least once

in their lives. Diagnosis of ACS presents an important challenge to the physician.

ACS is defined as the occurrence of at least one or more lower respiratory tract symptoms (dyspnoea, chest pain, fever, sputum and cough) in combination with new pulmonary infiltrates on chest radiography, in a patient with sickle cell disease³. It may present insidiously and non-specifically, often complicating other conditions like the pain crisis. This syndrome is described to be multifactorial in nature with underlying factors including fat embolism, infection with a wide range of organisms, and bone infarction³.

With a population of over 1.2 billion individuals, it is estimated that India is home to over 50% of the world's SCD patients. SCD in India is prevalent in the Western, Central, and Eastern

*Corresponding author: **Sangita Kamath**

Department of Medicine, Tata Main Hospital, Jamshedpur, Jharkhand, India

regions and in pockets of South. In the eastern regions, it is common in Odisha, Jharkhand, and Bengal. However, there are limited studies on SCD and its complications from this part of the country and especially from Jharkhand. Hence a retrospective analysis was undertaken to study the clinical spectrum and outcome of ACS patients who were admitted in our tertiary care hospital over 1 year period.

Aim: 1.To evaluate the clinical features and laboratory parameters of ACS patients over the last 1 year period. 2. To study the precipitating factors and outcomes in these patients.

METHODS AND MATERIALS

A retrospective observational cohort study was done during a one year period from 1stApril 2014 to 30thMarch 2015. The records of all sickle cell disease patients with acute chest syndrome (ACS) who were admitted in the medical wards, intensive care and critical care units of the Tata Main Hospital, Jamshedpur, Jharkhand, during this period were carefully analyzed. A case of ACS was defined by the presence of two or all of the following criteria: (i) lower respiratory tract symptoms – fever, chest pain, breathlessness, cough and sputum (ii) new pulmonary infiltrates on the chest radiograph and (iii) raised white cell count. This is in keeping with the most widely accepted definition of ACS.

Inclusion criteria: All confirmed cases of SCD aged 12 years who fulfilled the criteria of ACS.

Exclusion criteria: (i) Cases of combined SCD with other hemoglobinopathies - thalassemias, HbSC diseases etc. (ii) SCD cases with chronic pain and/or severe co morbid conditions.

The data analyzed included the demographic profile, clinical presentations, laboratory profile, treatment strategy and clinical outcomes (length of hospital stay, mortality and complications). Other reported clinical events included pain crises, anaemic events, surgeries, blood transfusions chest infiltrates other significant co morbid condition. The laboratory profile included complete blood counts, capillary hemoglobin electrophoresis, serum creatinine, serum bilirubin, chest x-ray (for chest infiltrates), and blood, sputum and urine cultures, and room air arterial blood gas (to know the severity of hypoxemia), electrocardiogram (ECG) and echocardiography (done in the patients with ECG changes and based on the discretion of the treating physician).

Smiley-face pain score was used for grading the severity of pain into mild (score 1 to 3), moderate (score 4 and 6) and severe (7 to 10) on a scale of 1 to 10 as shown in the **figure 1**. Patients who needed intravenous tramadol infusion (100mg) and intravenous fentanyl infusion (100mg) were given pain score of 9 and 10 respectively. Grading of hypoxemia was done based on the partial pressure of O₂ (PaO₂) in ABG. Those with PaO₂ from 70 to 79 mm Hg were classified to have mild hypoxemia, 69 to 60 mm Hg-moderate hypoxemia, 59 to 50 mm Hg -severe hypoxemia and < 50 mm Hg- extreme hypoxemia.

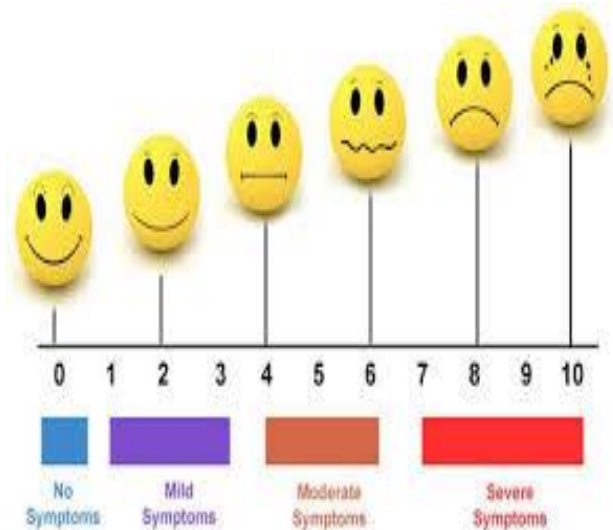


Figure 1 Smiley-face pain score was used for grading the severity of pain

The treatment strategy included oxygenation with high-flow oxygen mask for patients with a partial pressure of arterial oxygen (PaO₂) of <60 mm Hg or oxygen saturation (SaO₂) of < 90%, antibiotic therapy (cephalosporin and macrolide for 7 to 10 days), incentive-spirometry, pain-management protocol, bronchodilators, packed red blood cells transfusion in patients with moderate and severe ACS and patients with Hb < 8g/dl.

Patients were divided into three groups on the basis of age (12–20 years, 21 to 40 years and > 40 years) with a view to assessing the above parameters. There was only one patient in the age group 41 to 60 years and hence the case was not included in the statistical calculations. The incidence of symptoms, physical signs, and laboratory findings were enumerated and significant differences between age groups was determined.

Statistical methods: Results were analyzed and presented as mean ± standard deviation (SD) for continuous variables. Student t test was used to compare means of continuous variables while Fischer's test was used to assess statistical differences between the groups. P value of 0.05 was taken as significant.

RESULTS

Profile of the patients – A total of 75 patients of SCD were admitted over 1 year period of which 15 patients had 23 episodes of ACS. Most of them (60%) were from the tribal group. There were 5(33.3%) males and 10(66.6%) females, giving a sex ratio of 1:2. 3 (20%) patients were in the age group 12 to 20 years, 11 (73.3%) patients in the age group 21 to 40 years and 1 (6.6%) patient was >40 years. The mean age of males was 22.7 years (SD ± 1.5), the minimum age being 21 years and maximum age being 24 years, while the mean age of females was 26.5 years (SD ± 8.36), 16 years being the minimum age and maximum age being 50 years. 3(20%) patients were readmitted during the year of study. The number of admissions for each patient ranged from one to four. Hemoglobin electrophoresis showed AS (trait) pattern in

4(27%) patients while 11(73%) patients showed SS (disease) pattern.

Reason for admission - The admitting diagnosis in 3(13.1%) of the 23 events was ACS, while the remaining 20(86.9%) admissions were for vaso-occlusive crises in 18 patients (78.4%), acute enteritis (1 patient – 4.3%) and urinary tract infection (1 patient – 4.3%) and they subsequently developed ACS during their hospital stay (**Figure 2**)

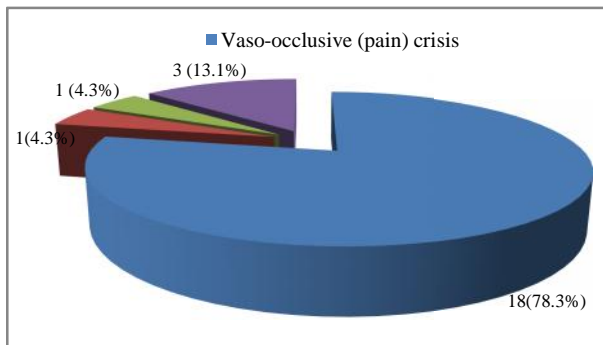


Figure 2 shows the reasons for admission.

Presenting symptoms–The symptoms commonly observed were fever, chest pain, cough, sputum production, and shortness of breath. The most common symptoms observed in the age group 12 to 20 years were fever and shortness of breath (21.7%) followed by chest pain (17.4%) and cough (13.1%). Those in the age group 21 to 40 years most commonly presented with shortness of breath (69.2%) followed by chest pain (56.5%), and fever (52.1%) in the descending order. Cough and sputum production were seen in 21.7% of the patients. None of the patients in either age group had hemoptysis. There was no difference in the frequency of symptoms in the disease (SS) group and trait (AS) pattern.

Figure 3 shows the clinical presentations by the age groups.

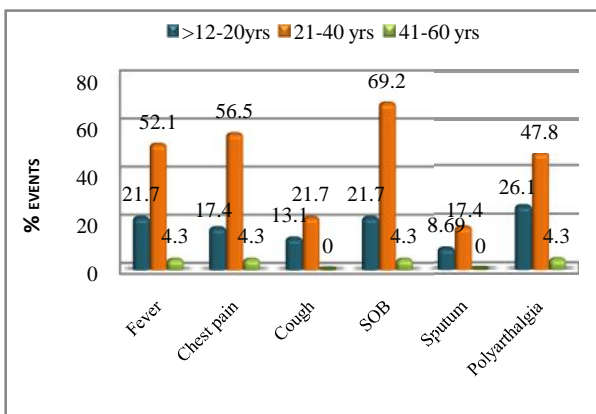


Figure 3 Percent of events with selected symptoms by age group (n = 23) (SOB, shortness of breath).

Physical findings – As depicted in the **figure 4**, the most common physical findings in the age group 12 to 20 years were tachycardia and tachypnoea (21.7%) followed by hypoxemia (17.4%) as detected by pulse oximetry. The average pulse rate was 120.5/minute (SD ± 20.41), respiratory rate was 32.4/ minute (SD ± 8.5), while SaO₂ by pulse oximetry was 90% (SD ± 6.5). The other physical findings observed in the decreasing frequency were rhonchi in 17.4%, and crepitations in the chest on auscultation in 4.3% of the patients. Normal

chest examination was noted in 1(4.3%) patient. Similar observations were seen in the older age group of 21 to 40 years. Tachypnoea was seen in 12 cases (52.2%) and was the most common physical finding followed by tachycardia in 10 patients (43.5%). Hypoxemia was also observed in 10 patients (43.5%). Rhonchi and crepitations were detected in 34.8% (8 cases) and 21.7% (5 cases) respectively. 8.7% of the patients had normal chest examination. However, no statistically significant difference was observed for the clinical signs and symptoms between both the age groups.

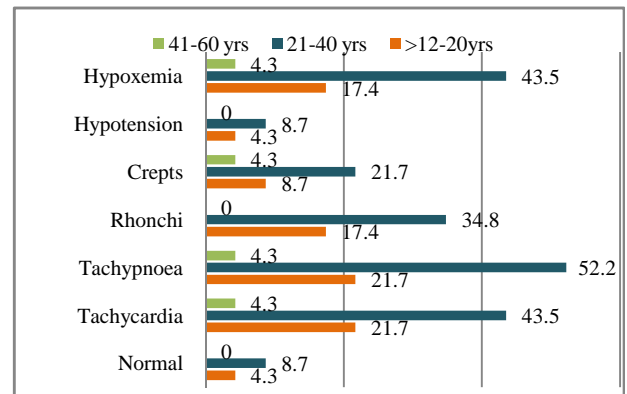


Figure 4 Findings on physical examination as a percentage of total study group (n = 23).

Seasonal factors: The rate of ACS was affected by the season of the year. It was maximum in winter. 60.8% of the cases occurred in winter, 30.4% cases occurred in summer while the remaining 8.8% of the cases occurred during the rainy season. The same trend was seen in both the age groups.

Laboratory parameters – All patients were anemic on admission. The mean (SD) hemoglobin concentration (in g/dl) and mean (SD) WBC count (on admission) were lower in the younger age group. Mean hemoglobin concentration (in g/dl) was 6.75 (2.3) and 7.93 (1.32) respectively while mean WBC count (10⁹/L) was 13.9 (16.5) and 12.8 (68.9) respectively in the age group 12 – 20 years and 21– 40 years. This difference was, however, not statistically significant. Similarly the mean (SD) RBC count (1000/μL) in basal state was lower in the 12 to 20 years age group and this difference was statistically significant. The mean (SD) platelet count (10⁹/L) and serum bilirubin (mg/dl) level were observed to be higher in the younger age group, though this difference was not significant. The biochemical parameters are tabulated in **table 1**.

Table 1 Blood investigations by age group (n=23), values are mean (SD)

Blood investigations	12-20 (yrs) (n=6)	21-40 (yrs) (n=16)	41-60 (yrs) (n=1)	P value
Hemoglobin (g/dl)	6.75 (2.3)	7.93 (1.32)	7.8	0.1
RBC count (1000/μL) (basal state)	2.71 (0.39)	3.62 (0.66)	3.24	0.005 *
White cell count (10 ⁹ /L)	13.9 (16.5)	12.8 (68.9)	11.5	0.7
Platelets x10 ⁹ /L	223.33 (201.44)	186.87 (122.71)	153.24	0.6
Total bilirubin (mg/dl)	3.54 (0.49)	2.88 (2.38)	2.65	0.5
Serum creatinine (mg/dl)	0.6 (0.32)	0.8 (0.2)	1.1	0.07

*Statistically significant differences exist for these variables, P value < 0.05 significant

Arterial Blood Gas (ABG) analysis: Room air arterial sampling showed hypoxemia ($PO_2 < 60$ mmHg) in 15 out of the 23 episodes (65.2%) while remaining 8(34.8%) episodes had normal O_2 tension as shown in **figure 5**. Mild hypoxia was seen in 4 patients (17.4%) of the younger age group (12 to 20 years) and the mean PO_2 level was $72.4 (\pm 2.4)$ while 6(26.1%) patients in the older age group (21 to 40 years) had moderate hypoxemia. Their mean PO_2 (\pm SD) was $64.2 (\pm 3.2)$ mm Hg. 2(8.7%) patients had severe hypoxemia with mean PO_2 (\pm SD) being $54.3 (\pm 4.4)$ mm Hg while 2(8.7%) patients had extreme hypoxemia. The mean PO_2 (\pm SD) was $48.2 (\pm 2.4)$ mm Hg. No clinical finding was predictive of the severity of hypoxia.

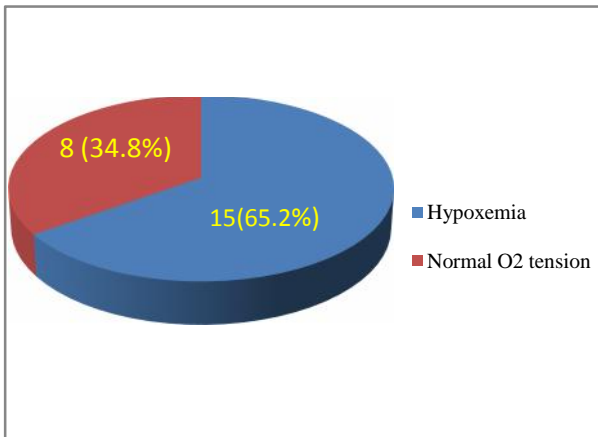


Figure 5 Hypoxemia in ACS patients (15/23 events)

Chest radiographs: Radiological involvement was seen in all cases either on admission or after admission (**figures 5a-5d**). The most common pattern of involvement observed was infiltrates in the right lower zone in 15(65.2%) patients followed by bilateral lower zones in 4(17.4%) patients. Involvement of both mid and lower zones bilaterally was seen in 1(4.4%) patient while involvement of all the three zones bilaterally was seen in 3(13.04%) patients who had severe hypoxemia. 5(21.7%) patients had mild pleural effusion which had resolved by 2 weeks at follow-up in the OPD. 1(4.4%) patient had pericardial effusion of about 100 ml which too did not therapeutic tapping and resolved on its own within 3 weeks.



Figure 5a – Chest radiograph of a SCD patient with ACS showing infiltrates in the right mid zone.



Figure 5b – Chest radiograph of a SCD patient with ACS who expired showing infiltrates in all the zones and pleural effusion on the left.

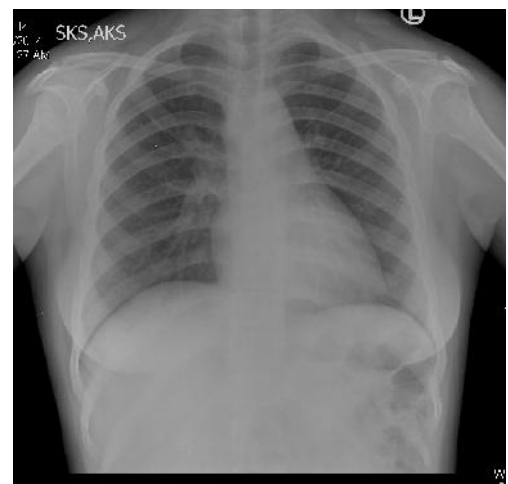


Figure 5c and 5d - Chest radiograph of a SCD patient with ACS who had pericardial effusion with chest infiltrations and subsequently improved with treatment.

ECG changes: They were observed during 8(34.8%) events, 2(8.7%) in the younger group and 6(26.1%) in the older age group. ECG changes seen were sinus tachycardia, T inversion in leads III and aVF and ST depression with T inversion in V_1 to V_3 .

Echocardiography done in these patients revealed dilated pulmonary artery with increased blood flow in 5(21.7%) patients, mild to moderate TR in 4(17.4%) patients, mild pulmonary hypertension (PASP 35 to 40 mm Hg) in 3(13.04%) patients, moderate pulmonary hypertension (PASP 46 mmHg) in 2(13.07%) patients who expired, mild MR in 4(17.4%) patients and mild pericardial effusion (which later settled on its own) in 1(4.3%) patient. In all the patients, except those who died, repeat echocardiography done 1 week at follow-up from OPD showed normal PASP.

Treatment: All the patients received bronchodilators and antibiotics though their blood cultures were sterile and they became afebrile within 48 to 72 hours (average 56.4 hours) of receiving antibiotics. All patients received simple blood transfusion. The mean number of units per patient was 3.1. Maximum units transfused to a patient were 5. 10 patients (43.4%) received narcotic analgesia (fentanyl infusion) for pain. 3 patients (13.04%) required mechanical ventilation while those with moderate hypoxemia required 6 to 8 liters of O₂ for about 18 to 24 hours.

Hospital course: The average length of stay (LOS) was 9.53 days (range 6–20 days) with 50% of patients staying more than a week. Female patients on average were hospitalized longer than their male counterparts (mean LOS male 7.97(SD ± 5.25) days and female LOS 11.1 days (SD ± 2.53)). Two patients died giving an in-hospital mortality rate of 8.7%. Average time to the development of ACS after hospitalization was 1.5 days. Mean duration of crisis was 7.2 days (SD ± 1.53). 3 of the 15 patients (13.04%) required invasive ventilation of which 2 patients (8.7%) died within 24 to 30 hours of ventilation while 1(4.3%) patient survived. He needed invasive ventilation for 34 hours. 91.3% of the ACS events were associated with complete recovery. Shortness of breath (P <0.02) and hypoxemia (P<0.001) were predictors of prolonged hospitalization.

DISCUSSION

The term acute chest syndrome was first suggested in 1979 by Charache *et al*⁵ and was coined to reflect the unique nature of acute pulmonary illness in patients with sickle cell disease. It is a common acute pulmonary complication of SCA and it has been identified as the most common cause of mortality in adult patients with SCA². In addition to elaboration of pro-inflammatory cytokines and up-regulation of cellular adhesion molecules, interplay among red cell sequestration, fat embolism and pulmonary infection, operate in a vicious cycle, leading to the final common pathway of in situ microvascular thrombosis and clinical features of ACS⁶. Despite an increased awareness that the acute chest syndrome is the leading cause of morbidity and mortality in patients with SCD, the diagnosis is often delayed and the cause is usually not determined. This retrospective study is a baseline study and throws light on the clinical features and the outcomes of the adult patients.

Data from the Clinical Course of Sickle Cell Disease Cooperative Study (CSSCD) showed an overall incidence of 10.5 per 100 patient-years of ACS^{7,8}. The incidence gradually declined with age to 8.8 per 100 patient-years in subjects older than 20 years. The decline in the incidence of ACS observed in

older age groups is believed to be related to fewer infective episodes in adults because of acquired immunity. We had only two patients of ACS with age > 30 years. The overall incidence in our study was 23.1 per 100 patient-years.

This study showed predilection of ACS for female patients. In a retrospective cohort study during a five year period by C Taylor *et al* of 63 cases of ACS involving 45 patients, 62% of the cases were female and 38% were male³. However, recent data from the Clinical Course of Sickle Cell Disease Cooperative Study which included patients from birth till 66 years, indicate that this complication occurs more commonly in males⁸. A study of ACS in children from Southern Province of Saudi Arabia by Hassan A *et al* also showed slight preponderance of male i.e. 54% compared to 46% in females⁹. Though sickle cell trait is traditionally described as a benign condition, there were 4 cases (17.4%) patients who developed ACS. They, however, had milder form of ACS.

Social habits like cigarette smoking and environmental factors like seasonal changes were thought of as contributing factors in the development of ACS. Seasonal variation in the incidence of ACS was also noted in our study as in other studies with peak number of events (12 events – 52.7%) in November and December and lower rate in summer⁸. This was most likely related to increased viral infection during the winter months. This variation is most pronounced in children. Our study, however, did not include children < 12 years. In Northern Nigeria, Ahmad *et al* in a 2-year prospective study (2005–2007) on seasonal variation of vaso-occlusive crisis in patients with SCD, demonstrated that the incidence of ACS was particularly high in 4 consecutive months of October through January¹⁰. Young and colleagues demonstrated a strong relationship between cigarette smoking and the frequency of ACS¹¹. As none of the patients in our study group were smokers, this relationship could not be demonstrated.

An infectious aetiology of ACS was emphasized in early studies. Infection is commonly associated with ACS in the paediatric population but does not play a major role in adults. A prospective report from the National Acute Chest Syndrome Study Group (NACSSG) that evaluated 671 episodes of ACS in 538 patients identified an infectious aetiology 29% of all ACS episodes¹². Infectious agents associated with ACS in children 9 years of age or younger were viruses (11% of all episodes), Mycoplasma (9%), Chlamydia (9%), and bacteria (4%)¹². In another study by Dean D and Neumayr L *et al*, of 296 patients with ACS a single infectious agent was identified in 30% of patients¹². In these patients, the most common cause of infection was Chlamydia (30%) followed by Mycoplasma (21%), respiratory syncytial virus (10%), Staphylococcus aureus (4%), and Streptococcus pneumoniae (3%). In the Clinical Course of Sickle Cell Disease Cooperative Study (CSSCD), 249 pathogens were identified in 216 episodes, a single infectious pathogen was identified in 172 episodes, multiple pathogens were identified in 25 episodes, and fat embolism was diagnosed together with an infectious agent in 19 episodes⁸. The National ACS Study Group identified fat emboli syndrome in 16% of ACS cases in adults and children based on positive lipid accumulations in alveolar macrophages obtained by bronchoscopy¹². In our study, infectious aetiology

could be established only in 2 patients (8.6%) who had E.coli related UTI and infectious gastroenteritis. Blood cultures and were sterile in all those cases (18) which were sent. This was probably as most of our patients were already on antibiotics. Similarly sputum cultures samples did not reveal any growth or were contaminated or were uninterpretable because of contamination with epithelial cells from the oropharynx or an inflammatory exudate. Bronchoscopy was not done in any of our patients. Thus it was not possible to ascertain which mechanism (pathologically) was responsible for the cases of ACS encountered.

The clinical characteristics of ACS in both children and adults have been more clearly defined by two large longitudinal studies in African Americans studies. The Cooperative Study for Sickle Cell Disease (CSSCD) analyzed 1722 episodes of ACS in 939 patients⁸ and the National Acute Chest Syndrome Study Group (NACSSG) reported the findings in 671 cases of ACS in 538 patients¹². The most frequent presenting symptoms were fever, cough, chest pain, shortness of breath, wheezing, and hemoptysis. Fever and cough were most frequent in young children (aged 2–4 yr). Chest pain, shortness of breath, productive cough, and hemoptysis increased in frequency with advancing age. In our study, the patients in the younger age group had less symptoms than those in the older age group. Fever (21.7%) and shortness of breath (21.7%) were the most common symptoms seen in the age group 12 to 20 years while shortness of breath (69.2%), chest pain (56.5%) followed by fever (52.1%) were seen in the elderly age group 21 to 40 years. Tachypnoea and wheezing were the common physical findings in both the age groups. Polyarthralgias were more common in the older age group. Presenting symptoms during a patient's first episode of ACS were predictive of symptoms during subsequent events. Hence, knowledge of previous symptomatology should allow for earlier diagnosis and intervention in subsequent episodes. No neurological events were seen in our series though neurologic events occurred in 11% of patients in the National Acute Chest Syndrome Study Group¹².

The CSSCD group found that the second most common examination finding was a normal examination, representing 35% of cases⁸. In contrast, *Agtmael et al* in an analysis of 81 episodes in 53 Afro-Caribbean patients documented abnormal examinations in at least 91%¹³. In the series by *C Taylor et al*, 36.7% of the patients had a normal examination, the commonest finding³. However, in our study a normal chest examination was found in 4.3% and 8.7% of the cases respectively in both the age groups. Thus, clinical examination may be the most misleading aspect of assessment of this syndrome.

The common radiological finding in our study was the involvement of the right lower zone followed by bilateral lower zones as in CSSCD study where adults had lower or multilobe disease and children <12 years had predominantly upper lobe involvement associated with bacteremia⁸. ACS in elderly age group (21 to 40 years) was characterized by severe polyarthralgia (10 patients) and lower or multilobe involvement radiologically thus implying vascular occlusion or bone

infarction as a cause of ACS and is compatible with the clinical picture reported in the study by Bellet¹⁴. The chest radiograph, however, may underestimate the degree of pulmonary involvement, as has been shown by simultaneous high-resolution CT scan (HRCT) or perfusion scintigraphy. HRCT thorax was done in 1 of our patients (4.3%) who had normal chest radiograph as his chest auscultation revealed persistent crepitations in the both the infrascapular regions. It showed areas of ground-glass attenuation in areas both involved and uninvolved on plain radiograph. Pleural effusion was seen in the older age group (21 to 40 years), but was not associated with infectious etiology.

Electrocardiogram showed right ventricular strain pattern in 8 patients (34.8%) and further echocardiography in these patients showed mild to moderate pulmonary hypertension. Two of the patients with moderate pulmonary hypertension expired. In the rest who survived, it reversed after the acute phase was over. In one study by *Mekontso et al*, 60% of severe ACS episodes were associated with pulmonary hypertension, suggesting that severe ACS may induce or worsen pulmonary pressure elevation¹⁵. Gladwin and colleagues established that mild steady state pulmonary hypertension was a major independent risk factor for death in adults with SCD¹⁶. The mechanism of pulmonary hypertension in ACS is still unclear. It is perhaps related to the pulmonary vasculopathy, chronic anemia with a high cardiac output and increased pulmonary blood flow, coupled with intravascular hemolysis, which dysregulates nitric oxide (NO) signalling, increases reactive oxygen species (ROS) generation, and activates the coagulation system, in large part mediated by the pathological effects of cell-free plasma haemoglobin¹⁷.

Vichinsky et al in the NACSSG found the mean partial pressure of arterial oxygen (PaO₂) while the patients were breathing room air as 63 mm Hg before transfusion, and it increased to a mean 71 mm Hg after transfusion (P<0.001) and increase in oxygen saturation from 91% to 94 % (P<0.001)¹². In our study also we observed improvement in the PaO₂ after simple blood transfusion and improvement in the symptoms especially body pains. However, patients with severe hypoxemia did not any improvement with simple transfusion.

In the Cooperative Study of Sickle Cell Disease (CSSCD), the mortality in patients with ACS was 1.1% in children and 4.3% in adults⁸. The overall death rate in this study was 8.7%. This was probably overestimation of the mortality due to small number of cases. Both the patients were males (average age was 23.4 years) and had sickle cell disease with > 60% sickled cells in the peripheral smear. They were extremely hypoxemic on admission. Both had severe diffuse chest pain, ECG changes suggestive of right ventricular strain pattern and multilobar involvement in chest radiograph. Clinical deterioration and death occurred very rapidly (within 24 to 30 hours of admission) despite patients being managed in critical care unit from the time of admission. The cause of death was probably pulmonary thromboembolism or pulmonary infarction in view of the severe chest pain and ECG changes and echocardiographic evidence of right ventricular overload.

Culture of the secretions obtained by tracheobronchial suction and blood culture were sterile.

To conclude, ACS frequently complicates unrelated hospital admissions (pain crisis in our case and it was seen in 78.3% of the patients). It may be precipitated by an underlying infection but often these factors may be absent. Symptoms are often similar to infective process like pneumonia. Severe bone pain and chest pain when associated with respiratory symptoms suggest fat embolism and imminent ACS. Tachycardia and tachypnoea were the common clinical signs in all age groups. Severity of symptoms was not predictive of the degree of hypoxemia. Chest radiograph is mandatory in all patients with acute respiratory symptoms, including the patients who are apyrexial and have normal chest examination. Physical examination findings on presentation of ACS were often an unreliable indicator of the presence of disease and clinically there were no predictors of which patients would succumb. This reinforces the need for frequent monitoring of all ACS patients. It should be actively sought out so that early management is instituted and morbidity and mortality can be limited. This is the first study in Tata Main Hospital to record the experience of ACS in adults with SCD and hence can be used as a baseline study. Nevertheless, further studies of such condition are required to clearly understand this important complication of SCD.

Drawbacks of the study

1. Number of cases was small.
2. Capillary haemoglobin electrophoresis could not be done in all patients and hence percent of Hb F could not be estimated for all patients.
3. Presence of some interobserver variation with respect to the presence or absence of critical clinical signs.

Compliance with the ethical standards

“For this type of study (retrospective), formal consent is not required”

References

1. Platt OS, Brambilla DJ, Rosse WF, Milner PF, Castro O, Steinberg MH, Klug PP. Mortality in sickle cell disease: life expectancy and risk factors for early death. *N Engl J Med* 1994; 330:1639–44.
2. Gray A, Anionwu EN, Davies SC, Brozovic M. Patterns of mortality in sickle cell disease in the United Kingdom. *J Clin Pathol* 1991; 44:459–63.

3. Taylor C, Carter F, Poulouse J, Rolle S, Babu S, Crichlow S. Clinical presentation of acute chest syndrome in sickle cell disease. *Postgrad Med J* 2004; 80:346–49.
4. Powars D, Weidman JA, Odom-Maryon T, Niland JC, Johnson C. Sickle cell chronic lung disease: prior morbidity and the risk of pulmonary failure. *Medicine* 1988; 67:66–76.
5. Charache S, Scott JC, Charache P: “Acute chest syndrome” in adults with sickle cell anemia. *Arch Intern Med* 1979;139:67
6. Paul RN, Castro OL, Aggarwal A, Oneal PA. Acute chest syndrome: Sickle cell disease. *Eur J Haematol* 2011; 87:191-207.
7. Castro O, Brambilla DJ, Thorington B, Reindorf CA, Scott RB, Gillette P, *et al.* The acute chest syndrome in sickle cell disease: incidence and risk factors. *Blood* 1994; 84:643–9.
8. Vichinsky EP, Styles LA, Colangelo LH, *et al.* Acute chest syndrome in sickle cell disease: Clinical presentation and course. *Cooperative Study of Sickle Cell Disease. Blood* 1997; 89:1787–92.
9. Al-Dabbous IA. Acute chest syndrome in sickle cell disease children in Saudi Arab children in Eastern Province. *Curr Pediatr Res* 2005; 9 (1 & 2): 23-6.
10. Ahmed SG, Kagu MB, Abjah UA, Bukar AA. Seasonal variations in frequencies of acute vaso-occlusive morbidities among sickle cell anaemia patients in Northern Nigeria. *J Blood Disord Transfus* 2012; 3:120.
11. Young RC Jr, Rachal RE, Hackney RL Jr, Uy CG, Scott RB. Smoking is a factor in causing acute chest syndrome in sickle cell anemia. *J Natl Med Assoc* 1992; 84:267–71.
12. Vichinsky EP, Neumayr LD, Earles AN, *et al.* National Acute Chest Syndrome Study Group. Causes and outcomes of the acute chest syndrome in sickle cell disease. *N Engl J Med* 2000; 342:1855–65.
13. Agtmael MA, Cheng JD, Nossent HC. Acute chest syndrome in Afro-Caribbean patients with sickle cell disease. *Arch Intern Med* 1994; 154:557–61.
14. Bellet PS, Kalinyak KA, Shukla R, Gelfand MJ, Rucknagel DL: Incentive spirometry to prevent acute pulmonary complications in sickle cell diseases. *N Engl J Med* 333:699, 1995
15. Gladwin MT, Sachdev V, Jison ML, *et al.* Pulmonary hypertension as a risk factor for death in patients with sickle cell disease. *N Engl J Med* 2004; 350:886–95.
16. Yusuf BJ, Abba AA, Tasiu M. Acute chest syndrome. *Sub-Saharan Afr J Med* 2014; 1:111-8.
17. Mekontso Dessap A, Leon R, Habibi A, *et al.* Pulmonary Hypertension and Cor pulmonale during severe Acute Chest Syndrome in Sickle Cell Disease. *Am J Respir Crit Care Med* 2008; 177:646–53.

How to cite this article:

Sangita Kamath., Neeraj Jain and B S Rao. 2016, Acute Chest Syndrome In Sickle Cell Disease – The Pain Malady (1 Year Tmh) Experience. *Int J Recent Sci Res.* 7(2), pp. 8940-8946.

T.SSN 0976-3031



9 770976 303009 >