PAEDIATRIC SOCIETY OF GHANA AGSM 2020 ACCRA, FIESTA ROYAL HOTEL

6-7TH FEBRUARY 2020

CONFERENCE THEME:

BUILDING PARTNERSHIPS TO ACHIEVE SDG 3

PRE-CONFERENCE

WHAT YOU'VE ALWAYS WANTED TO KNOW ABOUT SICKLE CELL DISEASE

TOPIC: ACUTE CHEST SYNDROME

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OUTLINE

- History and Epidermiology of SCDx
- Definition (What is ACS..old, new, adapted)
- How common is ACS- prevalence
- Risk factors/ who gets ACS
- What happens in ACS- aetiopathogenesis
- Clinical features
- Labs and CXR findings--- Hb, Plts, WBC
- How do you prevent ACS-educ, HU, Pen
- Take home

History of SCD

- F. Konotey-Ahulu - dx of antiquity
- J.B. Herrick – peculiar elongated and sickle shaped cells (1910)
- Pauling- separated Hb S from Hb A (1949)
- Itano and Neel- discovered Hb C (1950)
- Edington and Lehmann - Hb C highest in Northern Ghana (1956)
- According to Allison - Hb C occurrence is 6% in Ghana

Traditional names of SCDx in Ghana

- *Chwechweechwe* among the Gas
- *Ahotutuo* among the Ashantis
- *Dobakotiri* in Dagbani
- *Nwiiwii* in Fante
- *Nuidudui* in Ewe
- *Hemkɔm* in Krobo
- *Paa* in Kassena-Nankani

Introduction

- It is the most common genetic condition
- Sickle cell disease (SCD) is an inherited structural haemoglobinopathy
- Four mutations may have arisen on different occasions in Africa and another one in Saudi Arabia or India
- These mutations alter the physiological properties

Haplotypes

- These haplotypes present differently in the frequency and severity of acute events in SCD.
- Bantu, Cameroon, Benin, Senegalese and Saudi-Indian haplotypes
- Among the African haplotypes, the Bantu haplotype have the worst clinical course.
- The Senegal haplotype follows a milder course whilst the Benin type has an intermediate severity

Prevalence

- About 300 000 babies are estimated to be born with severe forms of sickle cell disease in the world yearly e.g. in 2010 alone 305000 new cases

- Global estimates of birth prevalence is 112/100000 live births.
- Europe : 43.12/100000 live births
- Africa : 1125/100000 live births.

- 200,000 are born in sub-Saharan Africa
- Most West African nations have a trait or carrier state as high as 20% and even reaches up to 40% in parts of Nigeria
- Newborn screening in Nigeria by Odunvbun et al involving 644 babies revealed the prevalence of SCD to be 3.0%.
- Trait rate is 20-30% in parts of Ghana

- At Techiman Holy Family Hospital (2018 publication), 383 people were screened using a RDT for SCDx HemotypeSC.
- SS 2 (0.5%)
- SC 9 (2.3%)
- CC 4 (1.0%)
- AS 39 (10.1%)
- AC 55 (14.3%)
- AA 274 (71.8%)

- In Ghana, Ohene-Frimpong et al got an incidence of 1.9 % in Kumasi after screening 202,244 babies
- NBS in the USA 0.1%
- NBS is not yet the case in most countries in sub-Saharan Africa which bears the brunt of the SCD
- Here come GHS-NORVATIS PARTNERSHIP
- However we diagnose when symptoms begin

2015 out of 100 SCDx on admssion

- SS 69
- SC 27
- SF 3
- SD 1

ACS

- Acute chest syndrome (ACS), first described by Charache et al in 1979

- The aetiology and pathophysiology of ACS is complex and still poorly understood.

- This term reflects the unique nature and the acuteness of the illness and the difficulty with establishing its pathogenesis

- Lowenthal et al in 1995, and also Paul et al in 2011, in review articles on ACS in SCD, re-defined ACS as:

"**new pulmonary infiltrates detected by chest radiography accompanied by fever, respiratory symptoms, or chest pain in a sickle cell disease patient**" ***

- In a study in Zambia of mortality among 62 children with SCD, ACS was not mentioned
- ACS is often not diagnosed or it is misdiagnosed as pneumonia or bronchopneumonia

Incidence

- Ibidabo 6.0%
- Al-Ghazaly 6.6%
- Al-Dabbous 7.7%
- Adegoke 11.3%
- Brown ** 13.8%
- Wierenga 21.8%
- **********Ghana (Parbie –25.0%) ??????

Risk factors

- Age
- Sex
- Genotype
- Haplotype
- Hb level*

WBC level
Hb F levels
Previous hx of ACS
Winter months
Reactive airway dx

Aetiology

- Complex and multi-factorial pathogenesis
- Specific cause is usually not identified

- Vichinsky et al – fat embolism and infectious agents

- Paul et al – Viruses 11%, Mycoplasma 9%, Chlamydia 9%, other bacteria 4%

- Dean et al- Chlamydia (30%), Mycoplasma (21%), RSV (10%), Staph. aureus (4%), and Streptococcus pneumoniae (3%)

- Poncz et al - found (64%) of ACS were of undetermined origin and the remaining 36% consisted of

- Bacterial pneumonia (12.0%)
- Uncomplicated viral pneumonia (8.0%)
- Mycoplasma pneumonia (16.0%)

Pathophysiology

- Pulmonary findings in ACS
- Hypoxia increases the ability of sickle red blood cells to adhere to vascular endothelium via an interaction with very late activation antigen-4 (VLA-4), which is usually expressed on sickle reticulocytes and cytokine-induced pulmonary endothelial cell vascular cell adhesion molecule-1 (VCAM-1) which is observed to be up-regulated in hypoxic conditions

- Diagnosing ACS involves recognizing significant symptoms from the history, a good clinical examination, imaging and laboratory studies.

- Morris- 61% cases not suspected by Drs before x-ray.

- Taylor and Vozenilek- most cases had normal chest finding on clinical examination

- Vital signs in ACS: higher temp, RR, pulse rate and hypoxaemia.

- From the CSSCD and NACSSG studies, the most common symptoms on presentation in ACS are fever, cough, bone pain, and chest pain

- Sprinkle- found fever in 68% on presentation then 31% developed it later

Respiratory signs

- Al-Trabolsi noted tachypnoea (86%), chest retractions (64%) and decreased breath sounds (57%) and 11% had normal chest examinations

Our own story

- ACS AMONG CHILDREN WITH SCDx AT KBTH IN 2015

Occurrence of ACS

- Based on the definition of ACS, 25 out of the 100 cases were determined to have ACS.
- Majority (56.0%) were between 4- <8 yr group.
- Of the 25 cases, 15(60.0%) were males. P=0.7
- Previous Hx of ACS was significant for ACS vrs Non ACS p=0.04

- While the occurrences of some features such as bone pain, abdominal pain, vomiting and cola-coloured urine is similar in both the ACS and non ACS cases, this is not the case for respiratory symptoms and signs.

- This implies that these signs do not only define the presence of ACS but must be actively looked for and well documented to ensure prompt and appropriate intervention.

- There are no significant differences with features such as hepatomegaly, jaundice, gnathopathy, frontal bossing splenomegaly, and dactylitis.($p>0.05$), except for pallor ($p=0.01$).

- High respiratory rate, high temperature and low oxygen saturation levels are more associated with ACS compared with the non ACS cases

- Ninety-two (92.0%) of ACS had fever in my study

- This is similar to the percentages of children in the CSSCD (90.0 %) and NACSSG (86.0%) who presented with fever.

- Thus fever is a pointer to ACS diagnosis and therefore clinicians need to be aware and have a high index of suspicion.

- ACS is an acute life threatening event associated with unfavourable haematological parameters.

- Haematological parameters have been used to define the severity of SCD for many years.

- In this study we found haemoglobin levels were significantly lower and the WBC significantly higher for children with ACS than those without ACS

- The mean haemoglobin level of 6.9g/dl, compares with but is lower than the 7.8g/dl noticed by Al-Dabbous and Buchanan et al who also found Hb to be 7.7g/dl.

- Al-Dabbous et al and Buchanan et al also found the mean WBC to be higher at 17.8 x10^9/l and 19.1 x 10^9/l respectively but much lower than the 26.2 x 10^9/l found in this study

- Thus the unfavourable haematological indices which are known universally to be associated with ACS seem to be exaggerated in the ACS cases in our environment.

- Reason ????

- Haemotransfusion : advocated for treatment of ACS. (44.0% of ACS)

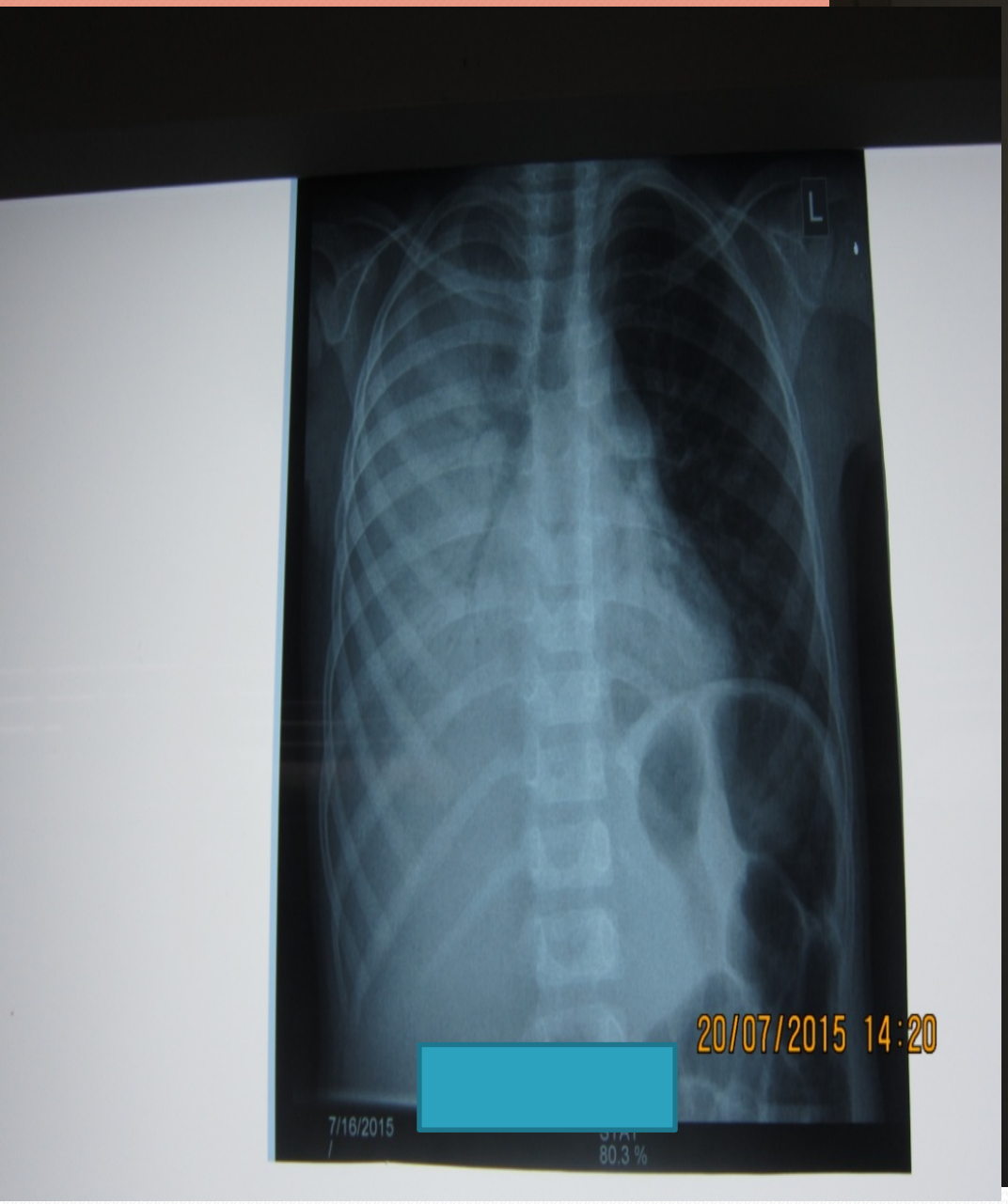
- Mallouh & Asha and Vichinsky et al showed that transfused patients recovered more quickly, however, in this study transfused cases stayed longer on admission.

- Reason **DCH 48 hours protocol.

- 56.0% were managed conservatively, suggesting that blood transfusion is not mandatory in all cases of ACS.

- Each case needs to be judged on its own merits, Horan et al supports this assertion.

- Sprinkle – pulmonary infiltrates in lower lobes 86%, upper 25% and middle 22%.
- Trabolsi- bilateral infiltrates
- Al-Dabbous – right lower lobes infiltrates were common.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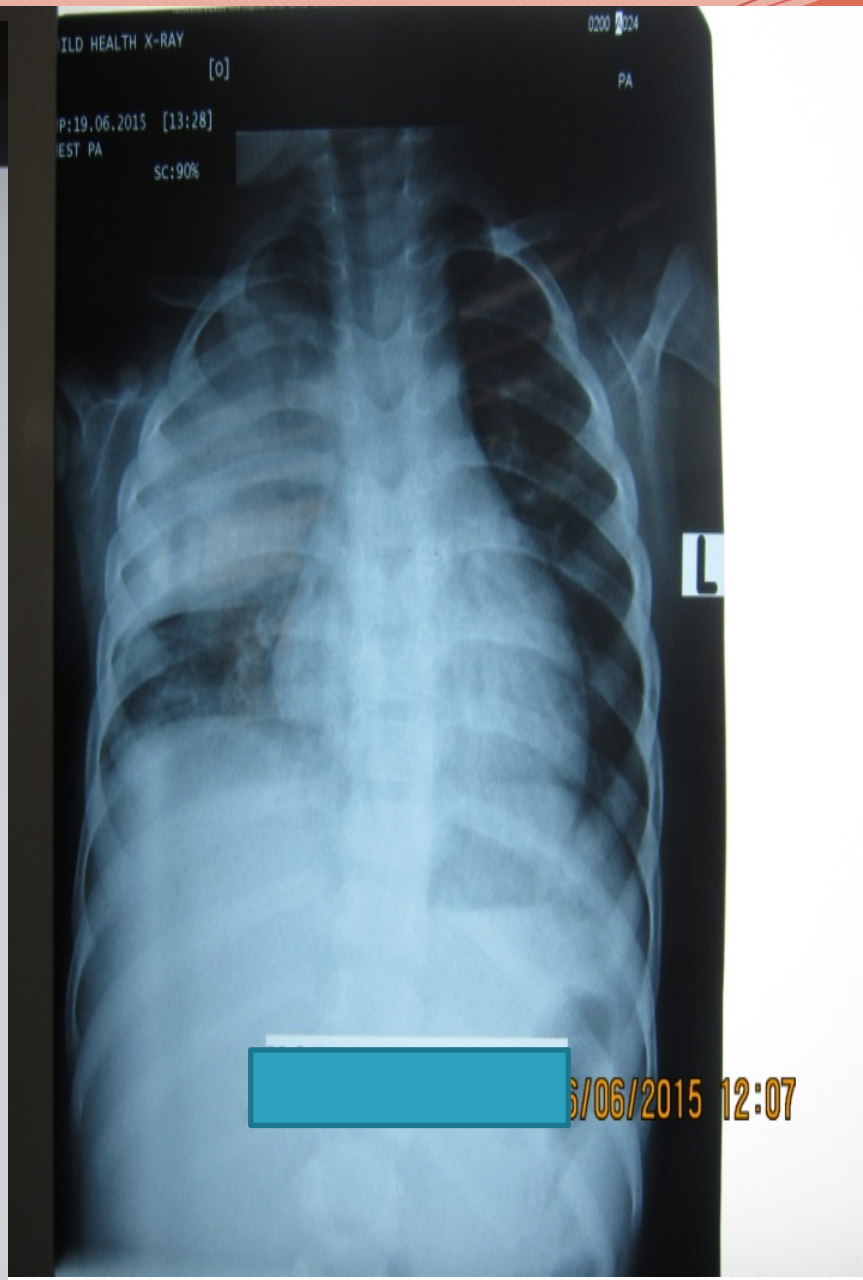
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- Lung infiltrates: necessary for diagnosis of ACS
- Davis et al and Charache et al, found more infiltrates in the right lungs (Parbie 84.0%).
- Even in the right lung, the lower lobes were more involved***
- Bilateral or multiple lung involvement associated with poorer prognosis.
- Some cases with fever and respiratory signs had no infiltrates on their CXR.

- This supports the assertion my Miller that radiologic changes lag behind clinical findings and thus recommends starting treatment on suspicion of ACS.

- Implication is that more cases can be picked if a more sensitive tools are used. (CT scan and perfusion scintigraphy)

According to Johnson the mainstay of successful ACS treatment should include:

- High quality multidisciplinary supportive care involving pulmonary, infectious disease and intensive care specialists.
- Intermittent incentive spirometry/Ventilation
- Preventive therapy- hydroxyurea, transfusions
- Fluid management Oxygen therapy
- Chest physiotherapy Bronchodilators
- Blood transfusion Antibiotics/Analgesics

Outcome

- Death in ACS is usually sudden and unexpected, and also usually occurs within 24 hours after presentation and is mostly due to acute events
- Length of stay averages 10 days *
- Mortality is about 1.1% from CSSCD,
- According to Gray et al and Platt et al it could be up to 25%.
- Causes of mortality - embolism, haemorrhage, hypovolaemic shock, sepsis and seizures.

- No death was recorded among all 100 study subjects
- All ACS cases were diagnosed within 3 days of admission- 44.0% Day 1, and 36.0% on Day 2
- One case had anterior chest wall abscess
- Another case required multiple transfusions o/a worsening hypoxaemia
- Three cases had persistently high grade temperatures lasting for more than 7 days

- The Duration of Admission for all cases ranged from 2 to 33 days and mean (SD) of 5.9 (4.3) days
- For ACS : Mean Duration = 9.5 days (Non ACS 4.5 days)

Prevention of ACS

OPPORTUNITY TO IDENTIFY CASES

- NEW BORN SCREENING
- PRE-SCHOOL MEDICAL EXAMINATION FORMS
- SCHOOL MEDICAL EXAMS
- PRE-EMPLOYMENT MEDICAL EXAMS
- ~~PRE-MARITAL MEDICAL EXAMS~~
- HOSPITAL VISITS
- GENERAL POPULATION SCREENING
- ACTIVE CASE FINDING
- HEALTH EDUCATION
- HEALTH TALKS IN ALL SHS

Penicillin prophylaxis

- About 50 years ago 15% of SCDx patients died by 2 years of age
- Most died from bacterial infections
- Penicillin prophylaxis was started (84% lower infection rate)
- New born screening started
- Reduced mortality from 8% to 1.8%

- Non-invasive transcranial doppler USG to identify cases at risk

- Periodic blood transfusion reduced the risk.
- Hydroxyurea (HU) – increases Fetal Hb

- HU frequency of severe pain episodes, transfusions, hospitalizations

- Parental and patient education
- Immunizations
- Micronutrients supplementation
- Fluid therapy
- Chronic blood transfusion
- Chelation therapy

have all contributed to increased survival

Other areas that need further attention

- strengthening public education
- surveillance and monitoring of disease occurrence and health outcomes
- enhancing adherence to health maintenance guidelines
- increasing knowledge and awareness among those affected

- Incidence may be high among our SCD patients
- With the high burden of SCD in Ghana and this high incidence of ACS it is expected to put pressure on blood transfusion services.
- Lets all be ambassadors of ACS in our facilities to safe SCD patients

Thank you

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- Comments
- Questions
- Contributions