ANAEMIA IN CHILDREN IN KIMBE

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INTRODUCTION

- Anaemia - main widespread nutritional disorder
- WHO defined anaemia – Hb <11g/dL (6 months to 5 years), <11.5g/dL (5 to 11 years). Severe anaemia – Hb <7g/dL
- Prevalence of anaemia < 5 year olds in PNG was 48.4% in 2016, highest over past 26 years was 56.3% in 1990, lowest 47.9% in 2011
  (WHO global health observatory data repository)
- Highest prevalence exist in the developing world – multifactorial causes

INTRODUCTION

- Severe anaemia is multifactorial in PNG
  (Manning, Laman. Madang 2012)
- Childhood anaemia – short term and long term consequences
- Impairs physical growth, cognitive/ motor development, cause social and emotional delays, affect school performance
- Consequences of anaemia may be irreversible even if corrected in later childhood

AIM

- To determine the common causes, risk factors and outcomes for anaemia in children

OBJECTIVES

- To determine whether malaria is a common cause of anaemia
- To determine whether iron deficiency is a common cause of anaemia
- To determine whether chronic illness is the common cause of anaemia
- To document the outcomes of children with anaemia when managed according to Standard Treatment

METHODOLOGY

1. **STUDY SITE**
   - Kimbe Provincial Hospital
     - Children's Out Patient Department
     - Paediatric Consultation Clinic
     - Paediatric Ward

2. **STUDY TYPE AND DURATION**
   - Prospective longitudinal study from June to December 2016

METHODOLOGY

3. INCLUSION CRITERIA

- Age between 6 months and 12 years
- No history of trauma
- Children with haemoglobin ≤10 g/dL
- Informed signed consent by caregiver

METHODOLOGY

4. RECRUITMENT PROCESS

- First contact & pre-screening
  - Regular health visit
  - Children with Hb 10g/dL or less identified for recruitment

- Enrolment and first visit
  - Objectives and procedure of study explained to care givers
  - Written consent signed

METHODOLOGY

- **STANDARDIZED ENROLMENT FORM**
  - Interview and record
    - Demographic information
    - Parents/ guardian's socio economical background
    - Nutritional history
    - History of malaria over last 2 weeks
    - History of any current or previous illness
    - History of anaemia or blood transfusion
  - Anthopometric measurements
  - Clinical assessment on the symptoms of anaemia
  - Laboratory investigations
    - FBE /RDT and BS/ UEC/LFT/Widals/ Stool –OCP/ Urine –MCS/ HIV
  - Radiography if clinically indicated - Chest X-ray

METHODOLOGY

- Standard Treatment
  - Albendazole, Iron tablets
  - Blood transfusion – if required as per protocol
  - Other treatment as per standard treatment guidelines
  - Dietary advice

- Follow up visits
  - Assess overall response to treatment
    - Symptoms
    - Clinical assessment
  - Hb at 5 months follow-up

METHODOLOGY

5. **ANALYSIS OF DATA**
   - Microsoft Excel
   - SPSS version 20
   - STATA V14

6. **ETHICAL CLEARANCE**
   - Kimbe Provincial Hospital Administration

RESULTS

- 214 children with anaemia enrolled in the study.
- 130 (60.7%) were male.
- Median age 48 months (IQR 22-84 months).
- Median weight 13 (9 to 20) kg
- 14 children had a history of chronic illness, including pulmonary tuberculosis (6 cases previously diagnosed), HIV, hypothyroidism and cerebral palsy (1 each).
- All children had conjunctival or palmar pallor, 47 had splenomegaly, 54 had lymphadenopathy

RESULTS: The role of malaria

- 93 reported by parents or caregivers to have had malaria in the previous 2 weeks.

- Rapid diagnostic tests for malaria in 213 children
  - 133 negative (62%)
  - 33 positive for plasmodium falciparum (15%)
  - 43 mixed (20%)
  - 4 plasmodium vivax (2%)

RESULTS:
Haematological parameters at baseline

- Hb: 6.72 (SD 2.27)
- Mean cell volume
  - Average mean cell volume 80.8 (SD 12.8): n=89.
  - Microcytic: 26 of 89 (29.2%) had an MCV< 75 fl)

- Red cell distribution width (upper limit of normal =15)
  - Median RDW 18.45 (SD 5.1)
  - 73% of children had an RDW >15
  - 40% had a RDW >20
  - 17 had both a high RDW and low MCV

- Platelet count median 221 (104 to 329)
- White cell count median 9.0 (6.2 to 13.5).

RESULTS

- 179 children followed up and had a repeat Hb five months after first presentation (IQR 4-6 months duration of follow up).
- The mean increase in Hb over the 5 months was 4.07 (SD 2.51) g/dL (difference between baseline and follow-up Hb $p<0.0001$).
- 61 children transfused during their acute illness. For these children the mean increase in Hb was 6.29 g/dL (95% CI 5.62-6.95).
- For the 118 children treated without transfusion who were followed up at a median of 5 months, the mean increase in Hb was 2.90 g/dL (95% CI 2.57-3.31, p<0001).

RESULTS:
Change in Hb over follow-up period

Population	Hb baseline	Hb at follow-up	p-value
All patients followed at 5 months (179)	6.72 (SD 2.27)	10.74 (SD 1.62)	<0.0001
Not transfused (118)	7.94 (SD 1.44)	10.83 (SD 1.1)	<0.0001
Transfused (61)	4.27 (SD 1.51)	10.56 (SD 2.32)	<0.0001

RESULTS

- 5 children died, 3 of whom had a transfusion.
- Median Hb of children who died was 5.68 (SD 1.76), not significantly lower than the overall population.
- The diagnoses of children who died were malignancies (AML and retinoblastoma), severe malaria, HIV and severe malnutrition and meningitis.

DISCUSSION

- Severe anaemia common in Kimbe
- 29% had evidence of iron deficiency (low MCV), and 19% had strong evidence of iron def (low MCV and high RDW)
- (22%) had hepatosplenomegaly likely due to malaria, or other infections.
- 37% of children have malaria parasitaemia, although may not be the sole cause of their anaemia.
- Plasmodium falciparum and mixed infection remains the significant cause of malaria.

DISCUSSION

- Cause of iron deficiency may be multi-factorial.
- The overall Hb for those transfused and those managed with dietary change and Fefol lead to a similar Hb at 5 months follow-up
- The outcome of anaemia is good if Standard Treatment is followed and co-morbidities identified and treated. The 2% of children that died had illnesses associated with poor prognosis.

LIMITATION

- Small sample size and limited time frame
- Hospital based study, which may not reflect Primary Health Facilities.
- All tests could not be done due to inconsistent availability of reagents
- Specialised tests were not available – e.g. G6PD, Hb electrophoresis, parvovirus, iron studies, bone marrow

CONCLUSION

- Cause of anaemia remains multi-factorial
- Iron deficiency remains a significant cause of anaemia in children in Kimbe
- Malaria remains a significant cause (P. falciparum and vivax)
- Chronic illness ('presumed' TB) was associated with anaemia, but aetiology of anaemia in these cases likely multifactorial

RECOMMENDATION

- Look at the MCV and RDW in every FBE
- Iron supplementation for children whose MCV and RDW suggest iron deficiency
- Adequate supply of malarial prophylaxis
- Strengthen malaria control programs
- Nutrition advice on introduction of complementary feeding at 6 months

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