

Relationship between anemia and biomarkers of inflammation in children

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Introduction

Micronutrient status...

- Can be affected by the acute phase response to inflammation and lead to misclassification of micronutrient status
- Examples:
 - **Vitamin A Status:** Elevated C-reactive protein (CRP) and α_1 -acid glycoprotein (AGP) associated with lowered serum retinol and retinol binding protein levels¹
 - **Iron status:** Elevated CRP and AGP associated with increased serum ferritin and plasma ferritin levels¹
- **How is hemoglobin (anemia status) affected by the acute phase response?**
- Prevalence of infection as well as micronutrient deficiencies are high in many developing countries, so it is important to determine how acute phase response influences measurements of nutritional status.

Objectives

Is there an association between anemia status and the acute phase protein biomarkers, C-reactive protein (CRP) and α_1 -acid glycoprotein (AGP), in children 6-59.9 months of age in Papua New Guinea (PNG)?

REFERENCES

1. Abraham K, Muller C, Gruters A, et al. Minimal inflammation, acute phase response and avoidance of misclassification of vitamin A and iron status in infants—importance of a high-sensitivity C-reactive protein (CRP) assay. *Int J Vitam Nutr Res* 2003;73:423-30.

The findings and conclusions in this poster are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention or of the other organizations involved.

Methods

Survey Design:

- 2005 PNG National Micronutrient Survey
- Stratified, probability proportional to size (PPS) cluster survey
- Stratification by 4 main regions of PNG
- N = 870 children 6-59.9 months of age
- Anemia defined as hemoglobin < 11g/dL (adjusted for altitude)
- Elevated CRP defined as CRP > 5mg/L
- Elevated AGP defined as AGP > 1.2mg/L



Data Analysis:

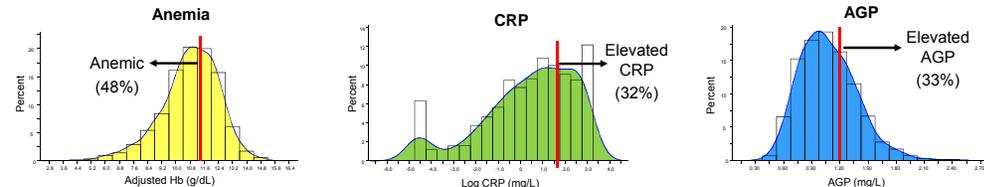
Logistic regression models were used to assess the following relationships:

1. Anemia status and elevated CRP status
2. Anemia status and elevated AGP status
3. Anemia status and any acute phase response (elevated CRP or AGP).
4. Anemia status and 4 categories of combined CRP and AGP status (representing 4 stages of infection)

- Analyses account for complex survey design
- Assessed for interaction ($p < 0.05$) and confounding by factors such as age, region, and low anthropometry

Results

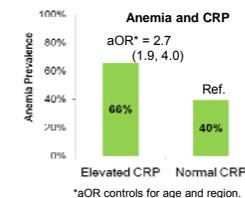
Overall prevalence (n=870):



- Children with elevated CRP/AGP tended to be younger, more stunted, and more underweight compared to children with normal levels of CRP/AGP.

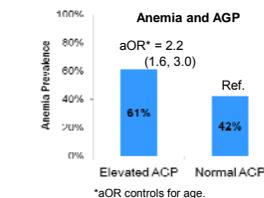
Anemia Status and CRP:

- Children with elevated CRP more likely to be anemic, controlling for age and region.



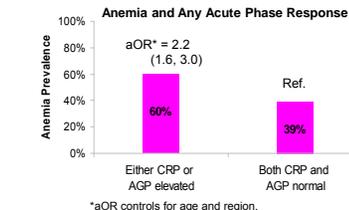
Anemia Status and AGP:

- Children with elevated AGP more likely to be anemic, controlling for age.



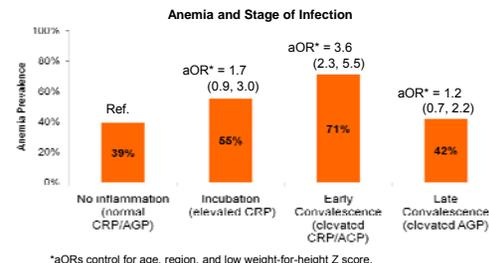
Anemia Status and any acute phase response:

- Children with elevated CRP or AGP more likely to be anemic, controlling for age and region.



Anemia Status and 4 Stages of Infection:

- Children in early convalescence stage (elevated CRP and AGP) more likely to be anemic than children with no inflammation, controlling for age, region, and low weight-for-height Z score.



Conclusions

- CRP and AGP are significantly associated with anemia in this survey which suggests CRP and/or AGP measurements be collected in nutrition surveys.
- Simulations of different prevalences of elevated CRP and AGP found a small effect on overall anemia prevalence. Presenting anemia prevalence overall, for those with elevated markers, and for those with normal markers of inflammation provides flexibility in interpreting results.