ANEMIA IN REMOTE INTERIOR COMMUNITIES
IN SARAWAK, MALAYSIA

DD Sagin¹, G Ismail², M Mohamad³, EKH Pang⁴ and OT Sya⁴

¹Faculty of Medicine and Health Sciences, ²Faculty of Resources Sciences and Technology, ³Center For Consultancy and Technology Transfer, Universiti Malaysia Sarawak, Kota Samarahan 94300; ⁴Central Medical Laboratory, Sarawak General Hospital, Kuching, Sarawak, Malaysia

Abstract. A cross-sectional survey of 365 individuals, (51.9% males, 48.1% females; ages 5-85 years), from five remote interior communities in upper Rejang River basin Sarawak, Malaysia, found 24.4% were anemic. The range and mean of Hb concentration in male and female were: 7.2-17.0 mg/ml and 13.7 mg/ml and 7.9-15.7 mg/ml and 12.9 mg/ml respectively. Amongst the five tribes surveyed, the prevalence of anemia (range: 10.6-46.7%), was higher among the Penans (46.7%), Kenyahs (31.1%), Kajangs (27.8%) and Kayans (19.3%), than amongst the Ukits (10.6%). Anemia is more common among males > 40 years and among adolescents and young reproductive females, as well as elderly females > 61 years old. Of the 83 anemic individuals, 6.0% and 3.6% had Trichuris trichiura or hookworm respectively; however there is no clear association with intestinal worm infection.

INTRODUCTION

Anemia is a common health problem worldwide with an estimated 30% of the world’s population being anemic (WHO, 2001a). This hematological disorder is prevalent in many poor rural and peri-urban communities, particularly those in the poorer developing countries, where it is one of the commonest causes of ill health (Ahmed, 2000). Its prevalence is most common among young children, adolescents and women of child-bearing age (Adish et al, 1999; Kuizon et al, 1982; Quintas et al, 1997). In developing countries its high prevalence is usually associated with various causes; such as malnutrition, of which, the root cause is poverty (Murila et al, 1999).

In West Malaysia, anemia was highly prevalent (> 65%) in some of the poorer rural areas in the 1960s, but in recent years, it has declined to about 30% (Tee et al, 1999). Pockets of high prevalence, usually associated with high parasitemia, poor nutrition and multiple pregnancies are, however, still found in some rural areas (Shahar et al, 1999). In Sarawak, Malaysia, the prevalence of anemia among the rural Ibas, coastal Malays and nomadic Penans in the late 1970s ranges from 20-35% (Anderson, 1978), however its current prevalence in poor remote communities is undetermined.

In the present study, the prevalence and distribution of anemia in five remote interior communities in upper Rejang River, Sarawak, Malaysia, was investigated, as part of a public health impact assessment of the proposed US$ 3 billion Bakun hydroelectric project (BHEP) development.

MATERIALS AND METHODS

The remote upper Rejang River basin in Sarawak, was selected for this study, because the area is undergoing large-scale human ecological changes brought about by the proposed US$3 billion BHEP development (Sagin et al, 2000). The area is sparsely inhabited (population ~10,000) by seven interior tribes in 16 villages along the Murum, Linau and Balui River valley. Seven villages were selected for this study, as they are relatively
accessible by river transport in addition to being an approximate representation of the five interior tribes in the area (Sagin et al., 2001). For the purpose of this study, the villages were visited, and the villagers briefed during a community visit to explain the purpose of the study. Informed consent was obtained from those volunteering to take part in the study (Sagin et al., 2000). Venous blood sample was taken by experience medical laboratory technologist, and the hemoglobin concentration measured in situ using a portable Ames Minilab haemoglobinometer.

RESULTS

A total of 365 venous blood samples were taken from a cross section (51.9% males, 48.1% females) of the five communities surveyed. Their ages ranged from 5-85 years old (Table 1). The majority of the samples was obtained from the Kayans as they form the major community in the area. The range and mean of Hb concentration amongst males was 7.2-17.0 mg/ml and 13.7 mg/ml, whereas in females it was 7.9-15.7 mg/ml and 12.9 mg/ml respectively. Based on WHO criteria (WHO, 2001b) for anemia, 24.4% of the individual surveyed were anemic, however the anemia was predominantly mild (Hb range: 7.2-12.9 mg/ml in males and 7.9-11.9 mg/ml in females).

Anemia was almost twice more common in male (29.2%) than in female (17.2%). Among the five communities surveyed, the prevalence of anemia ranged from 10.6-46.7%, with higher prevalence found among the Penans (46.7%), Kenyahs (31.1%), Kajangs (27.8%) and Kayans (19.3%) than among the Ukits (10.6%). Anemia was more common among male > 40 years and among adolescent and young reproductive

Table 1
Prevalence and distribution of anemia in five interior communities at upper Rejang River, Sarawak, Malaysia by ethnic group.

<table>
<thead>
<tr>
<th>Ethnic group</th>
<th>Age range (yr)</th>
<th>Hb range</th>
<th>Mean</th>
<th>No. (% of low)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kayan (n=187)</td>
<td>5 - 84</td>
<td>7.9 - 16.4</td>
<td>13.5</td>
<td>36 (19.3)</td>
</tr>
<tr>
<td>Male (n=90)</td>
<td>5 - 84</td>
<td>9.2 - 16.4</td>
<td>14.1</td>
<td>24 (26.7)</td>
</tr>
<tr>
<td>Female (n=97)</td>
<td>14 - 77</td>
<td>7.9 - 15.7</td>
<td>12.9</td>
<td>12 (12.4)</td>
</tr>
<tr>
<td>Kenyah (n=45)</td>
<td>18 - 85</td>
<td>10.6 - 16.6</td>
<td>13.0</td>
<td>14 (31.1)</td>
</tr>
<tr>
<td>Male (n=19)</td>
<td>18 - 85</td>
<td>10.6 - 16.6</td>
<td>13.8</td>
<td>6 (31.6)</td>
</tr>
<tr>
<td>Female (n=26)</td>
<td>18 - 60</td>
<td>10.8 - 14.1</td>
<td>12.4</td>
<td>8 (30.8)</td>
</tr>
<tr>
<td>Kajang (n=72)</td>
<td>17 - 70</td>
<td>7.2 - 15.8</td>
<td>12.9</td>
<td>20 (27.8)</td>
</tr>
<tr>
<td>Male (n=35)</td>
<td>16 - 70</td>
<td>7.2 - 15.8</td>
<td>13.3</td>
<td>13 (37.1)</td>
</tr>
<tr>
<td>Female (n=37)</td>
<td>16 - 69</td>
<td>7.9 - 14.5</td>
<td>12.6</td>
<td>7 (18.9)</td>
</tr>
<tr>
<td>Penan (n=30)</td>
<td>13 - 55</td>
<td>10.0 - 17.0</td>
<td>12.7</td>
<td>14 (46.7)</td>
</tr>
<tr>
<td>Male (n=19)</td>
<td>14 - 55</td>
<td>10.0 - 17.0</td>
<td>12.9</td>
<td>10 (52.6)</td>
</tr>
<tr>
<td>Female (n=11)</td>
<td>13 - 47</td>
<td>10.9 - 13.8</td>
<td>12.4</td>
<td>4 (36.4)</td>
</tr>
<tr>
<td>Ukit (n=47)</td>
<td>13 - 17</td>
<td>10.3 - 16.8</td>
<td>14.0</td>
<td>5 (10.6)</td>
</tr>
<tr>
<td>Male (n=31)</td>
<td>13 - 70</td>
<td>10.3 - 16.8</td>
<td>14.1</td>
<td>4 (12.9)</td>
</tr>
<tr>
<td>Female (n=16)</td>
<td>13 - 50</td>
<td>11.4 - 14.9</td>
<td>13.9</td>
<td>1 (6.0)</td>
</tr>
<tr>
<td>Total (N=365)</td>
<td>5 - 85</td>
<td>7.2 - 17.0</td>
<td>13.3</td>
<td>89 (24.4)</td>
</tr>
<tr>
<td>Male (n=189)</td>
<td>5 - 84</td>
<td>7.2 - 17.0</td>
<td>13.7</td>
<td>57 (29.2)</td>
</tr>
<tr>
<td>Female (n=176)</td>
<td>13 - 69</td>
<td>7.9 - 15.7</td>
<td>12.9</td>
<td>32 (17.2)</td>
</tr>
</tbody>
</table>

*WHO criteria for anemia: Hb concentration < 11,12 and 13 mg/ml in children, adult female and male respectively.
females as well as elderly female > 61 years old (Table 2). Of the 83 anemic individuals identified in this study, 9.6% had intestinal parasitic infection, of which *Trichuris trichiura* is more common (6.0%) than hookworm (Table 3).

### DISCUSSION

We suspected that anemia is common among the remote interior communities in upper Rejang River Sarawak, Malaysia. This is based on the observation that their remoteness and relative poverty (Sagin *et al.*, 2000; 2001) predisposes them to various risk factors associated with anemia (Rajaratnam *et al.*, 2000; Sagin *et al.*, 2000; Milman *et al.*, 2001). The present data confirmed that anemia is indeed relatively common (range: 10.6-46.7%), however its prevalence, except for the Penans community, is within the 20-35% range found among the rural Ibans, coastal Malays and nomadic Penans of Sarawak two decades ago (Anderson 1987). Additionally, the prevalence rate is similar to the 30% rate found in parts of rural West Malaysia, and the 26-48% range found in parts of rural of Sabah (UKM 1989; Tee *et al.*, 1999; Shahar *et al.*, 1999).

The finding that anemia is almost twice more common in males (29.2%) than in females (17.2%), except for the adolescent and young reproductive females (31.6%) is not unusual. The anemia in adolescent and young reproductive female may be associated with the increase in nutritional demand for physical and cognitive development in the former, and child bearing in the later group (Bondevik *et al.*, 2000; Kilbride *et al.*, 1999; WHO, 2001c). In the traditional poor rural cultures in many poor developing countries, women tend to have multiple pregnancies, with inadequate interval to replenish their nutritional store (Quintas *et al.*, 1997; Rajaratnam *et al.*, 2000). In remote rural communities, the modern concept of family planning and contraceptive usage is still generally unacceptable to their traditional conservative culture. This is particularly so, if their general literacy rate is very low. To reduce the negative health impact of anemia on mothers and infants, it has become common practice to give iron-folate supplements to poor pregnant rural mothers during their pregnancies.

The high incidence of anemia in males > 40 years old may be due to various factors such as nutritional deficiency and alcoholism.
as found in other studies (Shahar et al., 1999; Milman et al., 2001). Factors that may impact on nutritional deficiency include large-scale developmental pressure, which may directly or indirectly affect the supply of fish, wild meat and jungle vegetable. Reduction in fish supply may result from increased demand, and is exacerbated by water pollution, following large-scale commercial forestry activities in the area. The scarcity of aquatic resources was made worse, as some communities have resorted to destructive fishing methods; such as bombing, electric shock and chemical poisoning. These developmental pressures when considered together with other predisposing factors may cause dietary changes and reduce iron intake and absorption.

In the present study, we found that anemia is more common among the semi-nomadic Penans (46.7%) than among the other tribes. The data seem to indicate that the Penans are at an early stage of adaptation to their fast changing environment. Whilst a few decades ago their diet consists of wild animal meat and fish, from their immediate environment, the on-going socio-economic developmental pressure has introduced, hitherto alien, processed and canned food into their diet. It is noted that the elderly preferred their fresh locally produced aromatic rice, rather than the imported processed and polished rice, because its undesirable smell makes it rather unappetizing. In contrast, the Kenyahs, Kajangs and Kayans communities have already been adapting to a variety of modern diet for many decades. Therefore, they may have already achieved some kind of dynamic equilibrium with their changing physical, biological and socio-economic environment.

The low incidence of anemia among the small (pop ~ 100) and only Ukit (Hill) community in Sarawak maybe surprising to outsiders. However, it should be noted that this unique community has already been visited and studied by many local and foreign researchers for about a century. The observed low anemia rate may be attributable to the summative effect of their adaptation to various planned or incidental intervention measures introduced into the community by visitors, researchers, government agencies, as well as non-government agencies, over the last 100 years. It should also be noted that in the past decades, this community has been provided with regular flying doctor services.

We have investigated the relationship between anemia and intestinal parasitic infection, because high intensity trichuriasis and hookworm infection may potentially cause severe iron loss leading to iron deficiency anemia (Stoltzfus et al., 1997). The finding that only 9.6% of the 83 anemic individuals identified in this study was infected with T. trichiura or hookworm appear to suggest that the mild anemia is not significantly associated with intestinal parasitic infection as most of those infected may carry low parasitic burden (Sagin et al., 2000).

We conclude that the present data, when interpreted in the context of other relevant data, appear to suggest that despite significant improvement in health care services and facilities, in addition to socio-economic development, anemia remain relatively common in upper Rejang River area. As most of the communities surveyed are now resettled elsewhere, follow-up study is needed to determine their current health status as they adapt to the various physical, biological, social and economic peculiarities of their new environment.

ACKNOWLEDGEMENTS

We wish to acknowledged the support of The Sarawak Government in this study. DDS, GI and MM are the public health impact assessment consultants for the Bakun HEP development. We thank the Director of the Sarawak Health Services Department for extending to us the temporary use of their various health facilities in Belaga, Kapit, Sibu and Kuching. We thank the villagers for their consent, assistance, support and cooperation for this work.
REFERENCES


WHO. Iron deficiency anaemia. @http://www.who.int/ida/research.html. 2001a.


WHO. Adolescent nutrition: a neglected dimension. @http://www.who.int/nut/ado.html. 2001c.