



## INTRODUCTION

- 600 million children were anaemic globally (WHO, 2011).
- 65.5% of preschool children in Southeast Asia were anaemic (WHO, 2011).
- Young children living in remote Indigenous communities have long been known to suffer from anaemia (Udovicich et al., 2017).
- Indigenous children have poorer health outcomes compared to the non-Indigenous children (Udovicich et al., 2017)
- Previous local study indicated that 48.5% of OA school children were anaemic (Al-Mekhlafi et al., 2013).

## OBJECTIVES

### General Objective

- To determine factors associated with anaemia among Orang Asli children aged 2 to 6 years old in Negeri Sembilan

### Specific Objectives

- To examine the sociodemographic characteristic, nutritional factors and household environment factors of Orang Asli children
- To examine the prevalence of anaemia of Orang Asli children.
- To determine the associations between sociodemographic characteristic, nutritional factors, and household environmental factors with anaemia among Orang Asli children.

## METHODS AND MATERIALS

- Cross-sectional study located in 14 villages of Negeri Sembilan (6 in Jempol, 8 in Kuala Pilah) and 269 participants were selected via simple random sampling.

Study Instruments	Self-Administered questionnaire	Anthropometric measurement	Biological measurement
<b>Mother</b>	<ul style="list-style-type: none"> <li>• Sociodemographic question</li> <li>• Hygiene and sanitation questionnaire</li> <li>• Radimer/Cornell Food Insecurity Questionnaire</li> <li>• 24-hour dietary recall of children</li> </ul>	<ul style="list-style-type: none"> <li>• Weight (kg)</li> <li>• Height (cm)</li> <li>• Waist circumference (cm)</li> </ul>	Haemoglobin level (g/dL)
<b>Children</b>		<ul style="list-style-type: none"> <li>• Weight (kg)</li> <li>• Height (cm)</li> </ul>	<ul style="list-style-type: none"> <li>• Haemoglobin level (g/dL)</li> <li>• Stool sample</li> </ul>

### Data Collection Procedure

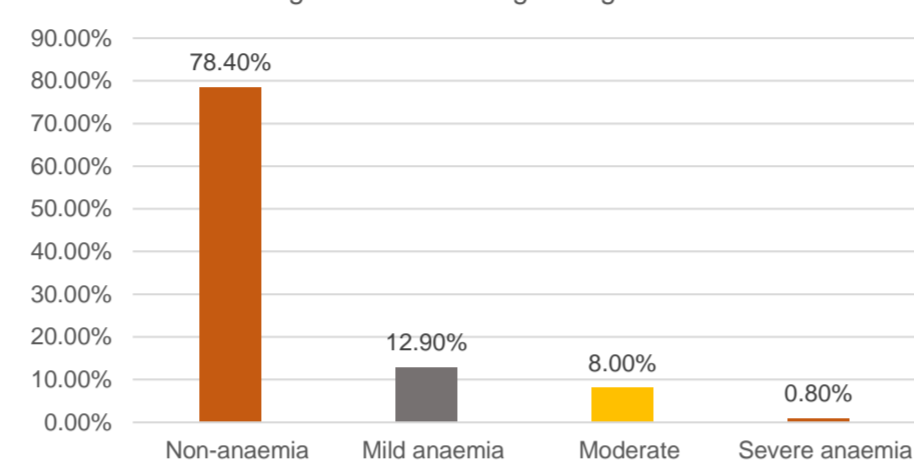
- JKEUPM-JAKOA-Written informed consent-Stool sample and mother interviewed-Finger prick and Anthropometric measurement.

### Statistical Analysis

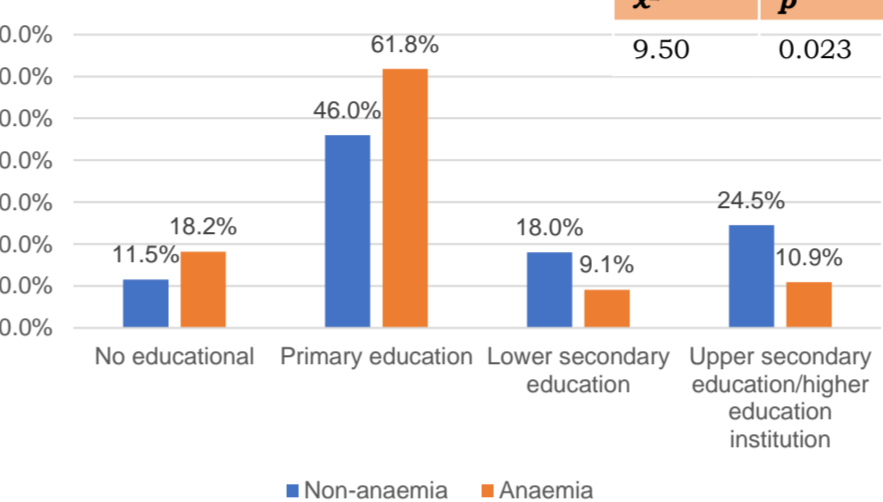
- Categorical variable- n(%), Continuous variable- mean±SD and Chi square ( $\chi^2$ )
- Association IV & DV, where p<0.05.

## RESULTS

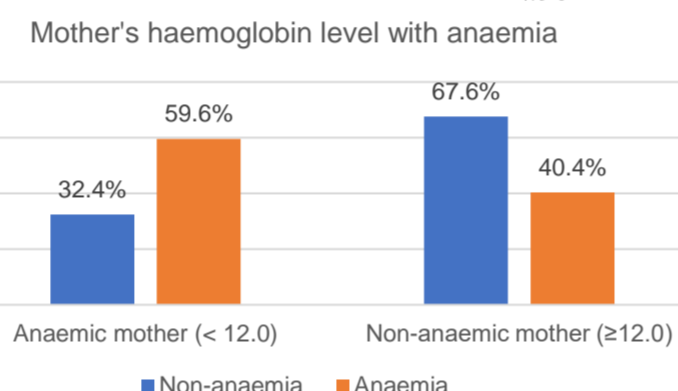
Haemoglobin level among Orang Asli children



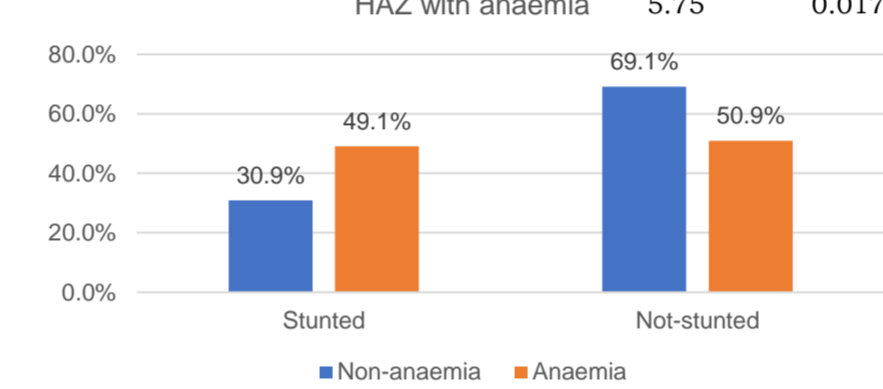
Father's educational level



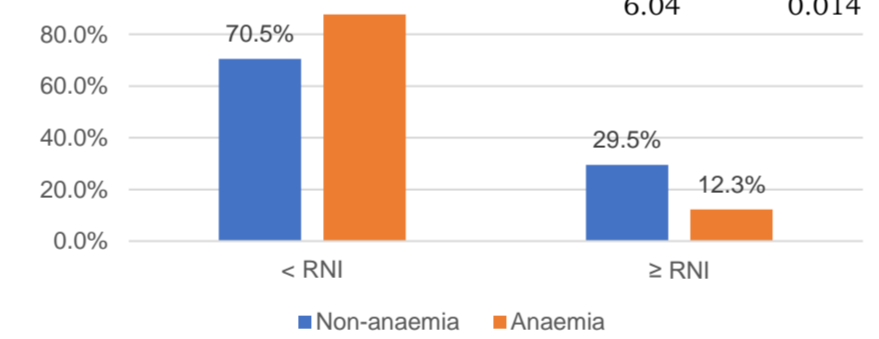
$\chi^2$  12.95,  $p$  < 0.001



$\chi^2$  5.75,  $p$  0.017

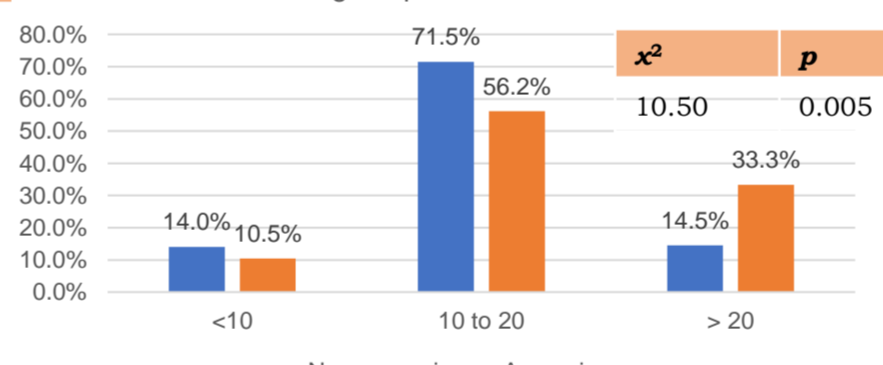


Energy with anaemia



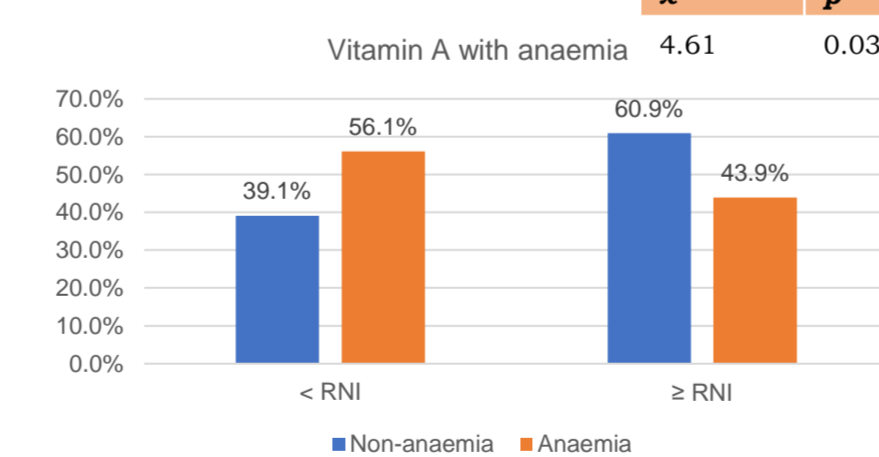
$\chi^2$  6.04,  $p$  0.014

Percentage of protein with anaemia



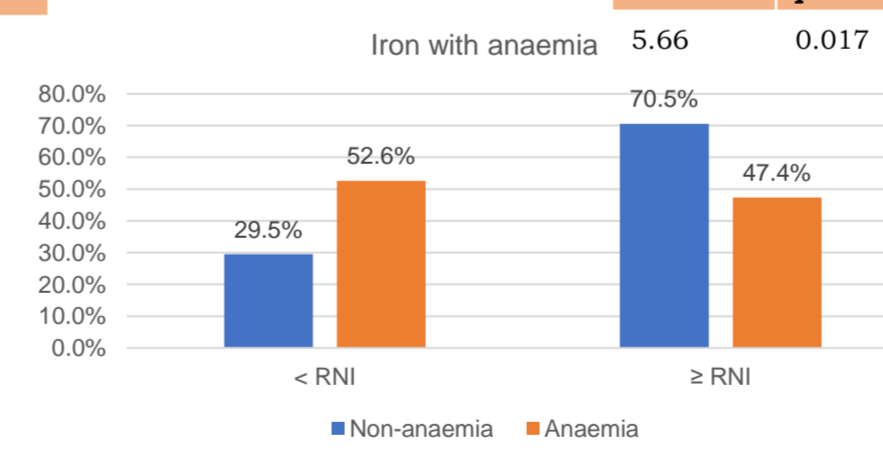
$\chi^2$  10.50,  $p$  0.005

Vitamin A with anaemia

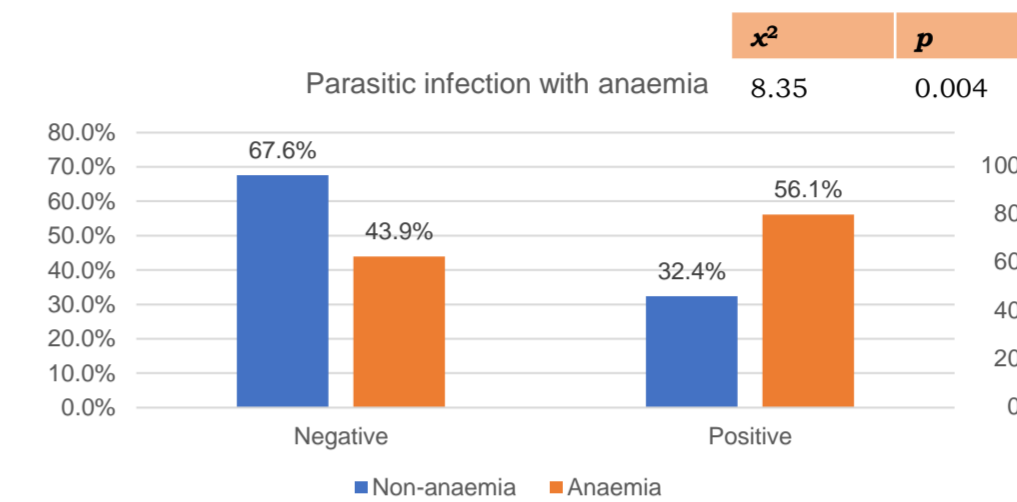


$\chi^2$  4.61,  $p$  0.032

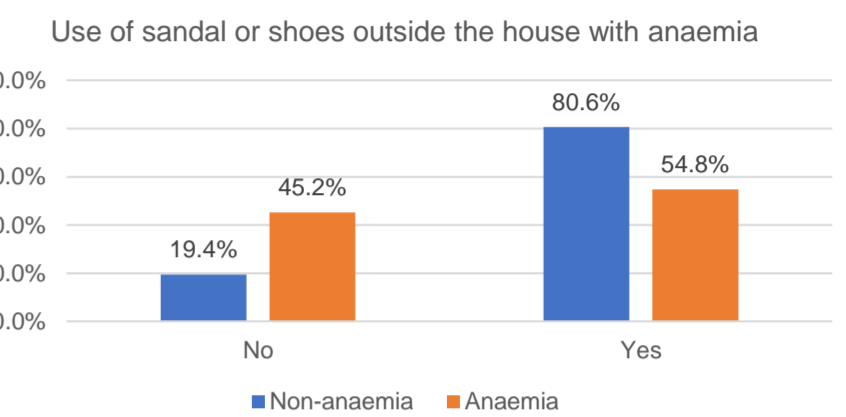
Iron with anaemia



$\chi^2$  5.66,  $p$  0.017



$\chi^2$  8.35,  $p$  0.004



$\chi^2$  7.82,  $p$  0.005

## DISCUSSION

- The mean±SD of haemoglobin level of the OA children was 11.81 ± 1.09 g/dL, where 12.9% had mild anaemia, 8.0% had moderate anaemia and 0.8% had severe anaemia, making the prevalence of anaemia was 21.7%.
- A study in Negritos under the Resettlement Plan Scheme found that stunting increased the risk of anaemia (Muslim et al., 2021).
- Studies found significant association between parasitic infection and anaemia status among indigenous children in the Philippines (Ng et al., 2014) and North West Cameroon (Cho et al., 2021). Children infected with parasites will hinder their uptake of iron and consequently lead to anaemia (Chaparro & Suchdev, 2019). This is due to the immune response to infections restricts iron availability to infectious organisms; when prolonged, this immune response can lead to anaemia (Ganz, 2009).
- Aini et al. (2007) found that there was a significant association between vitamin A deficiency with iron deficiency anaemia among 281 Orang Asli children in Selangor ( $p = 0.044$ ).
- Study conducted by Khan et al. (2016), parental education was associated with pre-school anemia children. No-formal education parents were increased risk of anemia among pre-school children compared educated parents. Generally, education level is associated with socioeconomic status, but it might results in relatively lower understanding of optimum child care and nutritional practices (Khan et al., 2016).
- Similar results have been reported in several other studies (Nambiema et al., 2019). Mothers and their children most often share a common environment, which could involve common exposures to some risk factors (Nambiema et al., 2019), for examples, mutual exposure to a common set of physical, socioeconomic, and dietary conditions (Leite et al., 2013).
- Inadequate dietary iron intake can be considered decisive for the occurrence of anaemia (Wiafe et al., 2020). Iron deficiency anaemia, which can be associated with cognitive issues, is prevented and treated with iron supplements or increased intake of dietary iron (Wang, 2016).

## CONCLUSION

- OA children in this study showed poor nutritional status and high rate of parasites infection and the prevalence of anemia was high among OA children in this study.
- There were significant association between HAZ, parasitic infection, father's educational level, haemoglobin level of the mother, sandal used outside the house, energy, percentage of protein, vitamin A and iron intake with anaemia among Orang Asli children.
- Further studies should include serum ferritin, iron, and vitamin B<sub>12</sub> as indicators in order to identify the different types of anaemia.
- Frequent health screening and appropriate health intervention are required to prevent anaemia and improve health status among Orang Asli community including women and children.

## REFERENCES

- Aini, U. N., Al-Mekhlafi, M. S., Azlin, M., Shaik, A., Sa'iah, A., Fatmah, M. S., Ismail, M. G., Firdaus, M. S., Aisah, M. Y., Rozlida, A. R., & Norhayati, M. (2007). Serum iron status in Orang Asli children living in endemic areas of soil-transmitted helminths. *Asia Pacific Journal of Clinical Nutrition*, 16(4), 724–730.
- Al-Mekhlafi, H., Al-Zabedi, E., Al-Maktari, M., Atroosh, W., Al-Delaimy, A., Moktar, N., Sallam, A., Abdullah, W. A., Jani, R., & Surin, J. (2013). Effects of vitamin A supplementation on iron status indices and iron deficiency anaemia: A randomized controlled trial. *Nutrients*, 6(1), 190–206. <http://dx.doi.org/10.3390/nu6010190>
- Chaparro, C. M., & Suchdev, P. S. (2019). Anemia epidemiology, pathophysiology, and etiology in low- and middle-income country. *Annals of the New York Academy of Sciences*, 1450(1), 15–31. <https://doi.org/10.1111/nyas.14092>
- Cho, F. N., Ngala, H., Bongazi, R. T., Kinsam, R. S., Tata, B. T., Aji, D., Fru, P. N., & Jokwi, P. K. (2021). Effects of soil-transmitted helminths and intestinal protozoan infections on haemoglobin levels among school-aged children in Belo and Bui, North West Cameroon: A cross-sectional study. *Journal of Parasitology Research*, 2021, 8873555. <https://doi.org/10.1155/2021/8873555>
- Ganz, T. (2009). Iron in innate immunity: starve the invaders. *Current Opinion in Immunology*, 21(1), 63–67. <https://doi.org/10.1016/j.coi.2009.01.011>
- Khan, J. R., Awan, N., & Misu, F. (2016). Determinants of anemia among 6–59 months aged children in Bangladesh: Evidence from nationally representative data. *BMC Pediatrics*, 16(3). <https://doi.org/10.1186/s12887-015-0536-z>
- Leite, M. S., Cardoso, A. M., Coimbra, C. E., Jr, Welch, J. R., Gugelmin, S. A., Lira, P. C., Horta, B. L., Santos, R. V., & Escobar, A. L. (2013). Prevalence of anemia and associated factors among indigenous children in Brazil: results from the First National Survey of Indigenous People's Health and Nutrition. *Nutrition Journal*, 12, 69. <https://doi.org/10.1186/1475-2891-12-69>
- Muslim, A., Lim, Y. A., Mohd Sofian, S., Shaari, S. A., & Mohd Zain, Z. (2021). Nutritional status, hemoglobin level and their associations with soil-transmitted helminth infections between Negritos (indigenous) from the inland jungle village and resettlement at town peripheries. *PLoS One*, 16(1), e0245377. <https://doi.org/10.1371/journal.pone.0245377>
- Nambiema, A., Robert, A., & Yaya, I. (2019). Prevalence and risk factors of anemia in children aged from 6 to 59 months in Togo: analysis from Togo demographic and health survey data, 2013-2014. *BMC Public Health*, 19(215). <https://doi.org/10.1186/s12889-019-6547-1>
- Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., Mullany, E. C., Biryukov, S., Abbafati, C., Abera, S. F., Abraham, J. P., Abu-Rmeileh, N. M., Achoki, T., AlBuhairan, F. S., Alemu, Z. A., Alfonso, R., Ali, M. K., Ali, R., Guzman, N. A., Ammar, W., ... Gakidou, E. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet (London, England)*, 384(9945), 766–781. [https://doi.org/10.1016/S0140-6736\(14\)60460-8](https://doi.org/10.1016/S0140-6736(14)60460-8)
- Udovicich, C., Perera, K., & Leahy, C. (2017). Anaemia in school-aged children in an Australian Indigenous community. *The Australian Journal of Rural Health*, 25(5), 285–289. <https://doi.org/10.1111/ajr.12338>
- Wang, F., Liu, H., Wan, Y., Li, J., Chen, Y., Zheng, J., & Li, D. (2016). Prolonged exclusive breastfeeding duration is positively associated with risk of anemia in infants aged 12 months. *The Journal of Nutrition*, 146(9), 1707–1713. <https://doi.org/10.3945/jn.116.232967>
- WHO. (2011). The global prevalence of anaemia in 2011. *Who*, 1–48. Retrieved from <https://apps.who.int/iris/handle/10665/177094>
- Wiafe, M. A., Apprey, C., & Annan, R. A. (2020). Patterns of dietary iron intake, iron status, and predictors of haemoglobin levels among early adolescents in a rural Ghanaian District. *Journal of Nutrition and Metabolism*, 2020, 3183281. <https://doi.org/10.1155/2020/3183281>