Anemia prevalence and correlates among young children and pregnant women in Indonesia

Globally, 43 percent of children ages 0–5 years and 38 percent of pregnant women are anemic (Stevens, Finucane et al. 2013). In children, anemia impairs physical and cognitive development and increases the risk of morbidity. Pregnant women are at risk of anemia due to the increase in bodily demand for iron during pregnancy. If they experience anemia, they are more likely to have low birth weight babies, be at higher risk of perinatal mortality (defined as stillbirths and deaths in the first week of life), and have higher rates of maternal mortality (WHO 2015).

Using household survey data and hemoglobin measurement from Indonesia, in this brief we investigate the prevalence of anemia among children 6-35 months old and pregnant women and identify risk factors for anemia in those populations.

ANEMIA AMONG CHILDREN

Sixty percent of children ages 6–35 months were anemic. As shown in Figure 1, anemia was present in nearly 80 percent of children in the 6-11 month age group, in 65 percent of children in the 12-23 age group, and in 45 percent of children in the 24-35 month age group. Nearly all children who were anemic had moderate anemia. (Only eight of the 1,454 children with anemia were severely anemic.) The prevalence of anemia was significantly lower among girls and in Central Kalimantan, even when controlling for differences in socioeconomic background, health, and nutrition.

Children were equally likely to be anemic across all socioeconomic backgrounds. This finding was consistent for a range of indicators indicative of household income and economic status including an index of household assets, participation in an unconditional cash transfer program, mother's education, or possession of health insurance.

Worm infections and diarrhea in older children were strongly associated with anemia, but other measures of health status were not. Anemia risk may increase because of parasitic infections, such as intestinal worms, which cause blood loss that reduces the body's iron stores (Crompton et al. 2003). Worm infections were primarily experienced by children ages 24-35 months—14 percent had been infected with worms in the last year – whereas the rate of infection for children under 24 months was less than 5 percent. Worm infections are much rarer for children younger than two years, likely because they face a lower risk of exposure to worm infection vectors, such as contaminated soil and water. For the 24-35 month age group, the prevalence of anemia was 48 percent higher for children who had been infected with worms.


DEFINING ANEMIA

For pregnant women and children under the age of 5 years, anemia is defined as a blood hemoglobin concentration of less than 11 g/dL (severe is less than 7 g/dL). Iron deficiency causes approximately half of anemia cases, but anemia can also be caused by other micronutrient deficiencies, infections like malaria or intestinal worms, or by disorders that affect how the body produces hemoglobin (WHO 2015).

In addition to worms, we also considered whether diarrhea and dysentery (diarrhea accompanied by blood or mucus in the stools) were related to anemia. Caregivers reported whether the child had had diarrhea in the last week. Children between 6-23 months who had had diarrhea in the last week were 16 percent more likely to be anemic. This figure was 25 percent for children in the 24-36 age group. This finding is consistent with other studies that have shown diarrhea as a risk factor for anemia (Howard et al. 2007). There was no significant difference in the prevalence of anemia between children with dysentery and those without.

NOTE: All comparisons of anemia across groups were estimated using multivariate Poisson regressions with controls for each respondent's age, gender, socio-economic background, and province, with standard errors clustered by kecamatan.

MATHEMATICA
Policy Research

FIGURE 1: YOUNGER CHILDREN AND BOYS WERE MORE LIKELY TO BE ANEMIC

Percent of children 6-35 months with anemia
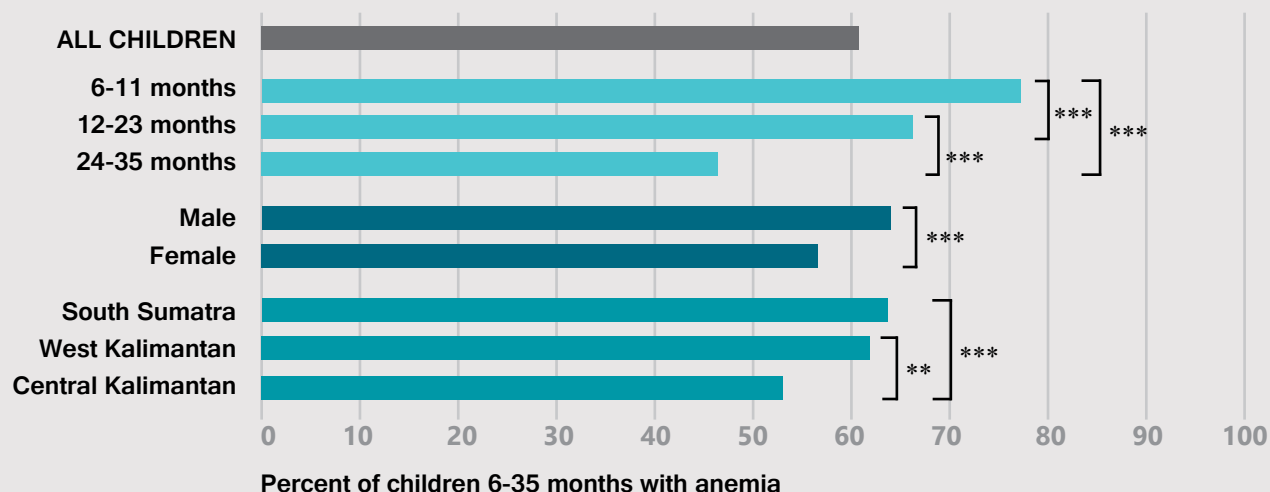
***/** Difference between bracketed categories is statistically significant at the 0.01/0.05 level.

Knowing about caregivers' general perceptions of heath is important because lethargy is a key sign of anemia. Children whose caregivers said they were overall healthy were no more or less likely to be anemic than other children.

Some measures of healthcare utilization and access were associated with lower rates of anemia. The primary opportunity in most areas for general infant and young child checkups is the posyandu (integrated maternal and child health service post). Yet only 59 percent of children in the overall sample had been to the posyandu in the last six months. This means that even if children are anemic, there is little opportunity for them to be screened and referred to the puskesmas (health facility) for treatment. Moreover, having gone to the posyandu was not associated with anemia.

ABOUT THE DATASET

Data used in this analysis are from a baseline survey for a cluster-randomized controlled trial of a nutrition program implemented by the Government of Indonesia and Millennium Challenge Account-Indonesia, funded by the Millennium Challenge Corporation. The survey was conducted in late 2014 and early 2015 in the provinces of South Sumatra, Central Kalimantan, and West Kalimantan. The survey is representative of pregnant women in their second or third trimester and of children aged 0-35 months in 190 keca-matan (subdistricts) that are the trial clusters.

The household survey included modules about household characteristics, health service access and utilization, knowledge of recommended health behaviors, nutrition practices, self-reported iron and folic acid (IFA) consumption, and capillary blood spots from 1,503 pregnant women and 2,469 children ages 6-35 months. Blood spots were analyzed using a Hemocue. Household data are complemented by data from health facility staff, community health workers, and midwives in the 190 kecamatan.

We also explored the relationships between anemia and mother's health care to gain insight into the quality and quantity of prenatal and postnatal health care that the caregivers utilized. Children whose mothers had four or more prenatal visits were 11 percent less likely to be anemic. Children whose mothers received the WHO recommended number of postnatal visits (two) and children who were delivered by a skilled professional were no more or less likely to be anemic than other children.

Children who consumed meat and vegetables were less likely to be anemic. We asked caregivers about the types and frequency of food their children consumed, focusing on meat, legumes, and green leafy vegetables—foods rich in iron, vitamins, and other micronutrients that enhance the absorption of iron, which can help prevent anemia (WHO NHD 2001). Among children aged 6-11 months, about a quarter had consumed meat over the past week and half had consumed vegetables. At 12 months and over, over half of children had consumed meat over the past week, for 2.4 days on average, and 70 percent had consumed vegetables, for 4.4 days on average.

Children in the older age group (12-35 months), who naturally get exposure to more foods, were 17 percent less likely to be anemic if they had eaten vegetables in the last seven days. Only children in the 12-23 month age group were less likely to be anemic if they had eaten meat in the last seven days (15 percent). (The anemia rate was also lower for children aged 24-35 months who had consumed meat, but the difference was not statistically significant.) Children who had at least a minimally diverse diet (see definition in the box to the right) or whose caregiver reported concerns about having enough food for the household were no more or less likely to be anemic than other children across all ages.

Formula use was associated with lower rates of anemia across all age groups. Supplementing children's diet with formula was a common practice—36 percent of children had received formula in the last seven days—and this practice was consistent across the age groups. In addition, 80 percent of children who received formula received it every day. Many formulas in Indonesia include iron, so it was not surprising to find that children who had received formula in the last seven days were 26 percent less likely to have anemia.
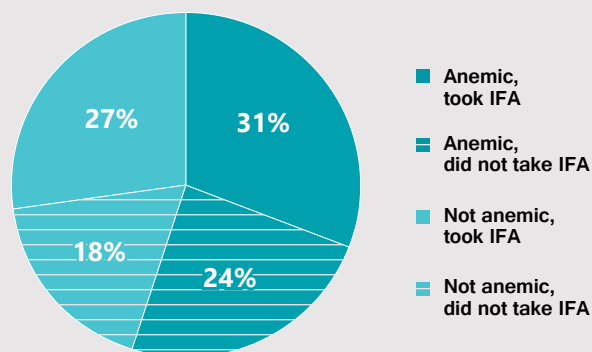
Exclusive breastfeeding showed no association with anemia. When looking at the effects of exclusive breastfeeding, defined as receiving no food or drink other than breastmilk for six months, we focused on the 6-11 month age group because we would not expect the effects of exclusive breastfeeding to persist in children over a year. Children who had been exclusively breastfed for their first six months were no more or less likely to be anemic.

ANEMIA AMONG PREGNANT WOMEN

Fifty-five percent of pregnant women were anemic, although only 10 percent reported having been diagnosed with anemia in the past three years. (See Figure 2.) Nearly all pregnant women who were anemic had moderate anemia. (Only 8 out of 820 anemic women were severely anemic.) The rate of anemia was significantly lower for pregnant women in sample villages in Central Kalimantan than in the other two provinces, even when controlling for differences in economic background, health, and nutrition.

As with children, we find that pregnant women of all socioeconomic backgrounds were equally vulnerable to anemia. Women are no more or less likely to be anemic based on their education, an index of their household assets, participation in an unconditional cash transfer program, education, or whether they possess health insurance.

FIGURE 2: RATES OF ANEMIA[1] WERE SIMILAR AMONG PREGNANT WOMEN WHO REPORTED TAKING IFA AND THOSE WHO DID NOT

- 31% — Anemic, took IFA
- 24% — Anemic, did not take IFA
- 18% — Not anemic, took IFA
- 27% — Not anemic, did not take IFA

[1] Anemia diagnosis based on hemoglobin levels in capillary blood spots collected by survey staff. IFA consumption self-reported by respondents.

DIETARY DIVERSITY for children is defined as consuming food from four or more of the following groups in past week: dairy, eggs, grains/roots/tubers, vitamin-A rich fruits and vegetables, other fruits and vegetables, "flesh foods" (i.e. fish, poultry, or meat), and legumes/nuts (WHO 2010). It should be noted that these food groups are not specifically designed to distinguish between foods that are helpful or not for anemia, so when examining the results, readers should keep in mind that our estimates are probably a lower bound of the association between diet and anemia.

Anemia rates were similar across pregnant women who reported differences in perceived health status and dietary intake. Women's perceived health or energy is relevant to understanding anemia because anemia can cause fatigue or lethargy. Women reported whether they were generally healthy and whether poor health constrained daily activities, neither of which was related to being more or less likely to have anemia.

Women who consumed meat were less likely to be anemic. Similar to the results for children, meat consumption was associated with lower rates of anemia in pregnant women. Meat and vegetable consumption was common among pregnant women—88 percent of pregnant women had consumed meat in the last seven days, for 4.2 days on average, and 94 percent had consumed vegetables, for 4.2 days on average. The rate of anemia was 14 percent lower for pregnant women who had consumed meat in the past seven days than those who did not.

Neither self-reported consumption of iron and folic acid supplements (IFA) nor reportedly being previously diagnosed with anemia by a healthcare provider were strongly associated with anemia measured at the time of the survey. Over half of pregnant women self-reported having consumed IFA during their current pregnancy (58 percent), but they were no less likely to have anemia at the time of the survey. (See Figure 2.) This lack of correlation between self-reported history of IFA consumption and present anemia should not be interpreted as evidence that IFA is ineffective, but rather suggests that women might not have accurately remembered or reported IFA consumption, or that they did not adhere to recommendations of how much IFA to consume. Because self-reported IFA consumption is often used to ascertain women's risk of anemia, our findings suggest that further research is needed to identify better means of assessing a behavior that is likely prone to misreporting.

Even more surprising, the 10 percent of women who reported having been diagnosed with anemia by a health care provider were also not more or less likely to test positive for anemia at the time of the survey than other pregnant women. This suggests that many women who are anemic are not identifying this condition appropriately and are thus not aware that they need treatment.

DISCUSSION AND RECOMMENDATIONS

We explored a number of measures of maternal and child nutrition and health that we might expect to be predictive of anemia. Most of these measures were not predictive, but we found important associations with the following measures.

- Anemia was very high among children and pregnant women across all socioeconomic groups. This suggests that awareness and prevention campaigns should span the socioeconomic spectrum.

- Although worms afflicted only 14 percent of children aged 24-35 months, those who were infected experienced much higher rates of anemia than children who were not infected. Similarly, children with diarrhea in the last week in the 24-35 month age group were 25 percent more likely to be anemic. This suggests that exposure to worms and diarrhea may be an important factor in developing anemia for two year old children.

- As expected, consuming meat was associated with lower levels of anemia among children older than 11 months and among pregnant women. Children older than 11 months were also less likely to be anemic if they consumed vegetables (many of which are likely rich in iron or likely promote iron absorption).

- Regular formula use was associated with much lower levels of anemia among children 6-35 months, which suggests that providing children in this age range with supplemental formula may be beneficial to prevent anemia.

- The fact that there was no difference in anemia between pregnant women who reported consuming IFA and those who did not draws into question whether women are reporting their consumption inaccurately or not consuming IFA as recommended. These preliminary results demonstrate the need for greater study about adherence to IFA recommendations and the accuracy of self-reporting on IFA consumption.

REFERENCES

Crompton DWT, Montresor A, Nesheim MC, Savioli L, editors. Controlling disease due to helminth infections. Geneva: World Health Organization, 2003 (http://apps.who.int/iris/bitstream/10665/42707/1/9241562390.pdf?ua=1, accessed 16 May 2017).

El-Farrash, Rania Ali, Eman Abdel Rahman Ismail, and Ahmed Shafik Nada. "Cord blood iron profile and breast milk micronutrients in maternal iron deficiency anemia." Pediatric blood & cancer 58.2 (2012): 233-238.

Howard, Caitlin T., et al. "Association of diarrhea with anemia among children under age five living in rural areas of Indonesia." Journal of tropical pediatrics 53.4 (2007): 238-244.

Stevens, Gretchen A., Mariel M. Finucane, Luz Maria De-Regil, Christopher J. Paciorek, Seth R. Flaxman, Francesco Branca, Juan Pablo Peña-Rosas, Zulfiqar A. Bhutta, Majid Ezzati, and Nutrition Impact Model Study Group. "Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anaemia in children and pregnant and non-pregnant women for 1995–2011: a systematic analysis of population-representative data." The Lancet Global Health 1, no. 1 (2013): e16-e25.

World Health Organization. "Indicators for assessing infant and young child feeding practices: Part 3 Country Profiles." Geneva: World Health Organization, 2010. https://www.unicef.org/nutrition/files/IYCF_Indicators_part_III_country_profiles.pdf

World Health Organization, Department of Nutrition for Health and Development. "Iron deficiency anaemia: assessment, prevention and control: a guide for programme managers." Geneva: World Health Organization, 2001.

World Health Organization. "The Global Prevalence of Anemia in 2011." Geneva: World Health Organization, 2015. http://apps.who.int/iris/bitstream/10665/177094/1/9789241564960_eng.pdf?ua=1&ua=1