

## REVIEW ARTICLE

# Magnitude of anemia and Strategies for Prevention and Control in South East Asia Countries

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Anemia is a condition in which the number of red blood cells (and consequently their oxygen-carrying capacity) is insufficient to meet the body's physiologic needs. Specific physiologic needs vary with a person's age, gender, residential elevation above sea level (altitude), smoking behavior, and different stages of pregnancy (1).

Globally, anemia affects 1.62 billion people (95% CI: 1.50–1.74 billion), which corresponds to 24.8% of the population (95% CI: 22.9–26.7%). The highest prevalence is in preschool-aged children (47.4%, 95% CI: 45.7–49.1), and the lowest prevalence is in adult men (12.7%, 95% CI: 8.6–16.9%). However, the population group with the greatest number of individuals affected is non-pregnant women (468.4 million, 95% CI: 446.2–490.6) (2). The prevalence of anemia is estimated at 9% in countries with high development, in countries with low development, the prevalence is 43% (3).

Anemia impairs health and well-being in women and increases the risk of maternal and neonatal adverse outcomes. Anemia and iron deficiency reduce individuals' well-being, cause fatigue and lethargy, and impair physical capacity and work performance. Median losses in physical productivity due to iron deficiency are important. Failure to reduce anemia worldwide consigns millions of women to impaired health and quality of life, generations of children to impaired development and learning, and communities and nations to

impaired economic productivity and development. Maternal anemia is associated with mortality and morbidity in the mother and baby, including risk of miscarriages, stillbirths, prematurity and low birth weight (4).

Iron deficiency is thought to be the most common cause of anemia globally, but other nutritional deficiencies (including folate, vitamin B12 and vitamin A), acute and chronic inflammation, parasitic infections, and inherited or acquired disorders that affect hemoglobin synthesis, red blood cell production or red blood cell survival, can all cause anemia. Hemoglobin concentration alone cannot be used to diagnose iron deficiency. The prevalence of anemia is an important health indicator when it is used with other measurements of iron status. The hemoglobin concentration can provide information about the severity of iron deficiency (5). Anemia is estimated to contribute to more than 115 000 maternal deaths and 591 000 perinatal deaths globally per year (6). The consequences of morbidity associated with chronic anemia extend to loss of productivity from impaired work capacity, cognitive impairment, and increased susceptibility to infection (7) which also exerts a substantial economic burden (8).

The distribution of countries in the World according to category of anemia as a public health significance in world has been depicted in [Table 1](#). The number of countries which have anemia as a severe Public

Health problem, in under five children, Non pregnant Mothers and pregnant mothers is 69, 32 and 37, respectively (9).

The estimated percentage of anemia that is amenable to iron supplementation is shown in [Table 2](#). In South East Asia (SEA) region countries only 41, 45 and 47 percent of anemia in Under five children, non-pregnant women and pregnant women are amenable to iron supplementation (9). Prevalence of anemia in South Asian countries is the highest among the World. WHO regional estimates generated for preschool-aged children and pregnant and non-pregnant women indicate that the highest proportion of individuals affected were in Africa (47.5–67.6%), while the greatest number of those affected were in South-East Asia, where 315 million (95% CI: 291–340) individuals in these three population groups happened to be affected (6).

In SEA region countries, in addition to iron, the folate deficiency is also a major contributing factor. In recent years, vitamin B12 deficiency is increasingly being reported in some SEA Region countries. Poor bioavailability of iron from plant-based diets rich in phytates is also an important factor responsible for the widespread iron-deficiency anemia (5).

In SEA region moderate and severe anemia is seen even among educated families and the higher income group. There are considerable variations between countries in the prevalence of moderate and severe anemia, which are associated with adverse health consequences (6).

The prevalence of anemia in preschool children, Non-pregnant women, Pregnant women and women in reproductive age group in SEA Region countries is given in [Table 3](#), [Table 4](#), [Table 5](#). Prevalence of anemia in all 4 groups is high in all countries of the SEA region. However, there are substantial differences in the prevalence between countries. Sri Lanka and Thailand have been successful in reducing the prevalence of anemia over the last three decades and hence have relatively lower prevalence of anemia currently (9).

Most countries of the SEA Region have programmes for nutrition education aimed at improving the consumption of micronutrient-rich food and iron

folic acid supplementation to vulnerable groups. Similarly, several countries have also invested in efforts to promote the availability of micronutrient-rich vegetables at affordable cost throughout the year but the coverage achieved under such efforts is very low. In an effort to increase iron intake some of the SEA countries have attempted to fortify commonly consumed inexpensive foodstuffs such as soya sauce and fish sauce in Thailand and salt with iron in India. There had been efforts to fortify rice and wheat flour at the central and local distribution levels and also to ensure that iron and multiple micronutrient sachets be sprinkled over food in order to improve iron intake. None of these have so far been scaled up to national level. As a component of community-based interventions to reduce anemia, there are ongoing programmes of once-daily, twice-a-week and once-a-week iron folic acid supplementation to preschool children, school children and adolescent girls. Some of these programmes cover fairly large populations and have been sustained for several years. Available data from studies evaluating the efficacy of these interventions in terms of reduction in anemia levels and their cost-effectiveness have yielded conflicting results. The current consensus appears to be that while these efforts can improve iron intake and perhaps prevent deterioration in hemoglobin levels, they will not be useful measures for the management of moderate and severe anemia (5).

The programmes for screening, early detection and appropriate management of anemia have been attempted mainly in pregnant women in SEA Countries. Mostly, these efforts have remained hospital-based and so there has not been any substantial reduction in the prevalence of anemia or associated health problems during pregnancy.

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## Tables

**TABLE 1 NUMBER OF COUNTRIES CATEGORIZED BY PUBLIC HEALTH SIGNIFICANCE OF ANEMIA, 2011**

| Category of public health problem* | Children (6–59 months) | Non-pregnant women (15–49 years) | Pregnant women (15–49 years) | All women of reproductive age (15–49 years) |
|------------------------------------|------------------------|----------------------------------|------------------------------|---|
| None                               | 0                      | 0                                | 0                            | 0   |
| Mild                               | 32                     | 44                               | 2                            | 42  |
| Moderate                           | 84                     | 109                              | 146                          | 110   |
| Severe                             | 69                     | 32                               | 37                           | 33  |

*The prevalence of anemia as a Public Health significance is categorized as follows: <5%, no Public Health problem; 5–19.9%, mild Public Health problem; 20–39.9%, moderate Public Health problem; ≥40%, severe Public Health problem.*

**TABLE 2 ESTIMATED PERCENTAGE (95% CI) OF ANEMIA THAT IS AMENDABLE TO IRON SUPPLEMENTATION**

| WHO region                   | Children (6–59 months) | Non-pregnant women (15–49 years) | Pregnant women (15–49 years) |
|------------------------------|------------------------|----------------------------------|------------------------------|
| African Region               | 32 (30 to 34)          | 41 (36 to 46)                    | 44 (42 to 47)                |
| Region of the Americas       | 56 (48 to 63)          | 55 (44 to 62)                    | 60 (52 to 68)                |
| South-East Asia Region       | 41 (34 to 54)          | 45 (35 to 53)                    | 47 (42 to 54)                |
| European Region              | 54 (44 to 65)          | 55 (46 to 61)                    | 62 (54 to 71)                |
| Eastern Mediterranean Region | 38 (33 to 43)          | 45 (39 to 50)                    | 49 (46 to 54)                |
| Western Pacific Region       | 64 (46 to 73)          | 59 (44 to 70)                    | 61 (49 to 72)                |
| Global                       | 42 (38 to 46)          | 49 (43 to 53)                    | 50 (47 to 53)                |

*CI: credibility interval.*

*a Anemia is defined as blood hemoglobin concentration <110 g/L for children and pregnant women and <120 g/L for non-pregnant women*

**TABLE 3 NATIONAL ESTIMATES OF ANEMIA IN COUNTRIES OF SOUTH EAST REGION FOR THE YEAR 2011 FOR CHILDREN AGED 6-59 MONTHS**

| S. No. | Country                               | Mean blood hemoglobin concentration (g/L) |            | Percentage of children with blood hemoglobin concentration <110 g/L |          | Percentage of children with blood hemoglobin concentration <70 g/L |            | Level of public health significance |
|--------|---------------------------------------|---|------------|---|----------|--|------------|-------------------------------------|
|        |                                       | Estimate                                  | 95% CI     | Estimate  | 95% CI   | Estimate   | 95% CI     |                                     |
| 1      | Bangladesh                            | 107                                       | 102 to 112 | 56  | 40 to 70 | 1.1  | 0.3 to 3.4 | Severe                              |
| 2      | Bhutan                                | 107                                       | 98 to 119  | 55  | 24 to 78 | 2.3  | 0.2 to 7.7 | Severe                              |
| 3      | Democratic People's Republic of Korea | 114                                       | 105 to 122 | 34  | 14 to 61 | 0.5  | 0.0 to 2.8 | Moderate                            |
| 4      | India                                 | 106                                       | 101 to 112 | 59  | 40 to 72 | 1.8  | 0.4 to 4.9 | Severe                              |
| 5      | Indonesia                             | 114                                       | 111 to 119 | 32  | 21 to 44 | 0.3  | 0.1 to 1.1 | Moderate                            |
| 6      | Maldives                              | 115                                       | 107 to 122 | 30  | 13 to 56 | 0.4  | 0.0 to 1.8 | Moderate                            |
| 7      | Myanmar                               | 112                                       | 104 to 120 | 40  | 19 to 67 | 0.7  | 0.0 to 3.9 | Severe                              |
| 8      | Nepal                                 | 109                                       | 103 to 114 | 51  | 34 to 68 | 0.9  | 0.2 to 3.1 | Severe                              |
| 9      | Sri Lanka                             | 113                                       | 107 to 120 | 36  | 19 to 56 | 0.2  | 0.0 to 1.1 | Moderate                            |
| 10     | Thailand                              | 116                                       | 107 to 123 | 29  | 11 to 55 | 0.5  | 0.0 to 2.7 | Moderate                            |
| 11     | Timor-Leste                           | 111                                       | 107 to 115 | 45  | 33 to 58 | 0.2  | 0.1 to 0.6 | Severe                              |

**TABLE 4 NATIONAL ESTIMATES OF ANEMIA IN COUNTRIES OF SOUTH EAST REGION FOR THE YEAR 2011 ESTIMATE FOR NON-PREGNANT WOMEN AGED 15-49 YEARS**

| S. No. | Country                               | Mean blood hemoglobin concentration (g/L) |            | Percentage of non-pregnant women with blood hemoglobin concentration <120 g/L |          | Percentage of non-pregnant women with blood hemoglobin concentration <80 g/L |            | Level of public health significance |
|--------|---------------------------------------|---|------------|---|----------|--|------------|-------------------------------------|
|        |                                       | Estimate                                  | 95% CI     | Estimate  | 95% CI   | Estimate   | 95% CI     |                                     |
| 1      | Bangladesh                            | 122                                       | 119 to 124 | 43  | 35 to 50 | 0.7  | 0.3 to 1.3 | Severe                              |
| 2      | Bhutan                                | 121                                       | 112 to 129 | 44  | 21 to 63 | 2.2  | 0.4 to 8.1 | Severe                              |
| 3      | Democratic People's Republic of Korea | 127                                       | 121 to 133 | 25  | 17 to 46 | 0.6  | 0.0 to 2.2 | Moderate                            |
| 4      | India                                 | 119                                       | 113 to 125 | 48  | 29 to 63 | 2.5  | 0.8 to 5.4 | Severe                              |
| 5      | Indonesia                             | 128                                       | 123 to 131 | 22  | 12 to 37 | 0.6  | 0.1 to 1.6 | Moderate                            |
| 6      | Maldives                              | 124                                       | 119 to 128 | 37  | 20 to 52 | 0.6  | 0.1 to 1.9 | Moderate                            |
| 7      | Myanmar                               | 125                                       | 118 to 132 | 30  | 13 to 51 | 1  | 0.1 to 3.1 | Moderate                            |
| 8      | Nepal                                 | 125                                       | 122 to 127 | 36  | 28 to 44 | 0.8  | 0.4 to 1.4 | Moderate                            |
| 9      | Sri Lanka                             | 127                                       | 120 to 132 | 26  | 12 to 46 | 0.7  | 0.1 to 2.3 | Moderate                            |
| 10     | Thailand                              | 127                                       | 115 to 132 | 24  | 10 to 58 | 0.9  | 0.1 to 3.5 | Moderate                            |
| 11     | Timor-Leste                           | 128                                       | 124 to 132 | 22  | 14 to 34 | 0.7  | 0.3 to 1.6 | Moderate                            |

**TABLE 5 NATIONAL ESTIMATES OF ANEMIA IN COUNTRIES OF SOUTH EAST REGION FOR THE YEAR 2011 FOR PREGNANT WOMEN AGED 15-49 YEARS**

| S. No. | Country                               | Mean blood hemoglobin concentration (g/L) |            | Percentage of pregnant women with blood hemoglobin concentration <110 g/L |          | Percentage of pregnant women with blood hemoglobin concentration <70 g/L |            | Level of public health significance |
|--------|---------------------------------------|---|------------|---|----------|--|------------|-------------------------------------|
|        |                                       | Estimate                                  | 95% CI     | Estimate  | 95% CI   | Estimate   | 95% CI     |                                     |
| 1      | Bangladesh                            | 110                                       | 107 to 113 | 48  | 37 to 58 | 0.5  | 0.2 to 1.0 | Severe                              |
| 2      | Bhutan                                | 110                                       | 104 to 118 | 46  | 25 to 67 | 1.2  | 0.2 to 4.2 | Severe                              |
| 3      | Democratic People's Republic of Korea | 118                                       | 111 to 124 | 27  | 14 to 47 | 0.4  | 0.1 to 1.5 | Moderate                            |
| 4      | India                                 | 108                                       | 104 to 113 | 54  | 37 to 67 | 1.3  | 0.5 to 2.8 | Severe                              |
| 5      | Indonesia                             | 117                                       | 109 to 123 | 30  | 17 to 51 | 0.5  | 0.1 to 1.5 | Moderate                            |
| 6      | Maldives                              | 113                                       | 105 to 119 | 39  | 21 to 63 | 0.6  | 0.1 to 1.8 | Moderate                            |
| 7      | Myanmar                               | 115                                       | 108 to 122 | 33  | 18 to 56 | 0.7  | 0.1 to 2.3 | Moderate                            |
| 8      | Nepal                                 | 111                                       | 108 to 115 | 44  | 33 to 56 | 0.6  | 0.3 to 1.3 | Severe                              |
| 9      | Sri Lanka                             | 118                                       | 112 to 124 | 25  | 15 to 42 | 0.4  | 0.0 to 1.5 | Moderate                            |
| 10     | Thailand                              | 117                                       | 104 to 126 | 30  | 12 to 66 | 0.6  | 0.1 to 2.0 | Moderate                            |
| 11     | Timor-Leste                           | 119                                       | 115 to 123 | 24  | 16 to 35 | 0.6  | 0.2 to 1.4 | Moderate                            |

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