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# THE PREVALENCE OF MATERNAL ANEMIA IN DEVELOPING COUNTRIES

## WORKING PAPER: 7B

## April, 1992

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**THE PREVALENCE OF MATERNAL ANEMIA IN DEVELOPING COUNTRIES**

**Nancy L. Sloan and Elizabeth A. Jordan**

# I. INTRODUCTION

Anemia is a condition associated with a deficiency in the quantity of red blood cells (RBC) which reduces the ability to transport oxygen to peripheral tissues. Worldwide, the leading cause of anemia is iron deficiency, but other nutritional deficiencies such as folate and vitamin B12 deficiencies, and other conditions including chronic blood loss (menstruation, childbirth, hemorrhage), chronic infection (malaria, helminths), genetic defects (sickle cell, the thalassemias) and metabolic disorders are also major contributors (1,2,3,4,5,6,7,8,9). Other causes of RBC loss, such as drug and autoimmune reactions, are rare. The term "maternal anemia" refers to anemia in pregnancy or anemia in non-pregnant women of reproductive age, the majority of whom are presumed to be multigravida.

The most recent, comprehensive reviews of maternal anemia are based on collections of data from developing countries prior to 1979 (10,11). These reviews showed that the highest prevalence rates of anemia in reproductive age and pregnant women are found in South Asia and subSaharan Africa, where it is estimated that almost two-thirds of pregnant women and one-half of non-pregnant women are anemic. The purpose of this report is to provide updated information on the prevalence of maternal anemia in developing countries. Working Paper 7A, "The Prevalence of Maternal Anemia in Developing Countries, 1979-1989: An Annotated Bibliography" provides an abstract of each of the papers reviewed in this report.



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## II. METHODOLOGY

This report presents data available from developing countries published in refereed journals or in national or regional reports with country specific data since 1979. References were identified by computer and bibliographic search. Studies covering less than 50 women were excluded from the review. Prevalence rates of maternal anemia were categorized by pregnancy status, and by region and country. Summary tables were compiled indicating the region, country, study, sample frame, sample size, the reported percentage of anemia and the reported mean hemoglobin levels. (Hemoglobin levels were estimated as hematocrit levels divided by 3 for studies reporting hematocrit only.) Although hemoglobin levels do not distinguish between the causes of anemia or hemodilution of pregnancy, they are the most commonly reported indicators of anemia. These tables, therefore, do not distinguish anemia caused by dietary inadequacies (although iron deficiency is presumably the major cause), associated with and compounded by factors such as intestinal parasites and malaria (12,13,14), or hemodilution of pregnancy.

To provide the most complete review possible, and to avoid assumptions about the generalizability of the observed distribution of the hematologic parameters presented in this review, the data reported in the following tables are presented as individual studies utilizing the WHO criteria for anemia (<11.0 g/dl Hb and <12.0 g/dl Hb, for pregnant and non-pregnant reproductive age women, respectively). Anemia prevalence data based upon different criteria (sometimes lower, perhaps to minimize the problem, and sometimes higher, applying the non-pregnant criteria to pregnant women) are presented separately to indicate the digression.

## III. RESULTS

Data from 59 surveys that did not select subjects on the basis of their initial hematologic status are presented. The majority of prevalence studies conducted in developing countries in the past decade and abstracted in this report included 101-300 subjects, similar to studies presented in earlier review articles (13,14). Approximately one-fifth of studies were conducted on sample sizes of 50-100, and very few conducted on samples over 1,000. Seven (22%) of the 32 studies of pregnant women and 15 (56%) of the 27 studies of non-pregnant women had population-based samples; the remainder of the studies drew their samples from hospitals or clinics.

Tables 1 and 2 present specific findings of each study by region and country for pregnant and non-pregnant women, respectively. The reported age distribution of women of reproductive age varies by study, but generally ranges between 15 and 45 years of age (with ages 12 and 49 being the upper and lower limits, respectively). Study sites were presumably selected by investigator preference and therefore do not represent regional, national or even site specific distributions of maternal hematologic status. The variation in subject selection (selective parity, gestational, racial or cultural criteria) and in the prevalence of infectious and parasitic diseases is large, and also limits inference regarding patterns of maternal anemia.

**Observed rates of anemia in pregnant women range from 8 to 94%, with the highest rates of anemia generally in Africa, the Caribbean and Middle South Asia.** Rates ranged as follows by region:

| | |
|---|---|
| Northern Africa | 42-94%, |
| Western Africa | 43-78%, |
| Eastern and Middle Africa | 8-58%, |
| Southern Africa | 17-33%, |
| Caribbean | 60-90%, |
| South America | 14-74%, |
| Middle South Asia | 68-69%. |

Only one study presented similar data in East Asia, reporting a 10% prevalence of anemia, and no studies presented comparable data from the area of Oceania. Mean hemoglobin levels were inversely related to the percent of maternal anemia, and ranged from 9.9-12.9 g/dl. Mean hemoglobin levels below 11 g/dl were observed in 14 (58%) of the 24 studies reporting mean hemoglobin levels for pregnant women.

**Rates of anemia seen in non-pregnant women ranged from 10 to 68%, with generally higher rates of anemia in Africa, the Caribbean and Middle South Asia.** The ranges in anemia rates were, in:

| | |
|---|---|
| Western Africa | 39-58%, |
| South America | 37-55%, |
| Middle South Asia | 25-68%, |
| East Asia | 10-58%, |
| Oceania | 27-40%. |

Only one study presented similar data for Northern, Middle and Southern Africa, and the Caribbean, which were 27, 24, 33 and 59%, respectively. As expected, mean hemoglobin levels

continued to be inversely associated with the prevalence of maternal anemia, and ranged from 9.6-13.2 g/dl. Mean hemoglobin levels below 12 g/dl were observed in 8 (38%) of the 21 studies presenting such data for non-pregnant women.

Data from recent publications of large studies in North America and Northern and Western Europe are provided in Table 3 for comparative purposes. These data generally represent poor population groups, but indicate much lower levels of anemia than study populations in developing countries, even in the groups which are at higher risk of anemia than the general population in the developed country. The prevalence of anemia in pregnant women is 20% or below for all studies, reflecting a sizeable problem even in economically advantaged countries.

## IV. DISCUSSION AND CONCLUSIONS

Most studies were conducted in Western Africa, the Caribbean, Tropical South America and Middle South Asia. The highest rates of anemia in pregnant and non-pregnant women were observed in Africa, the Caribbean and Middle South Asia. The lowest rates of anemia in pregnant women were observed in South America and South Africa. In general, mean hemoglobin levels were inversely related to the prevalence of maternal anemia.

These data, however, must be interpreted with caution. Almost all (79%) data available for pregnant women are derived from hospital or clinic based data, while most data (56%) on women of reproductive age come from population-based studies. The data presented here do not represent regional, national or even site specific distributions of maternal hematologic status, as the selection of study sites was determined by investigator preference. Due to the site and sample selection biases, results of these studies do not render themselves to interpretation of geographic, economic, infectious or dietary patterns.

One conclusion, however, is obvious. If hemoglobin level can be assumed to be a reasonable indicator of maternal anemia, then maternal anemia continues to be a problem of high prevalence in the world. Comparing these data with literature reviews covering the period from the early/mid 1960s to the late 1970s (13,14), the observed ranges of maternal anemia remain substantially unchanged. Regardless of efforts at iron supplementation, fortification, and dietary modification, little, if any, improvement is seen in the status of maternal anemia in the past decades. It is time to ask:

- **Why are these programs aimed at preventing or treating anemia failing?**

and

- **What can be done to effectively reduce this problem of maternal anemia?**

It is clear that iron supplementation in controlled trials improves maternal hematologic status and reduces the prevalence of anemia (see MotherCare Working Paper 15). However, population-based supplementation programs seem not to have achieved much success. Prolonged iron supplementation, investment in fortification, promotion and education of iron supplements, and in resolving logistical problems that hinder availability of iron supplements at the community level, need to be tested to find effective answers to this worldwide problem.

Many studies of maternal anemia continue to be conducted on hospital- or clinic-based populations, with little information emanating from countries not previously involved in the study of maternal anemia and its etiology. Feasibility studies should be conducted to understand and resolve the problems that hinder the effectiveness of these interventions. **Learning from past program errors, and creatively developing and testing new modes of intervention, may be more productive in reducing the prevalence of maternal anemia than further descriptive study.**

**TABLE 1: HEMATOLOGIC STATUS OF PREGNANT WOMEN, BY STUDY, 1979-PRESENT**

| REGION/COUNTRY | POPULATION BASED | N | % ANEMIA | | MEAN Hb g/dl |
|---|---|---|---|---|---|
| | | | <11 g/dl | <OTHER | |
| **Northern Africa** | | | | | |
| Egypt | No | 311 | 94 | | 10.30 |
| Egypt | No | 320 | 62 | | 10.70 |
| **Western Africa** | | | | | |
| Benin | No | 126 | 55 | | 10.50 |
| Liberia | No | 621 | 78 | | 9.90 |
| Nigeria | No | 234 | 43 | | 11.30 |
| Nigeria | No | 68 | 52 | | 10.80 |
| Nigeria | No | 871 | 46 | | 11.57 |
| **Eastern Africa** | | | | | |
| Mozambique | No | 881 | 58 | | |
| **Middle Africa** | | | | | |
| Cameroon | Yes | 90 | 08 | | 12.90 |
| Chad | No | 112 | 25 | | 12.23 |
| **Southern Africa** | | | | | |
| South Africa | No | 224 | 17 | | 12.10 |
| South Africa | No | 229 | 33 | | 11.40 |
| South Africa | No | 100 | | | 12.30 |
| **Caribbean** | | | | | |
| Antigua | No | 159 | 60 | | 10.50 |
| · Montserrat | Yes | 138 | 90 | | 10.00 |
| · Montserrat | Yes | 164 | 82 | | 10.20 |
| · Turks & Caicos | No | 1042 | 68 | | 10.40 |
| **Tropical South America** | | | | | |
| Brazil | No | 51 | 14 | | |
| Colombia | Yes | * | 24 | | |

**TABLE 1: HEMATOLOGIC STATUS OF PREGNANT WOMEN, BY STUDY, 1979-PRESENT**

| REGION/COUNTRY | POPULATION BASED | N | % ANEMIA | | MEAN Hb g/dl |
|---|---|---|---|---|---|
| | | | <11 g/dl | <OTHER | |
| **Tropical South America (cont.)** | | | | | |
| Ecuador | No | 84 | | | 12.40 |
| Ecuador | Yes | * | 21 | | |
| **Middle South Asia** | | | | | |
| India | Yes | 246 | 68 | | 10.20 |
| **Middle South Asia** | | | | | |
| India | No | 308 | | 0.31 | |
| India | No | 206 | 69 | | 9.90 |
| India | No | 613 | | 0.30 | 12.00 |
| **East Asia** | | | | | |
| China | No | 225 | | .28 | |
| Taiwan | No | 221 | 10 | | 12.60 |
| **Oceania** | | | | | |
| Papua New Guinea | No | 100 | | 0.44 | 9.91 |

* No sample size given

## TABLE 2 HEMATOLOGIC STATUS OF NON-PREGNANT WOMEN, BY STUDY, 1979-PRESENT

| REGION/COUNTRY | POPULATION BASED | N | % ANEMIA | | MEAN Hb g/dl |
|---|---|---|---|---|---|
| | | | <12 g/dl | <OTHER | |
| **Northern Africa** | | | | | |
| Algeria | No | 254 | 27 | | 12.60 |
| **Western Africa** | | | | | |
| Benin | Yes | 517 | 41 | | 12.10 |
| Benin | Yes | 95 | 39 | | 12.10 |
| Benin | Yes | 102 | 46 | | 12.10 |
| Nigeria | No | 66 | 46 | | 12.10 |
| Nigeria | No | 232 | | | 10.70 |
| Nigeria | No | 100 | | | 11.00 |
| Senegal | No | 172 | 58 | | |
| **Middle Africa** | | | | | |
| Chad | No | 114 | 24 | | 13.10 |
| **Southern Africa** | | | | | |
| South Africa | No | 328 | 33 | | 12.40 |
| **Caribbean** | | | | | |
| Jamaica | No | 689 | | | 12.40 |
| Jamaica | Yes | 229 | | | 10.40 |
| Jamaica | Yes | 423 | 59 | | 11.80 |
| **Tropical South America** | | | | | |
| Colombia | Yes | * | 37 | | |
| Guyana | Yes | 84 | 55 | | 11.60 |
| **Middle South Asia** | | | | | |
| Bangladesh | Yes | * | | 0.23 | 11.67 |
| India | Yes | 200 | 68 | | 9.60 |
| India | Yes | 246 | 25 | | 12.30 |
| India | Yes | 100 | 57 | | |
| Pakistan | No | 200 | 30 | | |

**TABLE 2 HEMATOLOGIC STATUS OF NON-PREGNANT WOMEN, BY STUDY, 1979-PRESENT**

| REGION/COUNTRY | POPULATION BASED | N | % ANEMIA | | MEAN Hb g/dl |
|---|---|---|---|---|---|
| | | | <12 g/dl | <OTHER | |
| **East Asia** | | | | | |
| China | No | 421 | 10 | | 13.20 |
| Malaysia | No | 229 | 58 | | 11.70 |
| Philippines | Yes | 566 | 10 | | 13.20 |
| **Oceania** | | | | | |
| Australia | No | 243 | 27 | | |
| Fiji | Yes | 231 | 40 | | 12.00 |
| Fiji | Yes | 213 | 32 | | 12.30 |
| Vanuata | Yes | 1277 | | 0.24 | |

* No sample size given

## TABLE 3: HEMATOLOGIC STATUS BY PREGNANCY STATUS AND REGION, 1979-1989

| REGION/COUNTRY | PREGNANT | | | NON-PREGNANT | | |
|---|---|---|---|---|---|---|
| | # Studies (% Pop-based) | % Anemia <11 g/dl | Mean Hb g/dl | # Studies (% Pop-Based) | % Anemia <12 g/dl | Mean Hb g/dl |
| Northern America | 1 (0) | 19.0 | 12.0 | 3 (100) | 7.6 | 13.3** |
| Northern Europe | 1 (0) | 9.4 | 13.2 | 2 (0) | 40.0* | 12.8 |
| Western Europe | 2 (0) | 20.1 | 12.0 | | | |

* Excludes one study due to lack of information or criteria other than WHO.
** Excludes two studies due to lack of information or criteria other than WHO.
*** Excludes three studies due to lack of information or criteria other than WHO.
\+ Reported criteria other than WHO.
NR Not reported.

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