GUIDELINE

IRON SUPPLEMENTATION

in postpartum women

2016

World Health Organization

Guideline:

IRON SUPPLEMENTATION IN POSTPARTUM WOMEN

WHO Library Cataloguing-in-Publication Data

Guideline: Iron supplementation in postpartum women

1.Iron - administration and dosage. 2.Anemia, Iron-Deficiency - prevention and control. 3.Postpartum period. 4.Women. 5.Dietary Supplements. 6.Guideline. I.World Health Organization.

ISBN 978 92 4 154958 5 (NLM classification: WH 160)

Printed by the WHO Document Production Services, Geneva, Switzerland

Cover design and document layout: Christopher Yuen

SUGGESTED CITATION

Guideline: Iron supplementation in postpartum women. Geneva: World Health Organization; 2016.

CONTENTS

ACKNOWLEDGEMENTS

This guideline was coordinated by the World Health Organization (WHO) Evidence and Programme Guidance Unit, Department of Nutrition for Health and Development. Dr Lisa Rogers and Dr Juan Pablo Peña-Rosas oversaw the preparation of this document. WHO acknowledges the technical contributions of the following individuals (in alphabetical order): Ms Hala Boukerdenna, Dr Christian Breymann, Dr Luz Maria De-Regil, Ms Rae Galloway, Dr Pura Rayco-Solon, Dr Hanne Wielandt and Mr Gerardo Zamora.

We would like to express our gratitude to the WHO Guidelines Review Committee Secretariat and members of the Guidelines Review Committee for their technical support throughout the process. Thanks are also due to Mr Issa T Matta and Ms Chantal Streijffert Garon from the WHO Office of the Legal Counsel, for their support in the management of conflicts-of-interest procedures. Mrs Paule Pillard and Ms Jennifer Volonnino from the Evidence and Programme Guidance Unit, Department of Nutrition for Health and Development, provided logistic support.

WHO gratefully acknowledges the technical input of the members of the WHO Steering Committee for Nutrition Guidelines Development and the WHO guidelines development groups, especially the chair of the meeting concerning this guideline, Dr Igor Veljkovik. WHO is also grateful to the Cochrane Pregnancy and Childbirth Group staff for their support during the development of the systematic review used to inform this guideline.

Financial support

WHO thanks the Bill & Melinda Gates Foundation for providing financial support for this work. The Micronutrient Initiative and the International Micronutrient Malnutrition Prevention and Control Program of the United States Centers for Disease Control and Prevention (CDC) provided financial support to the Evidence and Programme Guidance Unit, Department of Nutrition for Health and Development, for the commissioning of systematic reviews of nutrition interventions. Donors do not fund specific guidelines and do not participate in any decision related to the guideline development process, including the composition of research questions, membership of the guideline groups, conduct and interpretation of systematic reviews, or formulation of recommendations.

WHO GUIDELINE[1]: IRON SUPPLEMENTATION IN POSTPARTUM WOMEN

EXECUTIVE SUMMARY

Iron deficiency is one of the most common forms of nutritional deficiencies, particularly among vulnerable groups such as women, children and low-income populations. Iron deficiency often precedes anaemia, and anaemia during pregnancy is one of the strongest predictors of anaemia during the postpartum period, beginning just after childbirth throughout the subsequent 6 weeks. The consequences of iron deficiency and anaemia during the postpartum period can be serious and have long-term health implications for the mother and her infant.

This guideline reviews the evidence on the safety and effectiveness of iron supplementation in postpartum women.

Purpose of the guideline

This guideline aims to help Member States and their partners in their efforts to make informed decisions on the appropriate nutrition actions to achieve the *Sustainable Development Goals (1)*, the global targets set in the *Comprehensive implementation plan on maternal, infant and young child nutrition (2)* and the *Global strategy for women's, children's and adolescents' health (2016–2030) (3)*.

The recommendation in this guideline is intended for a wide audience, including policy-makers, their expert advisers, economists, and technical and programme staff at organizations involved in the design, implementation and scaling-up of programmes for the prevention of anaemia, and in nutrition actions for public health.

The recommendation supersedes the previous WHO recommendation on iron supplementation in postpartum women *(4)*.

Guideline development methodology

WHO developed the present evidence-informed recommendation using the procedures outlined in the *WHO handbook for guideline development (5)*. The steps in this process included: (i) identification of priority questions and outcomes; (ii) retrieval of the evidence; (iii) assessment and synthesis of the evidence; (iv) formulation of recommendations, including research priorities; and planning for (v) dissemination; (vi) implementation, equity and ethical considerations; and (vii) impact evaluation and updating of the guideline. The Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology was followed *(6)*, to prepare evidence profiles related to preselected topics, based on up-to-date systematic reviews.

The guideline development group consisted of content experts, methodologists, and representatives of potential stakeholders and beneficiaries. This expert group participated in a WHO technical consultation concerning this guideline held on 18–21 February 2013 in Geneva, Switzerland. Four experts served as technical peer-reviewers of the draft guideline.

[1] This publication is a World Health Organization (WHO) guideline. A WHO guideline is any document, whatever its title, containing WHO recommendations about health interventions, whether they be clinical, public health or policy interventions. A standard guideline is produced in response to a request for guidance in relation to a change in practice, or controversy in a single clinical or policy area, and is not expected to cover the full scope of the condition or public health problem. A recommendation provides information about what policy-makers, health-care providers or patients should do. It implies a choice between different interventions that have an impact on health and that have ramifications for the use of resources. All publications containing WHO recommendations are approved by the WHO Guidelines Review Committee.

Available evidence

The available evidence comprised a Cochrane systematic review that followed the procedures of the *Cochrane handbook for systematic reviews of interventions (7)* and assessed whether supplements with iron alone or in combination with folic acid and/or other vitamins and minerals, given to postpartum women, could safely improve maternal outcomes. The maternal outcomes considered critical for decision-making by the WHO guideline development group were anaemia, iron deficiency, iron deficiency anaemia and morbidity, particularly malaria incidence and severity. The guideline development group did not consider any infant outcomes to be critical for decision-making for this intervention. There were few studies with small sample sizes, which led to limited evidence of a positive effect of postpartum iron supplementation on maternal anaemia and iron deficiency, but no evidence of an effect on maternal iron deficiency anaemia in women receiving iron supplementation compared with women not receiving iron supplementation. Only one trial reported on side-effects during the intervention period, indicating no differences between women receiving iron supplementation alone compared to women receiving a placebo. As there is limited evidence to directly assess the benefits of iron supplementation in postpartum women, and because there are current recommendations on iron supplementation in women before and after the postpartum period (e.g. pregnant women and menstruating women), indirect evidence from these population groups was felt to provide additional input for discussions to inform the recommendations for women after childbirth.

The overall quality of the available direct evidence for iron supplementation alone or in combination with other vitamins and minerals in postpartum women, for the critical outcomes of maternal anaemia, iron deficiency and iron deficiency anaemia, was low to very low.

Recommendation[1]

- Oral iron supplementation, either alone or in combination with folic acid supplementation, may be provided to postpartum women for 6–12 weeks following delivery for reducing the risk of anaemia in settings where gestational anaemia is of public health concern[2] (*conditional recommendation, low quality of evidence*).

Key remarks

The remarks in this section are intended to give some considerations for implementation of the recommendation, based on the discussion of the guideline development group.

- For ease of implementation and continuity of care, postpartum supplementation should begin as early as possible after delivery, and the iron-supplementation regimen (e.g. dose and whether consumed daily or weekly) should follow that used during pregnancy, or alternatively should start with that planned for menstruating women.

- In cases in which a woman is diagnosed with anaemia in a clinical setting, she should be treated in accordance with the country's policy, or the WHO recommendation of daily iron (120 mg of elemental iron plus 400 µg folic acid) supplements, until her haemoglobin concentration rises to normal.

[1] This recommendation supersedes the previous WHO recommendation on iron supplementation in postpartum women *(4)*.

[2] WHO considers a 20% or higher population prevalence of gestational anaemia to be a moderate public health problem *(4)*.

Research priorities

Discussions between the members of the WHO guideline development group and the external review group highlighted the limited evidence available in some knowledge areas, meriting further research on iron supplementation in postpartum women, particularly in the following areas:

- more randomized controlled trials with an adequate sample size, using comparable techniques are necessary to determine:
  - the adverse effects of iron supplementation in this period, including iron overload;
  - the optimal dose, schedule (daily, intermittent) and duration of iron supplementation to benefit both the mother and infant;
  - the effect of iron supplementation on maternal morbidity, productivity and time to return to regular activity, postpartum depression, maternal well-being, breastfeeding practices, and infant function outcomes (e.g. cognitive and motor development);
- programmatic research to explore factors related to the feasibility of linking supplementation programmes (pregnancy, menstruating women), cost-effectiveness, integration into maternal and neonatal health platforms, and minimum support needed to ensure adequate coverage of and adherence to postpartum iron-supplementation programmes.

WHO GUIDELINE[1]: IRON SUPPLEMENTATION IN POSTPARTUM WOMEN

SCOPE AND PURPOSE

This guideline provides a global, evidence-informed recommendation on iron supplementation in postpartum women, as a public health intervention for the purpose of improving maternal and infant health outcomes.

The guideline aims to help Member States and their partners in their efforts to make informed decisions on the appropriate nutrition actions to achieve the *Sustainable Development Goals* (SDGs) *(1)*, in particular, Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture. It will also support Member States in their efforts to achieve the global targets of the *Comprehensive implementation plan on maternal, infant and young child nutrition*, as endorsed by the Sixty-fifth World Health Assembly in resolution WHA65.6 *(2)* and the *Global strategy for women's, children's and adolescents' health (2016–2030) (3)*.

The recommendation in this guideline is intended for a wide audience, including policy-makers, their expert advisers, and technical and programme staff at organizations involved in the design, implementation and scaling-up of programmes for anaemia prevention and control, and in nutrition actions for public health. This guideline is intended to contribute to discussions among stakeholders when selecting or prioritizing interventions to be undertaken in their specific context. This document presents the key recommendations and a summary of the supporting evidence. Further details of the evidence base are provided in Annex 1 and other documents listed in the references.

BACKGROUND

Anaemia is a condition in which there is too little haemoglobin, which is carried by red blood cells, thereby decreasing the capacity of the blood to carry sufficient oxygen to meet physiological needs. There are a number of causes of anaemia, including blood loss, iron deficiency and other micronutrient deficiencies (e.g. vitamin A, folate, vitamin B_{12} and riboflavin), inherited haemoglobin disorders (e.g. sickle-cell disease and thalassaemias), parasitic infections and other acute and chronic infections that cause inflammation *(4).* Iron deficiency often occurs before anaemia and is considered to be one of the most common forms of nutritional anaemia.

In comparison with pregnancy, maternal iron requirements usually decline during the postpartum period, defined as the period beginning just after childbirth throughout the subsequent 6 weeks *(8)*. However, this period may serve as a time to restore iron lost during pregnancy and delivery. Maternal iron stores are not utilized for production of breast milk, since very little iron is excreted through breast milk *(9, 10)*. Nevertheless, one of the strongest predictors of postpartum anaemia is anaemia during pregnancy, as iron stores tend to remain low for several months after childbirth, especially if there is significant blood loss during the delivery and additional iron is not consumed in sufficient quantities *(11–13)*. Worldwide, there are limited data on the prevalence of postpartum anaemia. Studies conducted in high-income countries have reported that 10–30% of postpartum women were anaemic *(8, 11, 14–16)*. Larger datasets for all women of reproductive age and pregnant women suggest that anaemia is a common problem throughout the world *(17, 18)* and the prevalence of anaemia in postpartum women may be higher in low- and middle-income countries, as compared to published figures for postpartum women in high-income countries.

[1] This publication is a World Health Organization (WHO) guideline. A WHO guideline is any document, whatever its title, containing WHO recommendations about health interventions, whether they be clinical, public health or policy interventions. A standard guideline is produced in response to a request for guidance in relation to a change in practice, or controversy in a single clinical or policy area, and is not expected to cover the full scope of the condition or public health problem. A recommendation provides information about what policy-makers, health-care providers or patients should do. It implies a choice between different interventions that have an impact on health and that have ramifications for the use of resources. All publications containing WHO recommendations are approved by the WHO Guidelines Review Committee.

Iron deficiency and anaemia during the postpartum period may have long-term health implications for the mother and her infant. Mothers with low iron stores at the time of delivery and following childbirth may experience fatigue, altered cognition and depressive symptoms *(19)*. These alterations in the mother's emotional and cognitive functioning may, in turn, affect her interactions with the infant and may negatively impact infant behaviour and development *(20)*. If iron stores are not restored soon after childbirth, the negative consequences of postpartum iron deficiency and anaemia may continue through other stages of the reproductive cycle, particularly in areas where there is a high prevalence of anaemia and among women consuming diets that are low in bioavailable iron and who have short inter-pregnancy intervals (less than 18 months); this can lead to continued adverse maternal and infant outcomes *(21–24)*.

WHO and the Food and Agriculture Organization of the United Nations recommended nutrient intake for iron in lactating women ranges from 10 to 30 mg per day *(25)*, depending on the bioavailability of dietary iron *(26)*. Iron absorption is affected by the type of iron in the diet. Non-haeme iron is the main form of dietary iron and is present in many vegetables. Its absorption is affected by an individual's iron status and by several factors in the diet, including phytates, iron-binding phenolic compounds, and calcium, which decrease absorption, and ascorbic acid, which facilitates absorption *(26)*. Conversely, the absorption of haeme iron, present only in meat, poultry and fish, is less affected by dietary factors and is regulated by the iron status of an individual and the total amount of dietary haeme iron consumed. Iron supplementation has proven to be effective for increasing haemoglobin concentrations among pregnant and non-pregnant women *(27–30)*, and iron supplementation has been recommended as a public health approach to improve maternal and infant health outcomes in different age groups *(4)*. In some women, the oral consumption of iron supplements has been associated with side-effects affecting the gastrointestinal system, such as diarrhoea, constipation, nausea and vomiting *(4)*. These symptoms generally increase in severity with increasing amounts of elemental iron and when the supplement is taken on an empty stomach. An increased incidence of gastrointestinal side-effects in adults receiving 25–222 mg of elemental iron daily as ferrous sulfate, the most common iron compound prescribed, compared to those receiving a placebo, has been reported, but the relationship between gastrointestinal side-effects of supplementation and the dose of iron remains unclear *(31)*.

OBJECTIVES

The recommendation in this guideline supersedes those of previous WHO guidelines on iron supplementation, such as *Iron deficiency anaemia: assessment, prevention, and control. A guide for programme managers (4)*, as they pertain specifically to lactating women.

SUMMARY OF AVAILABLE EVIDENCE

A Cochrane systematic review was conducted to assess whether oral supplements with iron alone or in combination with folic acid and/or other vitamins and minerals given to postpartum women safely improved maternal and infant health outcomes *(32)*. The maternal outcomes considered critical for decision-making by the WHO guideline development group were anaemia, iron deficiency, iron deficiency anaemia and morbidity, particularly malaria incidence and severity (see Annexes 1–3). The guideline development group did not consider any infant outcomes to be critical for decision-making for this intervention. The overall quality of the available direct evidence for iron supplementation in postpartum women was low or very low for the critical outcomes (see Annex 1) *(32)*.

The review included three trials (*n* = 320 women) conducted in China (Hong Kong Special Administrative Region), Mexico and Turkey *(32)*. The sample size from all studies was small, ranging between 83 and 168 women. Women with and without anaemia and mixed populations were included in the trials. Supplementation was initiated in the early postpartum period, with the timing of initiation of supplementation ranging between 1.5 and 5 weeks postpartum. The duration of supplementation also varied, ranging from 6 weeks to 6 months. Two trials compared supplementation with iron alone versus placebo *(33, 34)*, while the other trial compared supplementation with iron plus folic acid plus other vitamins and minerals versus folic acid plus other vitamins and minerals (without iron) *(35)*. Two trials provided iron as ferrous sulfate *(33, 34)*, while the remaining trial did not specify the type of iron compound used *(35)*. The daily dose ranged from 18 mg to 195 mg of elemental iron. In the trial of iron plus folic acid plus other vitamins and minerals, a daily multiple micronutrient containing 400 µg (0.4 mg) folic acid and 18 mg elemental iron was provided *(35)*.

Only one trial reported on the critical maternal outcome of anaemia *(34)* and two trials reported on maternal iron deficiency *(33, 34)* and iron deficiency anaemia *(33, 35)*. No trials reported on the critical outcome of maternal morbidity. Women receiving 65 mg elemental iron as ferrous sulfate three times daily for 6 weeks were less likely to have anaemia at the end of intervention compared to women receiving a placebo (risk ratio [RR]: 0.35; 95% confidence interval [CI]: 0.18 to 0.65; 1 trial, *n* = 122, low quality of evidence) *(32)*. Postpartum supplementation with iron alone (80 mg elemental iron once daily *(33)* or 65 mg elemental iron three times daily *(34)* was also associated with a reduction in iron deficiency compared to women receiving placebo (RR: 0.30; 95% CI: 0.13 to 0.67; 2 trials, *n* = 254, low quality of evidence). Although fewer postpartum women who received either iron alone (80 mg elemental iron) *(33)* or a multiple micronutrient supplement containing 18 mg elemental iron and 400 µg (0.4 mg) folic acid *(35)* had iron deficiency anaemia at the end of the intervention compared to controls, the difference between the groups was not significant (RR: 0.29; 95% CI: 0.07 to 1.12; 2 trials, *n* = 198, very low quality of evidence).

Outcomes judged to be non-critical by the guideline development group but that were reported in the trials include blood haemoglobin and ferritin concentrations. All three trials measured maternal haemoglobin *(33–35)*, but only two trials reported mean haemoglobin concentrations by intervention group *(33, 34)*. In the third trial, haemoglobin concentration was presented as the median for the treatment and placebo groups combined, noting that the values did not differ by treatment group *(35)*. In the two trials, there was no clear evidence of a difference in haemoglobin concentrations after the intervention between women receiving iron alone and women receiving a placebo (mean difference [MD]: 3.84 g/L; 95% CI: –0.06 to 7.75; 2 trials, *n* = 154, very low quality of evidence). All three trials also measured ferritin concentrations, but only one trial reported the mean maternal ferritin concentration, which indicated no difference in concentrations in women receiving 80 mg elemental iron alone compared to women receiving placebo (MD: –1.03 µg/L; 95% CI: –14.69 to 12.63; 1 trial, *n* = 132, very low quality of evidence) *(33)*.

Maternal side-effects during the intervention were measured in two trials *(33, 34)* but only one presented usable data *(33)*; it reported the prevalence of side-effects of constipation, abdominal pain, tooth/faeces pigmentation, nausea, vomiting and diarrhoea. The number of mothers experiencing these side-effects was presented for each side-effect individually, as well as the total number of mothers with a complaint collectively. There were no clear differences in the number of women receiving iron alone versus placebo and reporting constipation (RR: 0.82; 95% C:I 0.36 to 1.89; *n* = 132), abdominal pain (RR: 2.13; 95% CI: 0.58 to 7.89; *n* = 132), tooth/faeces pigmentation (RR: 8.23; 95% CI: 0.45 to 149.85; *n* = 132), nausea (RR: 0.46; 95% CI: 0.04 to 4.91; *n* = 132), vomiting (RR: 0.91; 95% CI: 0.06 to 14.29; *n* = 132) or diarrhoea (RR: 2.74; 95% CI: 0.11 to 66.13; *n* = 132). Collectively, there also was no clear evidence of any difference in the number of women reporting any gastrointestinal side-effects between those receiving 80 mg elemental iron alone and those receiving a placebo (RR: 1.31; 95% CI: 0.77 to 2.25; *n* = 132, very low quality of evidence). In the second trial, side-effects were measured but it was only reported that there was no difference in nausea, vomiting or constipation between the treatment (65 mg elemental iron three times daily) and placebo groups of women

who consumed a comparable amount of iron or placebo tablets *(34)*. Owing to the small number of studies, planned subgroup analyses by total duration of supplementation, regimen (iron alone versus in combination with other micronutrients), breastfeeding practices or malaria endemicity of the trial site could not be conducted. Additionally, all trials used a daily supplementation scheme and no trials provided intermittent supplementation.

As very limited evidence was available on the effect of postpartum iron supplementation for the identified critical outcomes, indirect evidence on iron supplementation in pregnant women and menstruating women, as well as current guidelines on iron supplementation in these population groups, was discussed *(36–38)*. WHO currently recommends daily oral iron and folic acid supplementation for pregnant women, as part of antenatal care to reduce the risk of low birth weight, maternal anaemia and iron deficiency (strong recommendation) *(38)*. This recommendation is based on a systematic review that assessed the benefits and harms of iron supplementation in healthy pregnant women *(27)*. The review compared daily supplementation with iron alone, or in combination with folic acid or other micronutrients, with no intervention, placebo or versus the use of the same supplements (but without iron) among pregnant women. Daily iron supplementation reduced the risk of maternal anaemia at term by 70% (RR: 0.30; 95% CI 0.19 to 0.46; 14 trials; *n*=2199, moderate quality of evidence) and iron deficiency at term by 57% (RR: 0.43; 95% CI 0.27 to 0.66, 7 trials, *n*=1256, moderate quality of evidence) but had no clear effect on the risk of infections (including urinary tract infections and others) during pregnancy (RR: 1.16; 95% CI: 0.83 to 1.63; 2 trials, *n*=1321, low quality of evidence) *(38)*. Women receiving iron supplements tended to report side-effects of any kind more frequently than those taking placebo or supplements without iron (RR: 2.36; 95% CI: 0.96 to 5.82; 11 studies, *n*=4418, very low quality of evidence). The daily dose of elemental iron provided in the trials ranged from 9 mg to 90 mg *(27)*.

As an alternative to a daily regimen, non-anaemic pregnant women living in areas where the prevalence of anaemia among pregnant women is lower than 20% may opt for intermittent iron and folic acid supplementation, which WHO recommends for the prevention of anaemia and improvement of gestational outcomes (strong recommendation) *(37)*. This recommendation is based on a systematic review assessing the benefits and harms of intermittent oral iron supplementation during pregnancy *(30)*. The review compared the intermittent use of iron supplements alone, or in combination with folic acid or other micronutrients, and the same supplements given on a daily basis to pregnant women. There was no difference between women taking iron supplements intermittently (alone or in combination with other micronutrients) and those receiving daily supplements, with respect to maternal anaemia at term (RR: 1.22; 95% CI: 0.84 to 1.80; 4 trials, *n*=676, very low quality of evidence) and maternal iron deficiency anaemia at term (RR: 0.71; 95% CI: 0.08 to 6.63; 1 trial, *n*=156, very low quality of evidence). Women receiving intermittent supplementation reported fewer side-effects of any kind compared to women receiving daily supplementation (RR: 0.56; 95% CI: 0.37 to 0.84; 11 trials, *n*=1777, very low quality of evidence) *(30)*.

In addition to iron and folic acid supplementation in pregnancy, WHO recommends intermittent iron and folic acid supplementation in menstruating women living in settings where the prevalence of anaemia among non-pregnant women of reproductive age is 20% or higher, to improve their haemoglobin concentrations and iron status and reduce the risk of anaemia (strong recommendation) *(36)*. This recommendation is based on a systematic review assessing the benefits and harms of intermittent iron supplementation for reducing anaemia and its associated impairments in menstruating women *(29)*. This review compared the intermittent use of iron supplements alone, or in combination with folic acid or other micronutrients, versus no intervention or placebo, and versus the same supplements given on a daily basis to pubescent girls and menstruating women. Women taking intermittent iron supplements (alone or in combination with folic acid or other micronutrients) were less likely to develop anaemia than those who did not receive the supplements or were given a placebo (RR: 0.73; 95% CI: 0.56 to 0.95; 10 trials, *n*=2996, low quality of evidence). There were fewer studies that assessed additional critical outcomes and there was no clear difference between women

receiving intermittent iron supplementation (alone or with other micronutrients) and those receiving placebo or no intervention, with respect to maternal iron deficiency (RR: 0.50; 95% CI: 0.24 to 1.04; 3 trials, *n*=624, low quality of evidence), iron deficiency anaemia (RR: 0.07; 95% CI: 0 to 1.16; 1 trial, *n*=193, very low quality of evidence) all-cause morbidity (RR: 1.12; 95% CI: 0.82 to 1.52; 1 trial, *n*=119, very low quality of evidence), and side-effects (RR: 1.98; 95% CI: 0.31 to 12.72; 3 trials, *n*=630) *(29)*.

As presented in the individual results, the quality of evidence for the critical outcomes ranges from low to very low, using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology *(7, 39, 40)*. The GRADE summary of findings table for oral iron or iron and folic acid supplementation compared to placebo or control in postpartum women is shown in Annex 1.

RECOMMENDATION

- Oral iron supplementation, either alone or in combination with folic acid, may be provided to postpartum women for 6–12 weeks following delivery for reducing the risk of anaemia in settings where gestational anaemia is of public health concern[1] (*conditional recommendation, low quality of evidence*).[2]

REMARKS

The remarks in this section are intended to give some considerations for implementation of the recommendation, based on the discussion of the guideline development group.

- This recommendation is applicable to all postpartum women, irrespective of their lactation status.

- For ease of implementation and continuity of care, postpartum supplementation should begin as early as possible after delivery and the iron supplementation regimen (e.g. dose and whether consumed daily or weekly) should follow that used during pregnancy *(37, 38)*, or alternatively should start with that planned for menstruating women *(36)*.

- Women should receive counselling on why and how to take iron and folic acid supplements. They should be informed of the common side-effects and be advised on how to manage them (e.g. take with meals or at bedtime) *(4)*.

- Once menses has returned, women should receive supplementation in accordance with the country's policy or WHO guidance on iron and folic acid supplementation for menstruating women *(36)*.

- In cases in which a woman is diagnosed with anaemia *(41)*, she should be treated in accordance with the country's policy or the WHO recommendation of daily iron (120 mg of elemental iron plus 400 µg folic acid) supplements until haemoglobin concentrations rise to normal *(4, 42)*.

- In malaria-endemic areas, provision of iron and folic acid supplements should be implemented in conjunction with measures to prevent, diagnose and treat malaria *(43, 44)*. In areas using sulfadoxine–pyrimethamine, high doses of folic acid should be avoided, as they may interfere with the efficacy of this antimalarial drug *(45, 46)*.

[1] WHO considers a 20% or higher population prevalence of gestational anaemia to be a moderate public health problem *(4)*.

[2] A conditional recommendation is one for which the guideline development group concludes that the desirable effects of adherence probably outweigh the undesirable effects, although the trade-offs are uncertain. The recommendation can be either in favour of or against an intervention. Implications of a conditional recommendation for patients are that while many people in their situation would desire the recommended course of action, a considerable proportion would not. Implications for clinicians are that they should help patients make a decision that is consistent with their values. With regard to policy-makers, a conditional recommendation means that there is a need for substantial debate and involvement from stakeholders before considering the adoption of the recommendation, and for funding agencies it means that the intervention may not represent an appropriate allocation of resources (i.e. alternative uses of resources may produce greater benefits).

- An iron and folic acid supplementation programme should ideally form part of an integrated programme for postnatal care *(47)* that promotes exclusive breastfeeding in the first 6 months and continued breastfeeding, screening of all women for anaemia at postpartum visits, use of complementary measures to control and prevent anaemia, and a referral system to manage cases of severe anaemia. Particular attention should be given to identifying potential barriers to equitable access to health care, including postnatal care, suffered by population groups most vulnerable to iron deficiency and iron deficiency anaemia, such as women in rural areas, women in low-income groups, women from racial or ethnic groups discriminated against, or women in settings where prevailing gender norms greatly disempower them over their body and health. Country programmes should be culturally appropriate to the target populations, so that the intervention is accepted, adopted and sustained.

- Oral supplements are available in capsules or tablets (soluble, dissolvable and modified-release tablets) *(48)*. A strong quality-assurance process is important to guarantee that supplements are manufactured, packaged and stored in a controlled and uncontaminated environment *(49)*. Distributers and women should monitor the expiration dates of the supplements, to ensure they are not provided or taken after their expiration date.

- Iron supplements are prepared using a variety of iron compounds, primarily containing ferrous compounds (e.g. fumarate, gluconate, sulfate) that are better absorbed then ferric iron *(50)*. The WHO Essential Medicines List (EML) specifies that iron supplements should contain a ferrous salt *(51)*.

- In all settings, breastfeeding mothers should be encouraged to receive adequate nutrition, which is best achieved through consumption of a healthy, balanced diet (that includes meat, fish, poultry and legumes when available and culturally appropriate), and to refer to guidelines on healthy eating during breastfeeding *(52)*.

- An efficient system for the routine collection of relevant data, including therapeutic adherence and measures of programme performance, is critical to ensure supplementation programmes are effective and sustained. Monitoring is key to identifying barriers that might be maintaining unequal access to postnatal care, including iron and folic acid supplementation, thus preserving health inequities. Sustained implementation and scale-up greatly benefit from appropriate monitoring mechanisms.

RESEARCH PRIORITIES

Discussions among members of the WHO guideline development group and the external review group highlighted the limited evidence available in some areas, meriting further research on iron supplementation in postpartum women, in particular in the following areas:

- the adverse effects of iron supplementation in this period, including iron overload;

- the optimal dose, schedule and duration of iron supplementation to benefit both the mother and infant;

- the effect of iron supplementation on maternal morbidity, productivity and time to return to regular activity, postpartum depression, maternal well-being, breastfeeding practices, and infant function outcomes (e.g. cognitive and motor development);

- programmatic research to explore factors related to the feasibility of linking supplementation programmes (pregnancy, menstruating women), cost-effectiveness, integration into maternal and neonatal health platforms, and minimum support needed to ensure adequate coverage of and adherence to postpartum iron-supplementation programmes.

DISSEMINATION, IMPLEMENTATION AND ETHICAL CONSIDERATIONS

Dissemination

The current guideline will be disseminated through electronic media such as slide presentations and the World Wide Web, through either the WHO Nutrition mailing lists *(53)*, social media, the WHO nutrition website *(58)* or the WHO e-Library of Evidence for Nutrition Actions (*eLENA*) *(54)*. eLENA compiles and displays WHO guidelines related to nutrition, along with complementary documents such as systematic reviews and other evidence that informed the guidelines; biological and behavioural rationales; and additional resources produced by Member States and global partners. In addition, the guideline will be disseminated through a broad network of international partners, including WHO country and regional offices, ministries of health, WHO collaborating centres, universities, other United Nations agencies and nongovernmental organizations. It will also be published in the WHO Reproductive Health Library *(55)*. Derivative products such as summaries and collation of recommendations related to iron supplementation will be developed for a more tailored product that is useful for end-users.

Particular attention will be given to improving access to these guidelines for stakeholders that face barriers in accessing information, or that play a crucial role in the implementation of the guideline recommendations, for example, policy-makers and decision-makers at subnational level that disseminate the contents of the guideline, and health workers and education staff that contribute to the delivery of the intervention. Disseminated information may emphasize the benefits of iron supplementation for postpartum women in populations or regions at risk of anaemia and iron deficiency. In addition, these guidelines and the information contained therein should be accessible to the nongovernmental organizations working in coordination with national authorities on the implementation of nutrition interventions, especially those related to the prevention and control of anaemia in women, including pregnant and postpartum women.

Implementation

As this is a global guideline, it should be adapted to the context of each Member State. Prior to implementation, a public health programme that includes the provision of iron supplements to postpartum women should have well-defined objectives that take into account available resources, existing policies, suitable delivery platforms and suppliers, communication channels, and potential stakeholders. Ideally, iron supplementation should be implemented as part of an integrated programme on reproductive health, spanning both antenatal and postnatal care, which includes addressing micronutrient deficiencies.

Considering the experiences of women with the intervention is also a relevant implementation consideration: ongoing assessment of the accessibility and acceptability of the intervention can inform programme design and development, in order to increase adherence to supplementation and better assess the impact of the programme. This is particularly relevant in settings where the prevailing social norms and determinants may set unequal conditions and opportunities for different groups. For instance, in some settings, social perceptions around ethnicity and race intervene in how certain population groups access and use an intervention.

Furthermore, intersectoral action is fundamental in those settings where the intervention is delivered in coordination with antenatal care. Antenatal care is an important partner in the implementation of the recommendation. Appropriate coordination mechanisms and proper training of health workers and education staff is necessary for delivery of the intervention and also for collection of data needed for programme monitoring and surveillance, including information on factors related to health inequities.

Specific efforts to increase the acceptability of the intervention to women are also important. Greater acceptability and adoption are better achieved if they are accompanied by simple and easy-to-access information that can be understood by different population groups, in a way that is culturally appropriate and understandable.

Accessing hard-to-reach population groups is extremely important during implementation stages, as it contributes to preventing or tackling health inequities and to furthering the realization of women's rights to health. Appropriate surveillance and monitoring systems can thus provide information on the impact of the disseminated guidelines and their implementation (including information on the adequacy of finding and the effectiveness of the supply chain and distribution channels).

Regulatory considerations

The development of norms, standards and guidelines to promote quality assurance and quality control is a responsibility enshrined in WHO's Constitution. Their development involves consultation with and input from regulatory authorities in the country, including its national drug quality-control laboratories *(49)*.

The WHO EML compiles medicines that satisfy the priority health-care needs of populations and are selected with due regard to disease prevalence, evidence on efficacy and safety, and comparative cost-effectiveness *(51)*. Hence, the WHO EML is used by countries for the development of their own national essential medicines list. The quality criteria of vitamins and minerals included in the WHO EML should take into account WHO/Food and Agriculture Organization of the United Nations standards *(25)*.

Universal access to essential medicines is part of the approach of universal health coverage and is used to assess national commitment and progress towards the highest attainable standard of health. Three basic criteria contribute to promoting access to essential medicines: quality, pricing and supply. WHO's regulatory capacity guidance can assist Member States in need of support, in terms of availability, quality and safety of essential medical products, decrease of prices, and improvement of financing, health insurance and social-protection coverage mechanisms *(56)*.

Ethical considerations

Ethics refers to standards of what is right or wrong and fair or unfair, which can advise people on what to do and not do in terms of rights, obligations and benefits to society and individuals. Ethics is central to science, research, policy-making and implementation. Every field of human action, including public health nutrition, is subject to facing ethical challenges.

Four principles constitute the most widely accepted framework for ethics in medicine, and are used in other health-related fields: (i) respect for individual autonomy; (ii) beneficence; (iii) non-maleficence; and (iv) justice. These principles assist health workers in identifying whether an intervention is producing benefits to individuals and communities; preventing harms, also at the individual and societal levels; distributing health benefits across social groups, i.e. how much an intervention is contributing to health equity; and respecting and promoting the exercise of human rights.

An assessment of the ethical implications of implementing this intervention is particularly pertinent in malaria-endemic settings, owing to the possible interactions and potential adverse effects of increased iron intake by women affected by malaria. Postpartum women who live in malaria-endemic settings should indeed receive adequate iron if needed according to the recommendation stated in this guideline. The provision of iron supplementation should be done in conjunction with public-health measures to prevent, diagnose and treat malaria. Otherwise, a nutrition programme working in isolation and not coordinated with a malaria prevention and treatment programme may lead to unintentional harm, absence of benefit and increased health inequities.

Coordination with public health measures to prevent, diagnose and treat malaria is not just a sound implementation decision, but also an ethics informed decision. Such coordination should comprise appropriate training for health workers in public health nutrition, so they are knowledgeable of the particular requirements of an iron-supplementation programme for postpartum women.

These considerations by no means imply that iron supplementation should not be provided to postpartum women in malaria-endemic settings. On the contrary, postpartum women in these settings should receive iron supplementation, inasmuch as they suffer greater vulnerability to ill-health, including malnutrition. It requires, however, that appropriate coordination between nutrition and malaria programmes is in place, so the intervention can actually produce health benefits.

Monitoring and evaluation of guideline implementation

A plan for monitoring and evaluation with appropriate indicators, including equity-oriented indicators, is encouraged at all stages *(57)*. The impact of this guideline can be evaluated within countries (i.e. monitoring and evaluation of the programmes implemented at national or regional scale) and across countries (i.e. the adoption and adaptation of the guideline globally). The WHO Department of Nutrition for Health and Development, Evidence and Progamme Guidance Unit, jointly with the United States Centers for Disease Control and Prevention (CDC) International Micronutrient Malnutrition Prevention and Control (IMMPaCt) programme, and with input from international partners, has developed a generic logic model for micronutrient interventions in public health *(58)*, to depict the plausible relationships between inputs and expected SDGs by applying the micronutrient programme evaluation theory. Member States can adjust the model and use it in combination with appropriate indicators, for designing, implementing, monitoring and evaluating the successful escalation of nutrition actions in public health programmes. Additionally, the WHO/CDC eCatalogue of indicators for micronutrient programmes *(59)*, which utilizes this logic model, has been developed for some micronutrient interventions. This eCatalogue is a user-friendly and non-comprehensive web resource for those actively engaged in providing technical assistance in monitoring, evaluation and surveillance of public health programmes implementing micronutrient interventions. Indicators for iron supplementation are currently being developed and, once complete, will provide a list of potential indicators with standard definitions that can be selected, downloaded and adapted to a local programme context. The eCatalogue *(59)* will serve as a repository of indicators to monitor and evaluate micronutrient interventions. While it does not provide guidance for designing or implementing a monitoring or evaluation system in public health, some key indicators may include useful references for that purpose.

Since 1991, WHO has hosted the Micronutrients Database as part of the *Vitamin and Mineral Nutrition Information System (VMNIS) (60)*. Part of WHO's mandate is to assess the micronutrient status of populations, monitor and evaluate the impact of strategies for the prevention and control of micronutrient malnutrition, and track related trends over time. The Evidence and Programme Guidance Unit of the Department of Nutrition for Health and Development manages the VMNIS Micronutrients Database through a network of regional and country offices, and in close collaboration with national health authorities. The Micronutrients Database has included information on the anaemia status of populations since its inception and is currently upgrading the database to include indicators of iron status.

For evaluation at the global level, the WHO Department of Nutrition for Health and Development has developed a web-based WHO Global Targets Tracking Tool that allows users to explore different scenarios to achieve the rates of progress required to meet the 2025 global nutrition targets, including target 2: 50% reduction of anaemia in women of reproductive age *(61)*, as well as a centralized platform for sharing information on nutrition actions in public health practice implemented around the world. By sharing programmatic details, specific country adaptations and lessons learnt, this platform will provide examples of how guidelines are being translated into actions. The *Global database on the Implementation of Nutrition Action (GINA) (62)* provides valuable information on the implementation of numerous nutrition policies and interventions. The use of GINA has grown steadily since its launch in November 2012.

An efficient system for the routine collection of relevant data, including relevant determinants of health, therapeutic adherence and measures of programme performance, is critical to ensure supplementation programmes are effective and sustained, and drivers to the achievement of the right to health for all population groups. Monitoring differences across groups in terms of accessibility, availability, acceptability and the quality of the intervention, contributes to the design of better public health programmes. The creation of indicators for monitoring can be informed by the approaches of social determinants of health *(63)*, so inequities can be identified and tackled. It is particularly important to design sound implementation strategies to serve as the base for scaling up efforts. Appropriate monitoring requires suitable data, so efforts to collect and organize information on the implementation are also fundamental.

GUIDELINE DEVELOPMENT PROCESS

This guideline was developed in accordance with the WHO evidence-informed guideline development procedures, as outlined in the *WHO handbook for guideline development (5)*.

Advisory groups

A WHO Steering Committee for Nutrition Guidelines Development (see Annex 4), led by the Department of Nutrition for Health and Development, was established in 2009 with representatives from all WHO departments with an interest in the provision of scientific nutrition advice, including the Department of Maternal, Neonatal, Child and Adolescent Health and Development and the Department of Reproductive Health and Research. The steering committee met twice yearly and both guided and provided overall supervision of the guideline development process. Two additional groups were formed: a guideline development group and an external review group.

The WHO guideline development group – nutrition actions, was established for the biennium 2013–2014 (see Annex 5). Its role was to advise WHO on the choice of important outcomes for decision-making and in the interpretation of the evidence. The WHO guideline development group – nutrition actions includes experts from various *WHO expert advisory panels* (*64*) and those identified through open calls for specialists, taking into consideration a balanced gender mix, multiple disciplinary areas of expertise, and representation from all WHO regions. Efforts were made to include content experts, methodologists, representatives of potential stakeholders (such as managers and other health professionals involved in the health-care process) and technical staff from WHO and ministries of health from Member States. Representatives of commercial organizations may not be members of a WHO guideline group.

The final draft guideline was peer-reviewed by four content experts, who provided technical feedback (see Annex 8). These peer-reviewers were identified through various expert panels within and outside WHO.

Scope of the guideline, evidence appraisal and decision-making

An initial set of questions (and the components of the questions) to be addressed in the guideline was the critical starting point for formulating the recommendation. The questions were drafted by technical staff at the Evidence and Programme Guidance Unit, Department of Nutrition for Health and Development, based on the policy and programme guidance needs of Member States and their partners. The population, intervention, control, outcomes (PICO) format was used (see Annex 3). The questions were discussed and reviewed by the WHO Steering Committee for Nutrition Guidelines Development and the guideline development group – nutrition actions, and were modified as needed. The group scored the relative importance of each outcome from 1 to 9 (where 7–9 indicated that the outcome was critical for a decision, 4–6 indicated that it was important and 1–3 indicated that it was not important). The final key questions on this intervention, along with the outcomes that were identified as critical for decision-making, are listed in PICO format in Annex 3.

WHO staff, in collaboration with researchers from other institutions, summarized and appraised the evidence, using the *Cochrane handbook for systematic reviews of interventions (7)*. For identifying unpublished studies or studies still in progress, a standard procedure was followed to contact more than 10 international organizations working on micronutrient interventions. In addition, the International Clinical Trials Registry Platform (ICTRP) *(65)*, hosted at WHO, was systematically searched for any trials still in progress. No language restrictions were applied in the search. Evidence summaries were prepared according to the GRADE approach, to assess the overall quality of the evidence *(7, 39, 40)*. GRADE considers: the study design; the limitations of the studies in terms of their conduct and analysis; the consistency of the results across the available studies; the directness (or applicability and external validity) of the evidence with respect to the populations, interventions and settings where the proposed intervention may be used; and the precision of the summary estimate of the effect.

Both the systematic review and the GRADE evidence profiles for each of the critical outcomes were used for drafting this guideline. The draft recommendation was discussed by the WHO Steering Committee for Nutrition Guidelines Development and in a consultation with the guideline development group – nutrition actions, held on 18–21 February 2013 in Geneva, Switzerland, where the members of the guideline development group also voted on the strength of the recommendation, taking into account (i) the desirable and undesirable effects of the intervention; (ii) the quality of the available evidence; (iii) values and preferences related to the intervention in different settings; and (iv) the cost of options available to health-care workers in different settings (see Annex 2). These aspects were discussed openly in the meeting, followed by notation of each member's primary considerations in these areas on individual forms. The group strived for full consensus; however, after the first round of voting, the results had not shown unanimous agreement, then the group did further deliberations and a second round of voting took place with consensus defined as two thirds in agreement. WHO staff present at the meeting, as well as other external technical experts involved in the collection and grading of the evidence, were not allowed to vote. The majority of the voting members of the guideline development group (10 of 12 members present) agreed that this is a conditional recommendation, while two felt it was a strong recommendation.

Management of competing interests

According to the rules in the WHO *Basic documents (66)* and the processes recommended in the *WHO handbook for guideline development (5)*, all experts participating in WHO meetings must declare any interest relevant to the meeting prior to their participation. The responsible technical officer and the relevant departments reviewed the declarations-of-interest statements for all guideline group members before finalization of the group composition and invitation to attend a guideline group meeting. All members of the guideline development group, and participants of the guideline development meetings, submitted a declaration of interests form, along with their curriculum vitae, before each meeting. Participants of the guideline development group meetings participated in their individual capacity and not as institutional representatives. In addition, they verbally declared potential conflicts of interest at the beginning of each meeting. The procedures for management of conflicts of interests strictly followed the WHO *Guidelines for declaration of interests (WHO experts) (67)*. It was considered that there were no real or perceived conflicts of interest relevant to this guideline.[1]

[1] A conflict-of-interest analysis must be performed whenever WHO relies on the independent advice of an expert in order to take a decision or to provide recommendations to Member States or other stakeholders. The term "conflict of interest" means any interest declared by an expert that may affect, or be reasonably perceived to affect, the expert's objectivity and independence in providing advice to WHO. WHO's conflict-of-interest rules are designed to avoid potentially compromising situations that could undermine or otherwise affect the work of the expert, the committee or activity in which the expert is involved, or WHO as a whole. Consequently, the scope of the inquiry is any interest that could reasonably be perceived to affect the functions that the expert is performing.

Plans for updating the guideline

The WHO Secretariat will continue to follow the research development in the area of iron supplementation in postpartum women. If the guideline merits an update, or if there are concerns about the validity of the guideline, the Department of Nutrition for Health and Development will coordinate the guideline update, following formal procedures of the *WHO handbook for guideline development (5)*.

As the guideline nears the 10-year review period agreed by the guideline development group, the Department of Nutrition for Health and Development at the WHO headquarters in Geneva, Switzerland, along with its internal partners, will be responsible for conducting a search for new evidence.

REFERENCES

1. United Nations Department of Economic and Social Affairs. Sustainable Development Knowledge Platform. Sustainable Development Goals (https://sustainabledevelopment.un.org/sdgs, accessed 3 May 2016).

2. Comprehensive implementation plan on maternal, infant and young child nutrition. Geneva: World Health Organization; 2014 (http://www.who.int/nutrition/publications/CIP_document/en/, accessed 2 May 2016).

3. Global strategy for women's, children's and adolescents' health, 2016–2030. Survive,thrive, transform. Geneva: Every Woman Every Child; 2015 (http://who.int/life-course/partners/global-strategy/globalstrategyreport2016-2030-lowres.pdf, accessed 3 May 2016).

4. Iron deficiency anaemia: assessment, prevention and control. A guide for programme managers. 2001, Geneva: World Health Organization; 2001 (WHO/NHD/01.3; http://apps.who.int/iris/bitstream/10665/66914/1/WHO_NHD_01.3.pdf, accessed 4 December 2015).

5. WHO Handbook for guideline development, 2nd ed. Geneva: World Health Organization; 2014 (http://www.who.int/kms/handbook_2nd_ed.pdf, accessed 4 December 2015).

6. GRADE Working Group (http://www.gradeworkinggroup.org, accessed 4 December 2015).

7. Higgins JPT, Green S, editors. Cochrane handbook for systematic reviews of interventions. Version 5.1.0 (updated March 2011). London: The Cochrane Collaboration; 2011 (http://community.cochrane.org/handbook, accessed 4 December 2015).

8. Simoes E, Kunz S, Bosing-Schwenkglenks M, Schmahl FW. Maternal postpartum anaemia–tendencies and variability, considering different hospital categories–research on the basis of perinatology in Baden-Württemberg. Z Geburtshilfe Neonatol. 2004;208:184–9.

9. Iron. In: Butte NF, Lopez-Alarcon MG, Garza C, editors. Nutrient adequacy of exclusive breastfeeding for the term infant during the first six months of life. Geneva: World Health Organization; 2002:34–5 (http://whqlibdoc.who.int/publications/9241562110.pdf, accessed 8 December 2015).

10. Shashiraj, Faridi MMA, Singh O, Rusia U. Mother's iron status, breastmilk iron and lactoferrin – are they related? Eur J Clin Nutr. 2006:60:903–8.

11. Bodnar LM, Cogswell ME, Scanlon KS. Low income postpartum women are at risk of iron deficiency. J Nutr. 2002;132:2298–302.

12. Reveiz L, Gyte GML, Cuervo LG, Casasbuenas A. Treatments for iron-deficiency anaemia in pregnancy. Cochrane Database Syst Rev. 2011;(10):CD003094. doi:10.1002/14651858.CD003094.pub3.

13. Scholl TO, Reilly T. Anemia, iron and pregnancy outcome. J Nutr. 2000;130(2 Suppl.):443S–447S.

14. Barroso F, Allard S, Kahan BC, Connolly C, Smethurst H, Choo L et al. Prevalence of maternal anaemia and its predictors: a multi-centre study. Eur J Obstet Gynecol Reprod Biol. 2011;159:99–105. doi:10.1016/j.ejogrb.2011.07.041.

15. Milman N. Postpartum anemia I: definition, prevalence, causes, and consequences. Ann Hematol. 2011;90:1247–53. doi:10.1007/s00277-011-1279-z.

16. Bergmann RL, Richter R, Bergmann KE, Dudenhausen JW. Prevalence and risk factors for early postpartum anemia. Eur J Obstet Gynecol Reprod Biol. 2010;150:126–31. doi:10.1016/j.ejogrb.2010.02.030.

17. Stevens GA, Finucane MM, De-Regil LM, Paciorek CJ, Flaxman SR, Branca F et al. 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. Lancet Glob Health. 2013;1(1):e16–25. doi:10.1016/S2214-109X(13)70001-9.

18. De Benoist B, McLean E, Egli I, Cogswell M, editors. Worldwide prevalence of anaemia 1993–2005. WHO global database on anaemia. Geneva: World Health Organization; 2008 (http://apps.who.int/iris/bitstream/10665/43894/1/9789241596657_eng.pdf, accessed 4 December 2015).

19. Breymann C, Honegger C, Holzgreve W, Surbek D. Diagnosis and treatment of iron-deficiency anaemia during pregnancy and postpartum. Arch Gynecol Obstet. 2010;282:577–80. doi:10.1007/s00404-010-1532-z.

20. Murray-Kolb LE, Beard JL. Iron deficiency and child and maternal health. Am J Clin Nutr. 2009;89:946s-50s. doi:10.3945/ajcn.2008.292D..

21. Conde-Agudelo A, Belizan JM. Maternal morbidity and mortality associated with interpregnancy interval: cross sectional study. BMJ. 2000;321:1255–9.

22. Khoshnood B, Lee KS, Wall S, Hsieh HL, Mittendorf R. Short interpregnancy intervals and the risk of adverse birth outcomes among five racial/ethnic groups in the United States. Am J Epidemiol. 1998;148:798–805.

23. King JC. The risk of maternal nutritional depletion and poor outcomes increases in early or closely spaced pregnancies. J Nutr. 2003;133(5 Suppl.):1732S–1736S.

24. Zhu BP, Rolfs RT, Nangle BE, Horan JM. Effect of the interval between pregnancies on perinatal outcomes. N Engl J Med. 1999;340:589–94.

25. World Health Organization, Food and Agriculture Organization of the United Nations. Codex alimentarius: guidelines for vitamin and mineral food supplements. Geneva: World Health Organization and the Food and Agriculture Organization; 2005 (CAC/GL 55; http://www.codexalimentarius.org/standards/list-of-standards/en/?provide=standards&orderField=fullReference&sort=asc&num1=CAC/GL, accessed 4 December 2015).

26. World Health Organization, Food and Agriculture Organization of the United Nations. Vitamin and mineral requirements in human nutrition, 2nd edition. Geneva: World Health Organization; 2004 (http://www.who.int/nutrition/publications/micronutrients/9241546123/en/, accessed 8 December 2015).

27. Peña-Rosas JP, De-Regil LM, Dowswell T, Viteri FE. Daily oral iron supplementation during pregnancy. Cochrane Database Syst Rev. 2012;(12):CD004736. doi:10.1002/14651858.CD004736.pub4.

28. Yakoob MY, Bhutta ZA. Effect of routine iron supplementation with or without folic acid on anemia during pregnancy. BMC Public Health. 2011;11(Suppl. 3): S21. doi:10.1186/1471-2485-11-S3-S21.

29. Fernandez-Gaxiola AC, De-Regil LM. Intermittent iron supplementation for reducing anaemia and its associated impairments in menstruating women. Cochrane Database Syst Rev. 2011;(12):CD009218. doi:10.1002/14651858.CD009218.pub2.

30. Peña-Rosas JP, De-Regil LM, Dowswell T, Viteri FE. Intermittent oral iron supplementation during pregnancy. Cochrane Database Syst Rev. 2012;(7): CD009997. doi:10.1002/14651858.CD009997.

31. Tolkien Z, Stecher L, Mander AP, Pereira DIA, Powell JJ. Ferrous sulfate supplementation causes significant gastrointestinal side-effects in adults: a systematic review and meta-analysis. PLoS One. 2015;10:e0117383. doi:10.1371/journal.pone.0117383.

32. Rogers LM, Dowswell T, De-Regil LM. Effects of preventive oral supplementation with iron or iron with folic acid for women following childbirth. Cochrane Database Syst Rev. 2016; resubmitted.

33. Baykan A, Yalcin SS, Yurdakok K. Does maternal iron supplementation during the lactation period affect iron status of exclusively breast-fed infants? Turkish J Pediatr. 2006;48:301–7.

34. Tam KF, Lee CP, Pun TC. Mild postnatal anemia: is it a problem? Am J Perinatol. 2005;22:345–9.

35. Khambalia A, Latulippe ME, Campos C, Merlos C, Villalpando S, Picciano MF et al. Milk folate secretion is not impaired during iron deficiency in humans. J Nutr. 2006;136:2617–24.

36. Guideline: Intermittent iron and folic acid supplementation in menstruating women. Geneva: World Health Organization; 2011 (http://www.who.int/nutrition/publications/micronutrients/guidelines/guideline_iron_folicacid_suppl_women/en, accessed 3 May 2016).

37. Guideline: Intermittent iron and folic acid supplementation in non-anaemic pregnant women. Geneva: World Health Organization; 2012 (http://www.who.int/nutrition/publications/micronutrients/guidelines/guideline_intermittent_ifa_non_anaemic_pregnancy/en/index.html, accessed 8 December 2015).

38. Guideline: Daily iron and folic acid supplementation in pregnant women. Geneva: World Health Organization; 2012 (http://apps.who.int/iris/bitstream/10665/77770/1/9789241501996_eng.pdf, accessed 4 December 2015).

39. Guyatt GH, Oxman AD, Vist GE, Kunz R, Falck-Ytter Y, Alonso-Coello P et al., GRADE Working Group. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. BMJ. 2008;336(7650):924–6. doi:10.1136/bmj.39489.470347.AD.

40. Guyatt G, Oxman AD, Akl EA, Kunz R, Vist G, Brozek J et al. GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings tables. J Clin Epidemiol. 2011;64(4):383–94. doi:10.1016/j.jclinepi.2010.04.026.

41. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Geneva: World Health Organization; 2011 (http://www.who.int/vmnis/indicators/haemoglobin/en/, accessed 4 December 2015).

42. Stoltzfus RJ, Dreyfuss ML, editors. Guidelines for the use of iron supplements to prevent and treat iron deficiency anaemia. Washington DC: ILSI Press; 1998 (http://www.who.int/nutrition/publications/micronutrients/guidelines_for_Iron_supplementation.pdf, accessed 17 December 2015).

43. Guidelines for the treatment of malaria, 3rd ed. Geneva: World Health Organization; 2015 (http://apps.who.int/iris/bitstream/10665/162441/1/9789241549127_eng.pdf, accessed 8 December 2015).

44. World malaria report 2014. Geneva: World Health Organization; 2014 (http://www.who.int/malaria/publications/world_malaria_report_2014/wmr-2014-no-profiles.pdf, accessed 4 December 2014).

45. Roll Back Malaria Partnership Malaria in Pregnancy Working Group. Consensus statement on folic acid supplementation during pregnancy. Geneva: Roll Back Malaria Partnership; 2015 (http://www.rollbackmalaria.org/files/files/partnership/1_FOLIC%20ACID_EN.PDF, accessed 8 December 2015).

46. Peters PJ, Thigpen MC, Parise ME, Newman RD. Safety and toxicity of sulfadoxine/pyrimethamine: implications for malaria prevention in pregnancy using intermittent preventive treatment. Drug Saf. 2007;30:481–501.

47. WHO technical consultation on postpartum and postnatal care. Geneva: World Health Organization; 2010 (WHO/MPS/10.03; http://whqlibdoc.who.int/hq/2010/WHO_MPS_10.03_eng.pdf, accessed 8 December 2015).

48. The international pharmacopoeia, 4th ed. Volumes 1 and 2, 2nd supplement. Geneva: World Health Organization; 2011 (http://apps.who.int/phint/en/p/docf/, accessed 8 December 2015).

49. The WHO Expert Committee on Specification for Pharmaceutical Preparations. Quality assurance of pharmaceuticals: meeting a major public health challenge. Geneva: World Health Organization; 2014 (http://www.who.int/medicines/publications/brochure_pharma.pdf, accessed 4 December 2015).

50. DeMaeyer EM, Dallman P, Gurney JM, Hallberg L, Sood SK, Srikantia SG. Preventing and controlling iron deficiency anaemia through primary health care. A guide for health administrators and programme managers. Geneva: World Health Organization; 1989 (http://www.who.int/nutrition/publications/micronutrients/anaemia_iron_deficiency/9241542497.pdf, accessed 8 December 2015).

51. World Health Organization. Essential medicines and health products (http://www.who.int/medicines/services/essmedicines_def/en/, accessed 4 December 2015).

52. Healthy eating during pregnancy and breastfeeding. Booklet for mothers. Copenhagen: WHO Regional Office for Europe; 2001 (http://www.euro.who.int/__data/assets/pdf_file/0020/120296/E73182.pdf, accessed 2 June 2015).

53. World Health Organization. Nutrition (http://www.who.int/nutrition/en/, accessed 4 December 2015).

54. World Health Organization, e-Library of Evidence for Nutrition Actions (eLENA) Guideline development process (http://www.who.int/elena/en/, accessed 4 December 2015).

55. RHL. The WHO Reproductive Health Library (http://apps.who.int/rhl/en/, accessed 8 December 2015).

56. Continuity and change. Implementing the third WHO Medicines Strategy 2008–2013. Geneva: World Health Organization; 2010 (WHO/EMP/2010.2; http://apps.who.int/medicinedocs/documents/s16880e/s16880e.pdf, accessed 4 December 2015).

57. Evaluation of the Good Governance for Medicines programme (2004–2012). Brief summary of findings. Geneva: World Health Organization; 2013 (WHO/EMP/MPC/2013.1; http://apps.who.int/medicinedocs/documents/s20188en/s20188en.pdf, accessed 4 December 2015).

58. WHO Vitamin and Mineral Nutrition Information System (VMNIS). WHO/CDC Logic model for micronutrient interventions in public health. Vitamin and Mineral Nutrition Information System. Geneva: World Health Organization; 2011 (WHO/NMH/NHD/MNM/11.5; http://www.who.int/vmnis/toolkit/logic_model/en/index.html, accessed 8 December 2015).

59. World Health Organization. eCatalogue of indicators for micronutrient programmes (https://extranet.who.int/indcat/, accessed 4 December 2015).

60. World Health Organization. Vitamin and Mineral Nutrition Information System (VMNIS). Micronutrients database (http://www.who.int/vmnis/en/, accessed 4 December 2015).

61. WHO Global Nutrition Targets 2025: Anaemia policy brief. Geneva: World Health Organization; 2014 ((WHO/NMH/NHD/14.14; http://www.who.int/nutrition/topics/globaltargets_anaemia_policybrief.pdf, accessed 8 December 2015).

62. World Health Organization. Global database on the Implementation of Nutrition Action (GINA) (http://www.who.int/nutrition/gina/en/, accessed 4 December 2015).

63. Handbook on health inequality monitoring: with a special focus on low- and middle-income countries. Geneva: World Health Organization; 2013 (http://apps.who.int/iris/bitstream/10665/85345/1/9789241548632_eng.pdf, accessed 8 December 2014).

64. Expert advisory panels and committees. Geneva: World Health Organization; 2010 (http://www.who.int/rpc/expert_panels/Factsheet_EAP2010.pdf, accessed 3 May 2016).

65. World Health Organization. International Clinical Trials Registry Platform (ICTRP) (http://www.who.int/ictrp/en/, accessed 8 December 2015).

66. World Health Organization Basic Documents, 48th ed. Geneva: World Health Organization; 2014 (http://apps.who.int/gb/bd/, accessed 4 December 2015).

67. Guidelines for declaration of interests (WHO experts). Geneva: World Health Organization; 2014.

ANNEX 1. GRADE SUMMARY OF FINDINGS TABLE

Iron or iron and folic acid supplementation compared to placebo or control in postpartum women

Patient or population: postpartum women.
Intervention: any oral supplements containing iron.
Comparison: same supplements without iron or no treatment/placebo (no iron).
Setting: all settings (including malaria-endemic areas).

Outcomes	Relative effect* (95% CI)	Number of participants (studies)	Quality of the evidence (GRADE)	Comments
Maternal anaemia (haemoglobin below a cut-off value defined by trialists, taking into account age, altitude and smoking)	**RR 0.35** (0.18 to 0.65)	122 (1 study)	⨁⨁⊖⊖ LOW[1]	
Maternal iron deficiency (as measured by trialists by using indicators of iron status such as ferritin or transferrin)	**RR 0.30** (0.13 to 0.67)	254 (2 studies)	⨁⨁⊖⊖ LOW[2]	
Maternal iron deficiency anaemia (defined by the presence of anaemia plus iron deficiency, diagnosed with an indicator of iron status selected by trialists)	**RR 0.29** (0.07 to 1.12)	198 (2 studies)	⨁⊖⊖⊖ VERY LOW[4]	
Maternal infection (any, as defined by trialists)				None of the studies reported on this outcome
Maternal gastrointestinal side-effects during the intervention period (constipation, abdominal pain, tooth/faeces pigmentation, nausea, vomiting, diarrhoea)	**RR 1.31** (0.77 to 2.25)	132 (1 study)	⨁⊖⊖⊖ VERY LOW[3]	

CI: confidence interval; **RR:** risk ratio.

GRADE Working Group grades of evidence.

High quality: We are very confident that the true effect lies close to that of the estimate of the effect.

Moderate quality: We are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low quality: Our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.

Very low quality: We have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

[1] High-quality trial with small confidence intervals and small number of events. As there is only one trial, it was not possible to assess the consistency of the findings.

[2] Two studies with design limitations contributed data.

[3] Two studies contributing data had design limitations (moderate to high losses to follow-up, small sample sizes, small number of events).

[4] One study with design limitations. Wide 95% CI crossing the line of no effect.

For details of studies included in the review, see reference *(40)*.

ANNEX 2. SUMMARY OF THE CONSIDERATIONS OF THE MEMBERS OF THE GUIDELINE DEVELOPMENT GROUP FOR DETERMINING THE STRENGTH OF THE RECOMMENDATION FOR IRON SUPPLEMENTATION IN POSTPARTUM WOMEN

QUALITY OF EVIDENCE:	The quality of direct evidence overall was very low to low and indirect evidence about iron supplementation in pregnant and menstruating women had to be considered. The effect of iron supplementation on anaemia is not likely to change with more evidence.
VALUES AND PREFERENCES:	Anaemia is one of the most prevalent nutritional deficiencies in women of reproductive age. It is important to position iron supplementation in postpartum women as a continuation of supplementation during pregnancy.
TRADE-OFF BETWEEN BENEFITS AND HARMS:	Most felt that the benefits of iron supplementation in postpartum women either clearly outweighed the harms or were balanced. Iron supplementation improves haemoglobin concentrations and prevents anaemia in a critical period (postpartum); however, uncertain or limited data were available for this population group. The side-effects of iron supplementation were considered to be minimal or self-limiting.
COSTS AND FEASIBILITY:	Iron supplementation in postpartum women is considered to be feasible and less resource intensive when used as a continuation of iron supplementation during pregnancy or prior to iron supplementation in menstruating women.

ANNEX 3. QUESTIONS IN POPULATION, INTERVENTION, CONTROL, OUTCOMES (PICO) FORMAT

Effects and safety of preventive oral supplementation with iron or iron with folic acid in postpartum women

Should supplements of iron or iron with folic acid be given to postpartum women to improve health outcomes? If so, (a) at what dose, frequency and duration for the intervention? (b) in which settings?

POPULATION:

Postpartum women
Subpopulations:

Critical

- By malaria (no transmission or elimination achieved, susceptibility to epidemic malaria, year-round transmission with marked seasonal fluctuations, year-round transmission; with consideration of *Plasmodium falciparum* and/or *Plasmodium vivax*)
- By use of concurrent malarial measures introduced in the study: yes versus no
- By antimalarial measures implemented by the health system: yes versus no
- By woman's iron status: iron deficient versus non-iron deficient
- By woman's anaemia status: anaemic versus non-anaemic
- By access to foods fortified with iron or iron and folic acid: yes versus no

Important

- By woman's HIV status: HIV positive versus HIV negative
- By population prevalence of haemoglobinopathies
- By woman's consumption of iron during the study
- By presence of a deworming programme: yes versus no
- By anaemia status of the population of children under 5 years of age: 20% or less versus 20–40 versus >40%
- By population prevalence of hookworm

INTERVENTION:

Iron with or without folic acid supplementation
Subgroup analyses:

Critical

- By iron content: 30 mg versus 60 mg versus other
- By folic acid content: 400 µg versus other
- By duration: 3 months or less versus >3 months
- By frequency: daily versus weekly versus twice weekly versus other
- By nutrient: iron plus folic acid versus iron alone versus iron plus others

Important

- By iron compound: ferrous sulfate versus ferrous gluconate versus others

CONTROL:

- No iron supplementation
- Placebo
- Same supplement without iron or folic acid

OUTCOMES:

Critical

1. Anaemia
2. Iron deficiency anaemia
3. Iron deficiency
4. Maternal morbidity

Malaria incidence and severity (parasitaemia with or without symptoms)

Important

5. Work performance and economic productivity (adults) or school performance and cognitive function (adolescents)
6. Maternal morbidity
   - All-cause
   - Acute respiratory infections
   - Diarrhoea
7. Adverse effects
8. Mental health
   - Depression
   - Anxiety
9. Vitamin A status
10. Vitamin B_{12} status
11. Zinc status

ANNEX 4. WHO STEERING COMMITTEE FOR NUTRITION GUIDELINES DEVELOPMENT

Dr Najeeb Mohamed Al Shorbaji
Director, Department of Knowledge Management & Sharing
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

Dr Douglas Bettcher
Director, Department of Prevention of Noncommunicable Diseases
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

Dr Ties Boerma
Director, Department of Health Statistics and Information Systems
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

Dr Francesco Branca
Director, Department of Nutrition for Health and Development (NHD)
World Health Organization
Avenue Appia, 20, 1211 Geneva 27
Switzerland

Dr Richard Brennan
Director, Department of Emergency Risk Management and Humanitarian Response
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

Dr Gottfried Otto Hirnschall
Director, Department of HIV/AIDS
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

Dr Knut Lonnroth
Medical Officer, Global TB Programme
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

Dr Elizabeth Mason
Director, Department of Maternal, Newborn, Child and Adolescent Health
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

Dr Kazuaki Miyagishima
Director, Department of Food Safety, Zoonoses and Foodborne Diseases
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

Dr Maria Purificacion Neira
Director, Department of Public Health, Environmental and Social Determinants of Health (PHE)
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

Dr Jean-Marie Okwo-Bele
Director, Department of Immunization, Vaccines and Biologicals
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

Professor John Charles Reeder
Director, The Special Programme for Research and Training in Tropical Diseases
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

Dr Isabelle Romieu
Section and Group Head, Nutritional Epidemiology Group
International Agency for Research on Cancer (IARC)
150, cours Albert Thomas
69372 Lyon Cedex 08
France

Dr Nadia Slimani
Group Head, Dietary Exposure Assessment Group
International Agency for Research on Cancer (IARC)
150, cours Albert Thomas
69372 Lyon Cedex 08
France

Dr Marleen Temmerman
Director, Department of Reproductive Health and Research (RHR)
World Health Organization
Avenue Appia 20, 1211 Geneva 27
Switzerland

ANNEX 5. WHO GUIDELINE DEVELOPMENT GROUP

Ms Deena Alasfoor
Ministry of Health
Muscat, Oman
Health programme management, food legislations, surveillance in primary health care

Dr Mary Chea
Deputy Manager of National Nutrition Programme
National Maternal and Child Health Center
Phnom Penh, Cambodia
Programme implementation, midwifery

Dr Maria Elena del Socorro Jefferds
Behavioural Scientist, Division of Nutrition, Physical Activity and Obesity
US Centers for Disease Control and Prevention
Atlanta, United States of America
Behaviour science, programme evaluation

Dr Davina Ghersi
Senior Principal Research Scientist
Executive Knowledge and Development Cluster
National Health and Medical Research Council
Canberra, Australia
Policy making, systematic reviews, evidence, GRADE working group member

Dr Guansheng Ma
Professor, Deputy Director
National Institute for Nutrition and Food Safety
Chinese Center for Disease Control and Prevention
Beijing, China
Food safety, public health, programme management

Dr Lynnette Neufeld
Technical Services
Micronutrient Initiative
Ottawa, Canada
Micronutrients, programmes, epidemiology

Dr Mical Paul
Infectious Diseases Unit
Rabin Medical Center, Belinson Hospital
Sackler Faculty of Medicine Tel Aviv University
Petah-Tikva, Israel
Infectious diseases, HIV

Professor HPS Sachdev
Senior Consultant Paediatrics and Clinical Epidemiology
Sitaram Bhartia Institute of Science and Research
New Delhi, India
Paediatrics, systematic reviews

Ms Rusidah Selamat
Deputy Director (Operations) Nutrition Division
Department of Public Health, Ministry of Health
Putrajaya, Malaysia
Public health nutrition

Dr Rebecca Joyce Stoltzfus
Professor and Director
Program in International Nutrition, Program in Global Health
Division of Nutritional Sciences
Cornell University
Ithaca, United States of America
International nutrition and public health, iron and vitamin A nutrition, programme research

Dr Igor Veljkovik
Health and Nutrition Officer
United Nations Children's Fund
Skopje, The Former Yugoslav Republic of Macedonia
Programme implementation

Dr Maged Younes
Committee on World Food Security
Food and Agriculture Organization
Rome, Italy
Food safety, public health, programme management

ANNEX 6. EXTERNAL RESOURCE EXPERTS

Dr Camila Chaparro[1]
International Nutrition Consultant
Brighton, United States of America

Dr Andrew Hall
Save the Children
London, United Kingdom of Great Britain and Northern Ireland

Dr Sonya Y Hess
University of California, Davis
Davis, United States of America

Dr Rafael Perez-Escamilla
Yale School of Public Health
New Haven, United States of America

Mr Arnold Timmer
United Nations Children's Fund
New York, United States of America

Dr David Tovey
Cochrane Editorial Unit
London, United Kingdom of Great Britain and Northern Ireland

Dr Michael Zimmerman
Institute of Food, Nutrition and Health
Swiss Federal Institute of Technology
Zurich, Switzerland

[1] Via video conference.

ANNEX 7. WHO SECRETARIAT

Dr Andrea Bosman
Coordinator
Diagnosis, Treatment and Vaccines Unit
Global Malaria Programme

Dr Carmen Casanovas
Technical Officer
Evidence and Programme Guidance Unit
Department of Nutrition for Health and Development

Dr Maria de las Nieves Garcia-Casal
Senior Consultant
Evidence and Programme Guidance Unit
Department of Nutrition for Health and Development

Dr Mercedes de Onis
Coordinator
Growth Assessment and Surveillance
Department of Nutrition for Health and Development

Dr Luz Maria De-Regil
Epidemiologist
Evidence and Programme Guidance Unit
Department of Nutrition for Health and Development

Dr Joao Paulo Dias de Souza
Medical Officer
Improving Maternal and Perinatal Health Unit
Department of Reproductive Health and Research

Mr Aiden McDowell
Intern
Nutrition Policy and Scientific Advice Unit
Department of Nutrition for Health and Development

Dr Antonio Montresor
Scientist
Preventive Chemotherapy and Transmission Control Unit
Department of Control of Neglected Tropical Diseases

Dr Eyerusalem Kebede Negussie
Medical Officer
HIV Treatment and Care
Department of HIV/AIDS

Dr Chizuru Nishida
Coordinator
Nutrition Policy and Scientific Advice Unit
Department of Nutrition for Health and Development

Dr Susan L Norris
Technical Officer
WHO Press
Department of Knowledge Management and Sharing

Dr Peter Olumese
Medical Officer
Diagnosis Treatment and Vaccines Unit
Global Malaria Programme

Dr Juan Pablo Peña-Rosas
Coordinator
Evidence and Programme Guidance Unit
Department of Nutrition for Health and Development

Dr Lisa Rogers
Technical Officer
Evidence and Programme Guidance Unit
Department of Nutrition for Health and Development

Mr Anand Sivasankara
Technical Officer
Ethics and Social Determinants of Health
Department of Ethics, Equity, Trade and Human Rights

Dr Nhan T Tran
Manager
Implementation Research Platform
Alliance for Health Policy and System Research

Dr Godfrey Xuereb
Technical Officer
Surveillance and Population-based Prevention Unit
Department of Chronic Diseases and Health Promotion

Regional Office for the Western Pacific

Dr Tommaso Cavalli-Sforza
Regional Adviser
Nutrition
WHO Regional Office for the Western Pacific
Manila, Philippines

Regional Office for the Americas/ Pan American Health Organization

Dr Chessa Lutter
Regional Adviser
Child and Adolescent Health
WHO Regional Office for the Americas/Pan American Health Organization
Washington DC, United States of America

ANNEX 8. PEER-REVIEWERS

Dr Christian Breymann
University Hospital Zurich
Zurich, Switzerland

Ms Rae Galloway
PATH
Washington DC, United States of America

Dr Pura Rayco-Solon
United Nations Children's Fund Eastern and Southern
Africa Regional Office
Nairobi, Kenya

Dr Hanne Wielandt
Department of Obstetrics and Gynecology
Kolding Hospital
Kolding, Denmark

For more information, please contact:

Department of Nutrition for Health and Development

World Health Organization

Avenue Appia 20
CH-1211 Geneva 27
Switzerland

Fax: +41 22 791 4156
Email: nutrition@who.int

www.who.int/nutrition

ISBN: 978 92 4 154958 5

World Health Organization