# DO WE NEED MICRONUTRIENT DURING PREGNANCY?

*Ali Sungkar*

## KEHAMILAN




## THE FIRST 9 MONTHS CAN SHAPE THE REST OF YOUR LIFE…….


Critical periods before and during pregnancy when specific nutrients are needed for optimal development.

Risks of a number of chronic diseases in adulthood such as hypertension, diabetes, heart disease may have their origins before birth.

# FETAL ORIGINS OF ADULT DISEASE

Term infants Who are small for their gestational age are Predisposed to Obesity and have an increased susceptibility to Cardiovascular disease and Type II diabetes (impaired glucose tolerance) in adulthood as a consequence of physiologic adaptations to Under-nutrition during fetal life.

Robinson R. The fetal origins of adult disease. *Brit Med J* 2001;322:375-376.

# DEVELOPMENTAL ORIGINS OF HEALTH AND DISEASE

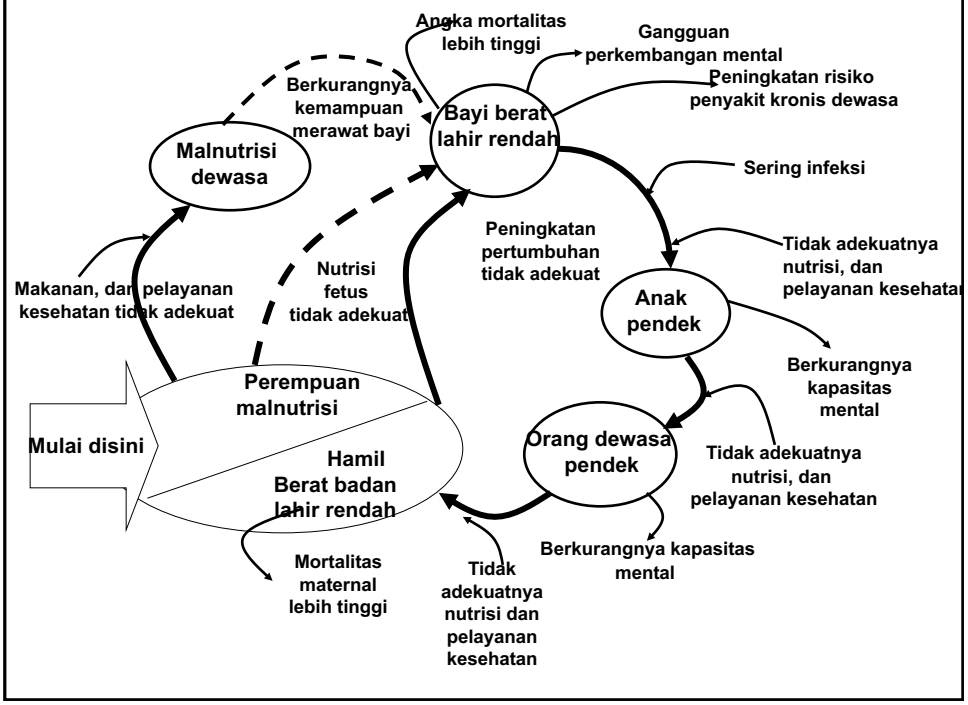
DOHaD emphasizes Prenatal period and Early childhood as Important periods for development of Chronic disease throughout life

# MENGAPA KEHAMILAN ADALAH WAKTU YANG PENTING DALAM KEHIDUPAN?

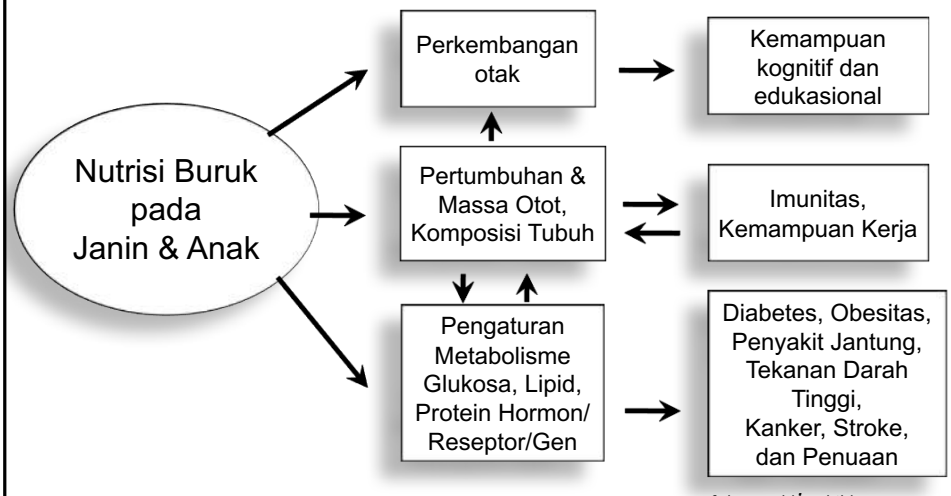
Status nutrisi ibu berperan penting Saat Hamil:
Janin sedang dalam pertumbuhan pesat

## NUTRISI SELAMA KEHAMILAN

- Energi
- Protein
- Vitamin dan mineral
- Nutrien khusus
  - Besi
  - Folat
  - Kalsium



## Efek Jangka Pendek & Jangka Panjang Nutrisi Buruk




*Source:UNICEF State of the World's Children 2001*

## BERAPA KALORI YANG DIBUTUHKAN ?

- ✓Protein 5,186
- ✓Lemak 36,329
- ✓Metabolisme 35,717

**77,234**

- ✓Energi makanan 7,723

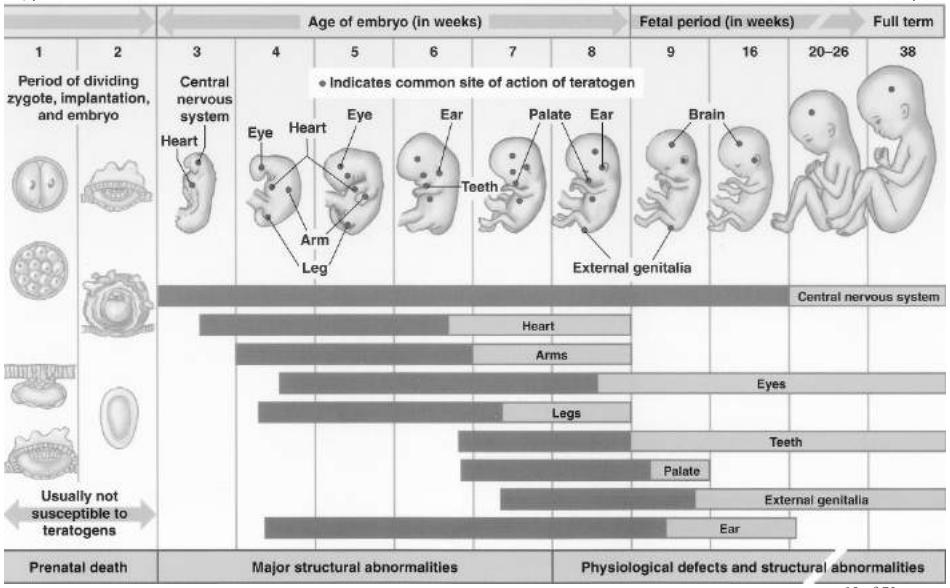
**84,957**

**=303 kkal/hari * 280 hari**

# REKOMENDASI

| Kelompok BMI | BMI | Peningkatan BB (kg) |
|---|---|---|
| Rendah | ≤ 19.8 | 12.5 - 18 |
| Normal | 19.8-26.0 | 11.5 -16 |
| Tinggi | 26.1 -29 | 7 - 11.5 |
| Sangat tinggi | ≥ 29.1 | minimal 6 kg |
| Remaja | (<17) | minimal 16 kg |
| Perokok | | minimal 15 kg |

# PERIODE KRITIS PERKEMBANGAN ORGAN



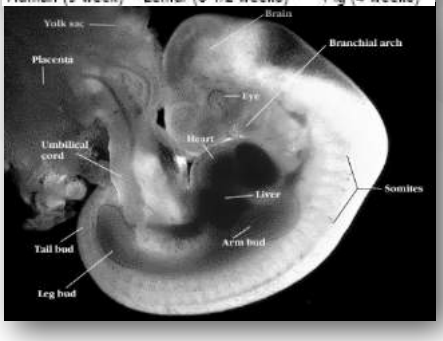

**Warna Merah merupakan periode Kritis perkembangan organ (Moore 143).**

# Perkembangan Janin dalam Rahim

4 Minggu


8 Minggu

6 Minggu




# FIGO Recomendation

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www.figo.org

## The International Federation of Gynecology and Obstetrics (FIGO) recommendations on adolescent, preconception, and maternal nutrition: "Think Nutrition First"#

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[l] International Federation of Gynecology and Obstetrics, London, UK

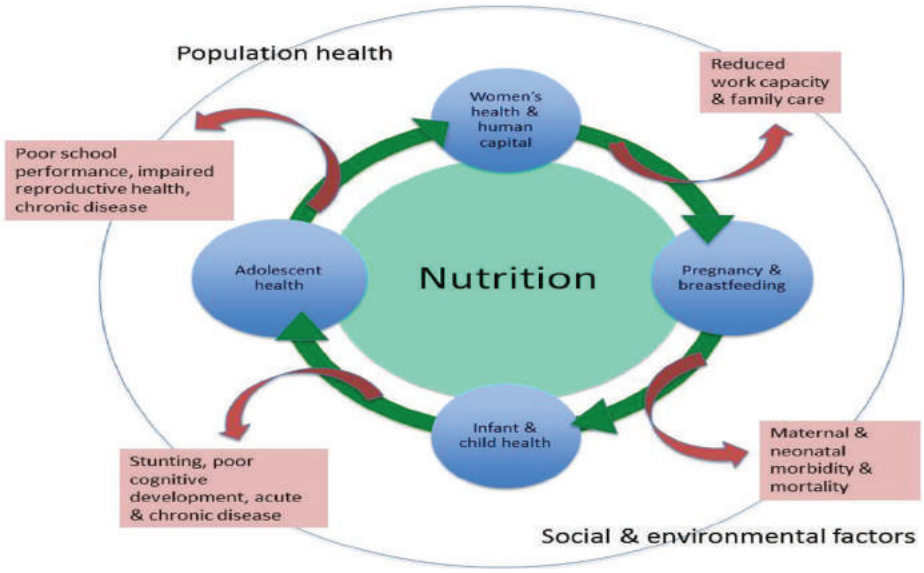


**Figure 1** The central role of nutrition in determining health across the life course and across generations. All stages in a woman's life are connected by the effects of good or poor nutrition. Poor nutrition at any stage has negative consequences that disrupt the cycle and impact later life stages, including future generations.

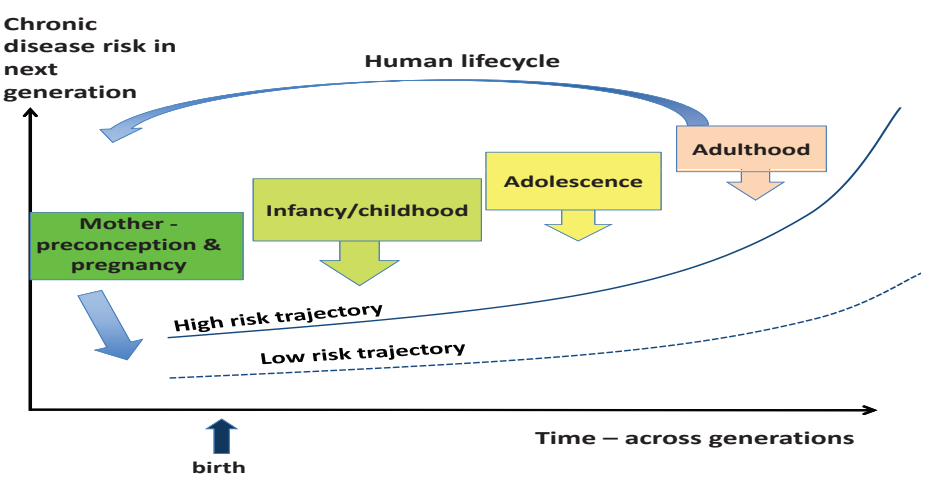


**Figure 2** Life course model of chronic disease risk. Developmental trajectories established in early life, influenced by factors such as maternal diet and body composition, affect the risk of disease across the life course. Timely intervention early in life (prepregnancy or during pregnancy) can reduce later disease risk. Adapted with permission from Godfrey KM, Gluckman PD, Hanson MA. Developmental origins of metabolic disease: life course and intergenerational perspectives. Trends Endocrinol Metab. 2010;21(4):199-205; and Gluckman P, Hanson M, Seng CY, Bardsley A. Nutrition and Lifestyle for Pregnancy and Breastfeeding. Oxford: Oxford University Press; 2015.

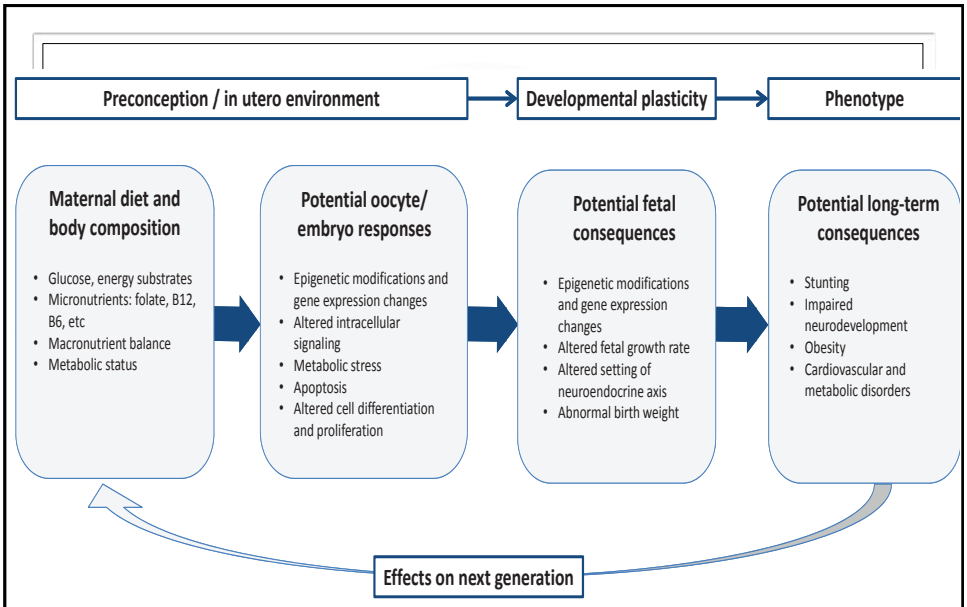


**Figure 3** Effects of the preconception and in utero environment on offspring phenotype and future health. Maternal nutritional factors provide cues to the fetus during critical periods of developmental plasticity, triggering epigenetic and other responses that have lasting impacts on offspring health and that can be passed in a similar manner to the next generation.

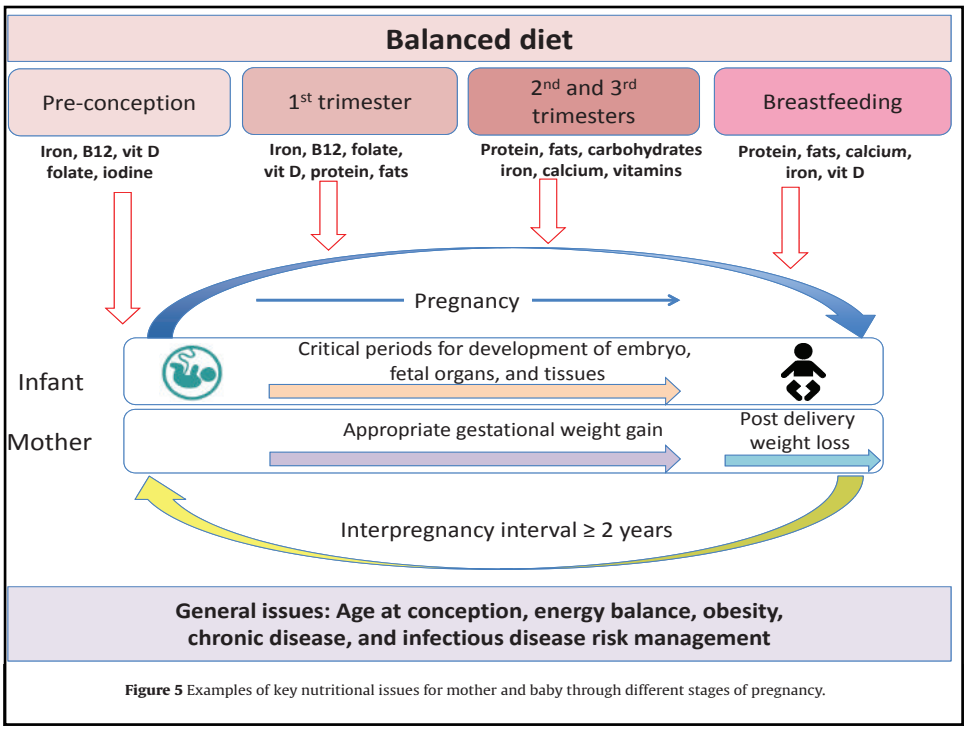


**Figure 5** Examples of key nutritional issues for mother and baby through different stages of pregnancy.

**Table 2**
FIGO recommendations on adolescent, preconception, and maternal nutrition: Specific nutritional requirements before conception, and increases for pregnancy and lactation, based on Institute of Medicine recommended dietary allowance and adequate intake guidelines.[a]

| Nutrient | Daily intake requirement | | | Function | Food sources | Risk factors for deficiency/ consideration for supplementation |
|---|---|---|---|---|---|---|
| | Pre-pregnant | Pregnant | Lactating | | | |
| Protein | 60 g | 71 g | | Building blocks for structural and functional components of cells | Meat, poultry, fish, eggs, dairy products, legumes, grains, nuts, seeds | Protein energy malnutrition |
| Omega-6 PUFAs | 11–12 g | 13 g | 13 g | Component of structural membrane lipids, involved in cell signaling, precursor of eicosanoids | Nuts, seeds, vegetable oils (corn, sunflower, soybean). For arachidonic acid: poultry, eggs, fish | Fat intake mainly from saturated fat sources |
| Omega-3 PUFAs | 1.1 g | 1.4 g | 1.3 g | Neurological development, growth, precursor of eicosanoids | Fish oils, fatty fish, flaxseed oil, nuts (e.g. walnuts) | Low intake of fatty fish, fat intake from saturated fat sources |
| Carbohydrates | 130 g | 175 g | 210 g | Fuel for growth | Starchy vegetables, grains, sugars | Protein energy malnutrition |
| Folate | 400 µg | 400–600 µg | 600 µg | Neurological function, erythropoiesis, neural tube formation, brain development | Liver[b], yeast extract, green leafy vegetables, legumes, citrus fruits, fortified breakfast cereals | Family history of neural tube defects, low folate diet[c] |
| Vitamin B12 | 2.4 µg | 2.6 µg | 2.8 µg | Neurological function, erythropoiesis, neural tube formation, brain development | Milk/dairy products, meat (especially liver[b]), poultry, fish, and eggs | Vegan/vegetarian diets, malabsorption disorders, communities where undernutrition is prevalent |
| Vitamin A (as retinol activity equivalents) | 700 µg | 750–770 µg | 1300 µg | Vision, immunity, growth, organ and limb development, red blood cell production | Yellow and orange vegetables, cod liver oil, eggs, dairy (sources of vitamin A precursors: carotenoids) | Endemic in some areas. Zinc deficiency may interfere with vitamin A metabolism |
| Vitamin D | ≥600 IU[d] | ≥600 IU[d] | ≥600 IU[d] | Immune function, bone growth, calcium and phosphorus balance, insulin secretion, blood pressure regulation | Fatty fish, eggs, dairy | Limited sun exposure, low dietary intake, obesity |
| Vitamin B6 | 1.3 mg | 1.9 mg | 2.0 mg | Multiple enzyme function – protein metabolism, neurological function | Poultry, fish (especially tuna), meats, legumes, potatoes and other starchy vegetables, noncitrus fruits, nuts, and seeds | Alcoholism, poor diet, systemic inflammation |
| Iodine | 150 µg | 220 µg | 290 µg | Thyroid adaptation to pregnancy, brain development | Seaweed, seafoods, iodized salt | Endemic iodine deficiency due to low soil content |
| Iron | 15–18 mg | 27 mg | 9 mg | Hemoglobin synthesis, organ function | Meat, poultry, fish, seafood, molasses, prunes, lentils, kidney beans, yeast extract, tofu, cashew nuts | Malaria infection/endemic area[e], vegetarian diet, malnutrition |
| Calcium[f] | 1000–1300 mg | 1000–1300 mg | 1000–1300 mg | Muscle function, skeletal development, nerve impulse transmission, hormone secretion | Dairy products, tofu, sardines, beans, Chinese cabbage, oranges, figs, kale, broccoli | Low intake of dairy products; vegan diet, adolescent growth spurt |
| Selenium | 55 µg | 60 µg | 70 µg | Fertility, fetal growth, prevention of oxidative stress | Plant foods (e.g. wheat) grown in selenium-rich soil; animals fed on selenium-rich plant foods | Low regional soil selenium content |
| Zinc[f] | 8–9 mg | 11–12 mg | 12 mg | Immune function/infection resistance, growth, neurodevelopment | Oysters, other shellfish, red meat, nuts legumes, poultry, eggs, seeds (sesame, pumpkin, sunflower) | Protein-energy malnutrition, diets low in animal protein and/or high in phytates (whole grains). Iron and calcium supplements decrease zinc absorption |
| Choline | 400–425 mg | 450 mg | | Membrane function, nerve impulse transmission, brain development, neural tube formation | Liver[b], eggs, beef, fish, seafood, milk, wheat germ | Vegan/vegetarian diets |
| Biotin | 25–30 µg | 30 µg | | Immune function, neurological function | Egg yolk, legumes (particularly soybeans and lentils), sunflower seeds, milk, cheese, chicken, pork, beef, and some fruits and vegetables. | High consumption of egg whites |
| Copper | 890–900 µg | 1000 µg | | Immune function, connective tissue formation, iron metabolism, central nervous system function | Organ meats, grains, shellfish (oysters), nuts, seeds, and cocoa products | Iron and zinc supplementation reduces copper absorption |

[a] Source: Institute of Medicine [107,119,132,136,141].

**Table 2**
FIGO recommendations on adolescent, preconception, and maternal nutrition: Specific nutritional requirements before conception, and increases for pregnancy and lactation, based on Institute of Medicine recommended dietary allowance and adequate intake guidelines.[a]

## KEBUTUHAN DAN BATAS MAKSIMUM NUTRISI HARIAN

| Nutrisi | RDA/AI (per hari) | UL (per hari) |
|---|---|---|
| Vitamin A* | H: 0,75-0,77 mg<br>L: 1,2-1,3 mg | 3 mg |
| Niasin (Nikotinamid) | H: 18 mg<br>L: 17 mg | 35 mg |
| Tiamin (Vitamin $B_1$) | H: 1,4 mg<br>L: 1,4 mg | TA |
| Vitamin $B_6$ | H: 1,9 mg<br>L: 2,0 mg | 100 mg |
| Vitamin $B_{12}$ | H: 2,6 µg<br>L: 2,8 µg | TA |
| Vitamin C | H: 80-85 mg<br>L: 115-120 mg | 2000 mg |
| Kalsiferol** (Vitamin D) | H: 15 µg<br>L: 15 µg | 100 µg |
| Alfa-tokoferol (Vitamin E) | H: 15 mg<br>L: 19 mg | 1000 mg |
| Folat (asam folat, folasin) | H: 600 µg<br>L: 500 µg | 1000 µg |

| Nutrisi | RDA/AI (per hari) | UL (per hari) |
|---|---|---|
| Riboflavin (Vitamin $B_2$) | H: 1,4 mg<br>L: 1,6 mg | TA |
| Biotin (Vitamin H) | H: 30 µg<br>L: 35 µg | TA |
| Kromium | H: 29-30 µg<br>L: 44-45 µg | TA |
| Tembaga | H: 1,0 mg<br>L: 1,3 mg | 10 mg |
| Yodium | H: 220 µg<br>L: 290 µg | 1100 µg |
| Besi | H: 27 mg<br>L: 9-10 mg | 45 mg |
| Molibdenum | H: 50 µg<br>L: 50 µg | 2000 µg |
| Selenium | H: 60 µg<br>L: 70 µg | 400 µg |
| Seng | H: 11-12 mg<br>L: 12-13 mg | 40 mg |
| Magnesium | H: 350-400 mg<br>L: 310-360 mg | 350 mg |

**Keterangan:**
*sebagai Retinol Activity Equivalents (RAEs);
1 RAE = 12 mg b-carotene
**pada keadaan paparan sinar matahari yang tidak mencukupi)

RDA: Recommended Dietary Allowance; AI: Adequate Intakes; UL: Tolerable Upper Intake Level;
H: Hamil; L: Laktasi; TA: Tidak ada

http://iom.edu/Activities/Nutrition/SummaryDRIs/~/media/Files/Activity%20Files/Nutrition/DRIs/RDAs%20and%20AIs_Vitamins%20and%20Elements.pdf (diakses pada 26 Februari 2013)
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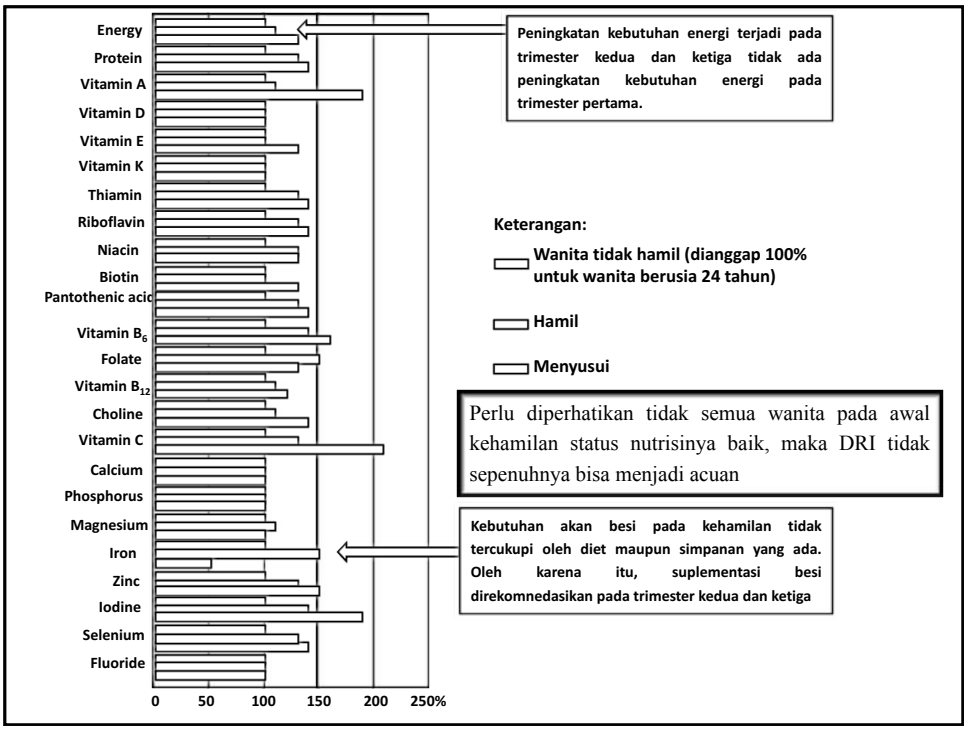


# NUTRISI DALAM KEHAMILAN

- Status Nutrisi sebelum kehamilan sama penting dengan selama hamil.
- Nutrisi ibu selama hamil merupakan hal terpenting pada pertumbuhan & perkembangan janin.
- Nutrisi dan gizi buruk berakibat gangguan pada perkembangan janin seterusnya.

# KEBUTUHAN NUTRISI TRIMESTER I

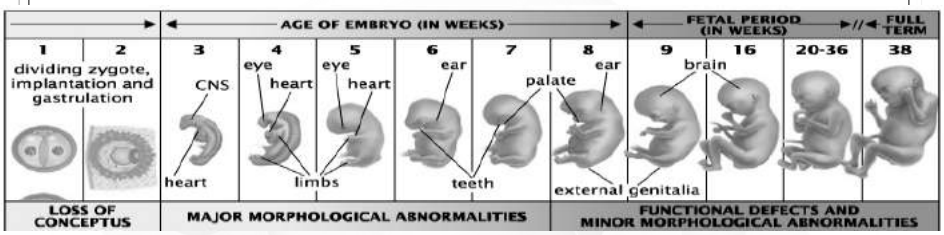
- Kebutuhan kalori tambahan: 300 kalori per hari
- Asupan protein, besi, dan kalsium adalah terpenting .
- Kelebihan glukosa bisa didapat walaupun tidak mendapatkan gestational diabetes, akibat kehamilan .
- Makanan tambahan / camilan .
- Hindari lemak dan makanan berminyak terkait insulin
- Makanan berserat perlu diperhatikan.
- Cairan ditambahkan 400 ml/ hari

# KEBUTUHAN NUTRISI TRIMESTER II-III

- Kalsium untuk perkembangan janin menjadi fokus.
- Janin berkembang pesat pada trimester ini sehingga kebutuhan nutrisi lebih besar.

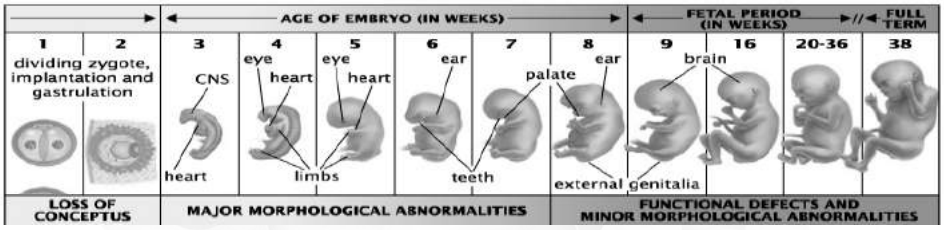
- Makanan tambahan penting untuk dikonsumsi.
- Kenaikan berat badan kurang lebih 500 gr/ 2 mg, jangan melakukan diet selama hamil.

# NUTRISI PENTING JANIN, SEMASA KEHAMILAN




| | Trimester 1 | Trimester 2 | Trimester 3 |
|---|---|---|---|
| **Waktu** | 0 – 12 minggu | 13 – 28 minggu | 28 – 40 minggu |
| Proses yg terjadi | Pembentukan organ vital, otak,sistem saraf jantung, kelamin | Perkembangan organ vital, peningkatan volume darah, pembentukan tulang. | Perkembangan organ penambahan bobot bayi, pembentukan tulang |
| Nutrisi yg dibutuhkan | Asam Folat, NTD, Vitamin A, B1, B6, B12, Vit E | Asam folat, DHA dan ARA, Fe, Ca, Vit E | DHA >> , asam folat, kalsium, Vit B1, B2, B6, Iodium, Zinc |

## NUTRISI PENTING JANIN, SEMASA KEHAMILAN

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## MAKRO DAN MIKRONUTRIEN

Makronutrien

- Protein (asam amino)
- Energi (karbohidrat)
- Lemak (asam lemak)

Mikronutrien

- **Vitamin larut air** (membantu dalam pelepasan energi karbohidrat dan pembentukan sel darah merah)
- **Vitamin larut lemak** (perkembangan dan metabolisme)
- **Mineral**

## MAKRONUTRIEN MERUPAKAN SUMBER ENERGI DAN PENYUSUN MATERI

| Nutrien | Peranan bagi tubuh |
|---|---|
| Protein | Penyusun utama dari sel tubuh. Membantu memproduksi darah ibu dan sumber energi. |
| Karbohidrat | Menyediakan energi untuk ibu dan janin selama kehamilan. |
| Lemak | Menyediakan energi jangka panjang untuk pertumbuhan. Sebaiknya merupakan ≤ 30% kalori harian. |
| Asam lemak esensial | Bagian dari sistem saraf pusat, otak, dan jaringan janin. Penting untuk pertumbuhan dan perkembangan otak yang baik. |
| DHA (DocosaHexaenoic Acid) | Penting Untuk perkembangan otak dan jaringan syaraf dan serabut mata / Visual |

Worthington-Roberts B, Williams SR. Maternal nutrition and the outcome of pregnancy. Nutrition in Pregnancy and Lactation, 4th ed. College Publishing: St. Louis, Missouri, 1989.
Kline DA. Macronutrient requirements during pregnancy. Today's Dietitian Jan 2004:20-24.

## VITAMIN MEMBANTU METABOLISME DAN INTEGRASI JARINGAN

| Nutrien | Peran bagi tubuh |
|---|---|
| Vitamin A | Membantu kesehatan kulit dan membran mukosa gastrointestinal, saluran kemih, dan saluran pernapasan. Membantu pertumbuhan gigi dan tulang. |
| Vitamin C | Membantu kesehatan gusi, gigi, dan tulang. Memperkuat absorbsi besi. Bertindak sebagai antioksidan. |
| Vitamin E | Mencegah oksidasi dari asam lemak yang belum tersaturasi, yang menyusun membran sel. |
| Vitamin $B_6$ | Membantu menyusun sel darah merah. Diperlukan untuk metabolisme asam amino, metabolisme asam lemak, dan sintesis protein. |
| Vitamin $B_{12}$ | Membantu menyusun sel darah merah. Memicu pertumbuhan normal dari sistem saraf. |
| Asam folat | Diperlukan untuk produksi, perbaikan, dan fungsi DNA. Diperlukan untuk memproduksi darah. Membantu fungsi enzim. |

# VITAMIN LARUT AIR

- **Thiamin B**
  Fungsi sistem saraf, pelepasan energi enzimatik dari karbohidrat (sapi,hati, kacang-kacangan, roti)
- **Riboflavin B2**
  Berperan pada enzimatik pelepasan energi karbohidrat, lemak, dan protein (susu, produk susu, sayuran berwarna hijau gelap, yogurt)
- **Niacin**
  Berperan dalam enzimatik pelepasan energi nutrien (sapi, babi, hati, roti, kacang-kacangan)
- **Folat**
  Pembentukan sel darah merah, pembelahan sel baru (sayur-sayuran, biji-bijian)
- **Vitamin B12 (Cobalamin)**
  Pembentukan sel darah merah, sistem saraf (produk hewani)
- **Pantothenic Acid**
- **Biotin (Vitamin H, CoEnzyme R)**
- **Vitamin B6 (Pyridoxine)**
- **Vitamin C**

# VITAMIN LARUT LEMAK

- **Vitamin A**
  - ✓ Penting untuk penglihatan, perkembangan janin, respon imun
  - ✓ Ditemukan pada produk susu, minyak ikan, sayur-sayuran (wortel, mangga)
- **Vitamin D**
  - ✓ Pembentukan tulang, metabolisme dan absorbsi kalsium
  - ✓ Ditemukan pada cahaya matahari, kuning telur, produk susu, dan minyak ikan
- **Vitamin E**
  - ✓ Membentuk dan menjaga membran sel
  - ✓ Ditemukan pada lemak, minyak, sayuran hijau, ayam, ikan
- **Vitamin K**
  - ✓ Pembekuan darah, sintesis protein
  - ✓ Sayuran hijau, hati, kubis

# STRUKTUR JARINGAN DAN PERKEMBANGAN SISTEM ORGAN

| Nutrien | Peranan bagi Tubuh |
|---|---|
| Kalsium | Membantu menyusun tulang dan gigi dengan memicu mineralisasi adekuat. Meliputi kontraksi dan relaksasi otot, fungsi saraf, pembekuan darah, tekanan darah, dan sistem imun. |
| Besi | Membantu sintesa sel darah merah. Membantu mencegah kelelahan ibu. Diperlukan oleh enzim yang mebuat asam amino, kolagen, hormon. |
| Magnesium | Membantu menyusun tulang dan gigi. Membantu regulasi insulin dan kadar gula darah. Membantu keseimbangan asam basa. |
| Zinc | Membantu organ, sistem rangka, saraf, dan organ sirkulasi. Merupakan komponen insulin dan beberapa enzim. Membantu sintesis DNA, RNA, dan protein. Terlibat dalam penyembuhan luka. |

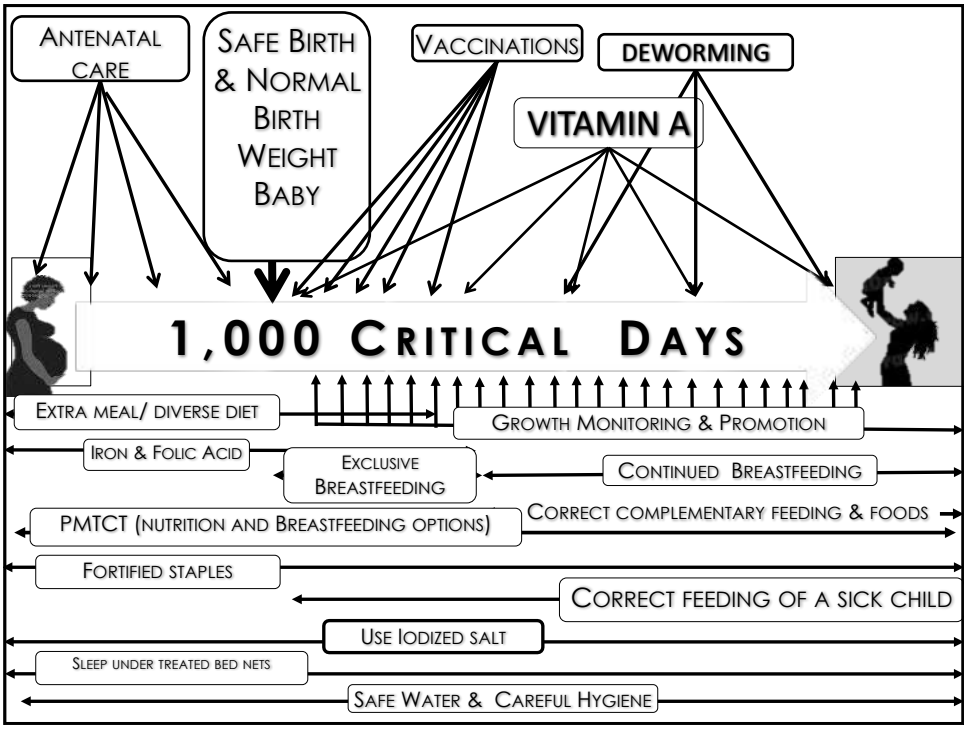
# MINERAL

## Mineral utama "tulang"

Kalsium (tulang)
Fosfor (DNA)
Magnesium (tulang)
Natrium (saraf)
Klorida (keseimbangan cairan)
Kalium (sintesis protein)
Sulfur (beberapa asam amino)

## Mineral lain

Iodin (fungsi tiroid)
Besi (hemoglobin)
Zinc (enzim, hormon)
Tembaga (penyerapan besi)
Flouride (tulang dan gigi)
Chromium (energy)
Molybdenum (enzim)
Manganese (enzim)
Selenium (antioksidan)
Cobalt (B12)


ANTENATAL CARE
SAFE BIRTH & NORMAL BIRTH WEIGHT BABY
VACCINATIONS
DEWORMING
VITAMIN A
1,000 CRITICAL DAYS
EXTRA MEAL/ DIVERSE DIET
GROWTH MONITORING & PROMOTION
IRON & FOLIC ACID
EXCLUSIVE BREASTFEEDING
CONTINUED BREASTFEEDING
PMTCT (NUTRITION AND BREASTFEEDING OPTIONS)
CORRECT COMPLEMENTARY FEEDING & FOODS
FORTIFIED STAPLES
CORRECT FEEDING OF A SICK CHILD
USE IODIZED SALT
SLEEP UNDER TREATED BED NETS
SAFE WATER & CAREFUL HYGIENE


Terima Kasih