Maternal Morbidity & Mortality

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Objectives

• Define maternal mortality
• Measuring maternal mortality
• Millennium development goals (MDGs)
• Major causes of maternal mortality
• Interventions to reduce maternal mortality
• Emergency Obstetric Care (EmOC)
• Health and human rights framework
Definitions

Box 1  Definitions of maternal mortality commonly used.

Maternal death
The death of a woman while pregnant or within 42 days of termination of the pregnancy, irrespective of the duration and the site of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

Maternal mortality ratio
Number of maternal deaths during a given time period per 100 000 live births during the same time period.

Maternal mortality rate
Number of maternal deaths during a given time period per 100 000 women of reproductive age (usually 15–50 years) during the same time period.

Life-time risk of maternal death
The probability of dying from a maternal cause during a woman’s reproductive lifespan.

Maternal Mortality Ratio (MMR)

• MMR may be limited by data sources
  – (i.e. birth registrations, death registrations)
• Average MMR
  – Developing country: 290-402 per 100,000 live births
  – Developed country: 14 per 100,000 live births
• Lifetime risk of maternal death
  – Developing country: 1:120
  – Developed country: 1:4300
• Morbidity more difficult to measure

WHO, Maternal Mortality Fact Sheet, 2010
Measuring maternal mortality

• Direct Data
  – National confidential inquiry into maternal death
  – Requires complete civil registration systems

• Estimates of Maternal Mortality
  – Household surveys
  – ‘Sisterhood’ methods
  – Reproductive age mortality studies (RAMOS)
  – Demographic and Health Survey (DHS)
  – Statistical modeling

A Global Perspective

- 90% of maternal deaths occur in Sub-Saharan Africa and South Asia
- Majority occur in low income countries (LIC)

WHO, 2012
Statistics

• Global context:
  – 2/3 of births occur at home
  – Only 50% of births are attended by skilled personnel

• Low contraceptive prevalence rates

• High total fertility rates

*Majority of maternal deaths can be prevented*

WHO, Maternal Mortality Fact Sheet, 2010


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# MDG 5
## Improve Maternal Health

<table>
<thead>
<tr>
<th>Target 5a</th>
<th>Reduce maternal mortality by 75% 1990-2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>Reduce the maternal mortality ratio (MMR)</td>
</tr>
<tr>
<td>5.2</td>
<td>Increase number of births attended by skilled health personnel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Target 5b</th>
<th>To achieve universal access to reproductive health by 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3</td>
<td>Increase contraceptive prevalence rate (CPR)</td>
</tr>
<tr>
<td>5.4</td>
<td>Reduce adolescent birth rate</td>
</tr>
<tr>
<td>5.5</td>
<td>Increase antenatal coverage</td>
</tr>
<tr>
<td>5.6</td>
<td>Reduce unmet need for family planning</td>
</tr>
</tbody>
</table>

- **MDG 4**: Reduce under-5 child mortality by 2/3rds 1990-2015

Millennium Development Goals

The 8 Millennium Development Goals

1. Eradicating extreme poverty and hunger
2. Achieving universal primary education
3. Promoting gender equality and empowering women
4. Reducing child mortality
5. Improving maternal health
6. Combating HIV/AIDS, malaria, and other diseases
7. Ensuring environmental sustainability
8. Building global partnerships for development

United Nations Statistics Division
Progress

• 34 percent decline in maternal deaths from 1990 to 2008
• Need 5.5% annual decline (2.3% at time of 2010 report)

<table>
<thead>
<tr>
<th>Region</th>
<th>MMR 2005</th>
<th>Annual number of estimated maternal deaths in 2005</th>
<th>MMR 2008</th>
<th>Annual number of estimated maternal deaths in 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>820</td>
<td>276 000</td>
<td>590</td>
<td>207 000</td>
</tr>
<tr>
<td>Asia</td>
<td>330</td>
<td>241 000</td>
<td>190</td>
<td>139 000</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>130</td>
<td>15 000</td>
<td>85</td>
<td>9200</td>
</tr>
<tr>
<td>Oceania</td>
<td>430</td>
<td>890</td>
<td>230</td>
<td>550</td>
</tr>
<tr>
<td>Developed regions</td>
<td>9</td>
<td>960</td>
<td>14</td>
<td>1700</td>
</tr>
<tr>
<td>World total</td>
<td>400</td>
<td>536 000</td>
<td>260</td>
<td>358 000</td>
</tr>
</tbody>
</table>

Causes of Maternal Mortality

• Direct causes
  – Hemorrhage
  – Infection / Sepsis
  – Unsafe abortion
  – Hypertensive disease
  – Obstructed labor

• Indirect causes
  – Disease process occurring within 42 days

WHO, Maternal Health, 2012
Causes of Maternal Mortality

• Other important causes
  – Anemia
  – Embolism
  – Ectopic pregnancy
  – Infectious diseases
    • Malaria
    • HIV
    • Tetanus
  – Domestic violence
3 Delays and Maternal Mortality

• Delay in seeking care
  – Lack of information, resources
  – Cultural and gender norms
• Delay in reaching care
  – Lack of referral system
  – Transport limitations, inadequate roads, distance, cost
• Delay in receiving care
  – Insufficient staffing, training, equipment, meds
  – Cost prohibitive

WHO
www.change.org
Figure 1: Countdown databases in the context of maternal, newborn, and child survival

ODA = overseas development aid. SES = socioeconomic status.
Interventions

Structural & Systemic
Clinical interventions
Priority areas
Political & Human rights
Clean Delivery Kit

- Soap
- Gloves
- Umbilical cord tie
- Razor blade for cord
- Bag for placenta

WHO “Cleans”: clean hands, clean perineum, clean delivery surface, clean cord tying instruments, clean surfaces

Clinical Interventions

Clean Delivery Kit to reduce maternal and neonatal sepsis
Emergency Obstetric Care (EmOC)

• WHO and UN criteria
• Ministry of Health criteria
  – Level 1: Clean delivery kits, family planning, STI
  – Level 2: Basic EmOC, clinical management of rape
  – Level 3: Comprehensive EmOC
• Treat conditions that lead to maternal mortality
  – Hemorrhage, sepsis, HTN, obstructed labor
• Newborn care (EmONC)

UNFPA. Safe Motherhood:
Providing emergency obstetric and newborn care to all in need.
# Emergency Obstetric Care (EmOC)

<table>
<thead>
<tr>
<th>Basic Emergency Obstetric Care</th>
<th>Comprehensive Emergency Obstetric Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration of antibiotics, oxytocics, and anti-convulsants</td>
<td>Cesarean delivery</td>
</tr>
<tr>
<td>Manual removal of the placenta</td>
<td>Safe blood transfusions</td>
</tr>
<tr>
<td>Removal of retained products of conception following miscarriage or abortion</td>
<td>Neonatal resuscitation</td>
</tr>
<tr>
<td>Assisted vaginal delivery (vacuum extraction)</td>
<td></td>
</tr>
<tr>
<td>Newborn care</td>
<td></td>
</tr>
</tbody>
</table>

**UN Process Indicators (per 500,000 people)**

- 1 comprehensive EmOC facility
- 4 basic EmOC facilities
Priority Interventions

• Management of direct causes
  – Antepartum hemorrhage (placental abruption)
  – Postpartum hemorrhage (uterine atony)
  – Puerperal sepsis
  – Eclampsia
  – Obstructed labor
  – Family planning and safe abortion access

Postpartum hemorrhage (PPH)

• 15% of cardiac output goes to uterus

• Definition of:
  >500 cc for vaginal delivery
  >1000 cc for C-section

• Most common cause of PPH is uterine atony

• Other causes of obstetric hemorrhage
  – Placenta previa / abruption
  – Uterine rupture
  – Infection
  – Lacerations
  – Coagulopathy
  – Ectopic pregnancy
  – Miscarriage / septic abortion

www.aafp.org
Management of PPH

- Identify (drapes, pads)
- Fundal massage
- Basics (IV, oxygen, labs)
- Uterotonics
  - Misoprostol
    (200 – 1000 mcg vial oral, sublingual, or rectal routes)
  - Oxytocin
    (10 U IM or 40 U in 1L normal saline as IV infusion)
- Active management of the third stage of labor
- Uterine tamponade
  - Balloon
  - Condom with saline
- Surgery
  - D&C, B-lynch suture, hysterectomy
- Treatment of anemia
  - Iron, transfusion
- Maintain core circulation
- Training & protocols
Protocols and Preparation

Emergency Hemorrhage Kit
1000mcg Cytotec
20U Pitocin
IV needle/tubing set
1000cc Lactated Ringers (2)
Tourniquet
Gloves
Alcohol
Tape
Long Gyn Glove

Photos: Scott
Anti-Shock Garment

- Provide pressure on lower extremities and abdomen
- Increased BP due to peripheral venous compression
- May control bleeding with direct pressure
Preeclampsia / Eclampsia

- Multi-system disorder
- Symptoms
  - HA, visual changes, RUQ pain
- Signs
  - HTN, proteinuria
- Labs
  - CBC, LFTs, creatinine, uric acid, urinalysis
- Eclampsia = above + seizure
- HELLP = hemolysis, elevated liver enzymes, low platelets
- Intervention to improve low-cost, easy diagnostics

- Management of HTN
  - Labetalol IV
  - Hydralazine IV
  - Nifedipine oral (do not give if on magnesium sulfate)
- Magnesium sulfate for seizure prophylaxis

www.lifeforafricanmothers.org
Management of Eclampsia

- Prevent maternal injury
- Maintain oxygenation
- Goal is to stabilize patient
- Prevent recurrent seizures
  - Magnesium sulfate IV
  - OR
  - 10 gm IM loading (5 gm in each buttock)
  - 5 gm IM q 4 hrs (alternate buttocks)

Photos: Scott
Obstructed labor

• Fetus cannot progress through vaginal canal despite contractions
• Causes:
  – Young age, malnutrition, pelvic shape, fetal malpresentation
• Failure to detect abnormal labor pattern, limited access to care
• Without access to operative deliveries → uterine rupture, hemorrhage, sepsis, death
Interventions for Obstructed Labor

- Skilled personnel
- Recognition, warning signs
- Access to operative delivery (forceps, vacuum, C-section)
- Delivery plan
- Transportation
- Incentives for institutionalized delivery
Obstetric Fistula

- A devastating health and social consequence of obstructed labor
- Obstructed labor → Necrosis of tissue → Incontinence
- Urinary and / or fecal incontinence

www.who.int

http://www.wlsa.org

www.operationof.org
Vesicovaginal Fistula

Treatment: Surgical

http://www.glowm.com/

www.radiographics.rsna.org
Infection / Sepsis

- Peripartum infections
- Chorioamnionitis
- Endometritis
- Septic abortions
- Sexually transmitted infections
- Urinary pathogens
- Pulmonary (pneumonia)

Intervention: prevention, timely diagnosis, resuscitation & stabilization, targeted antibiotics

Photo: Heinrichs, Rwanda
Unsafe Abortion

• Family planning program
  – Reduce the unmet need for family planning
• Comprehensive abortion care
  – Safe abortion
  – Post-abortion care
  – Post-abortion contraceptive services
• *Approach as a health issue and not a moral issue*

Unsafe Abortion

• Definition
  – Performed by individual without necessary skills
  – Performed in an environment that does not meet medical standards

• Nearly half of all abortions worldwide are unsafe

• Majority in developing countries

Interventions
• Legalization decreases abortion-related deaths
• Advances in medical abortion
• Improved access to family planning options
Abortion Care

• Complications of unsafe abortions
  – Infections
    • Clostridium perfringens
    • Clostridium tetani
  – Uterine perforation & hemorrhage
  – Bowel perforation
  – Reproductive tract damage
Interventions to Prevent and Treat Infections

• Preventing maternal and neonatal tetanus from *Clostridium tetani*
  – Immunize pregnant women
  – Clean delivery and umbilical cord care

• Preventing HIV infections and maternal-child transmission
  – Antenatal testing
  – Antenatal care / ARVs
  – MTCT programs
  – Co-morbid infections
  – Infant feeding practices
    • Maternal and neonatal prophylaxis
    • Alternative feeding
Malaria

- Severe maternal cases are due to *Plasmodium falciparum*

- Consequences
  - Anemia
  - SAB
  - Preterm delivery
  - Low birth weight
  - Stillbirth

- Prevention
  - Avoidance of mosquitos
    - Insecticide bed nets
  - Chemoprophylaxis antepartum
    - 2 doses of antimalarial (sulfadoxine pyrimethamine)

- Treatment
  - Prompt treatment with antimalarial
  - Supportive care

www.jhpiego.org
Skilled Birth Attendants

- Health professional with midwifery skills
- Resources to enable them to perform
- Access to higher levels of OB care (surgery, blood)
- Target for countries to have 80% births attended by skilled provider
- Need more data collection from low-income countries

www.thinkafricapress.org

www.wunrn.com
MISP

• Minimum Initial Service Package (MISP)
• Women’s Commission for Refugee Women & Children, Inter-Agency Working Group (IAWG)
• Coordinated set of priority RH activities in humanitarian context
• SPHERE standard
• Online module
Kits 0-5: Health post level (10,000 people x 3 months)  
Kits 6-10: Health center level (30,000 people x 3 months)  
Kits 11-12: Hospital level (150,000 people x 3 months)

<table>
<thead>
<tr>
<th>Kit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kit 0</td>
<td>Administrative</td>
</tr>
<tr>
<td>Kit 1A; 1B</td>
<td>Male condoms; Female condoms</td>
</tr>
<tr>
<td>Kit 2A; 2B</td>
<td>Clean delivery kits for patient; Clean delivery kit for skilled birth attendant</td>
</tr>
<tr>
<td></td>
<td>(Clean delivery kits include soap, gloves, umbilical cord tie, razor blade for cutting the umbilical cord and a bag for the placenta)</td>
</tr>
<tr>
<td>Kit 3A</td>
<td>Post rape kit (pregnancy tests, emergency contraception, STI treatment)</td>
</tr>
<tr>
<td>Kit 3B</td>
<td>Post rape kit (post-exposure prophylaxis for HIV)</td>
</tr>
<tr>
<td>Kit 4</td>
<td>Oral and injectable contraceptives</td>
</tr>
<tr>
<td>Kit 5</td>
<td>STI treatment (syndromic approach to treatment)</td>
</tr>
<tr>
<td>Kit 6</td>
<td>Clinical delivery assistance (hospital delivery). Contains 6 cartons including oxytocin, magnesium sulfate, and a sterilizer for instruments.</td>
</tr>
<tr>
<td>Kit 7</td>
<td>Intrauterine devices (for contraception)</td>
</tr>
<tr>
<td>Kit 8</td>
<td>Management of complications (retained products of conception, cervical dilators, manual vacuum aspirators)</td>
</tr>
<tr>
<td>Kit 9</td>
<td>Suture of tears (vaginal and cervical instruments)</td>
</tr>
<tr>
<td>Kit 10</td>
<td>Vacuum extraction delivery</td>
</tr>
<tr>
<td>Kit 11A; 11B</td>
<td>Cesarean section (surgical supplies); Cesarean section (support supplies, 35 boxes)</td>
</tr>
<tr>
<td>Kit 12</td>
<td>Blood transfusion</td>
</tr>
</tbody>
</table>
MISP Kits

Photos: Scott
Reducing Newborn Deaths

• Half of newborn deaths can be prevented by:
  – Tetanus toxoid immunization of mothers
  – Clean and skilled care at the birth
  – Newborn resuscitation
  – Exclusive breastfeeding
  – Clean umbilical cord care

Areas of Need

• Need for improved data collection/methods
• Lack of skilled health care providers
• Missed opportunities in training
• Poor access to essential meds
• Persistent high fertility
• Need for cost-effective interventions
  – Standardized data (DALYs or ‘cost per lives saved’)

Cost-effective interventions (cost per life saved)

- Family planning
- Safe abortion
- Antenatal care with misoprostol distribution for home deliveries
- Facility-based PPH management

Human Rights Issues

• Address gender inequality and norms
• Elimination of discrimination against women
• Improved education
• Right to have access to RH services and options
• Elimination of harmful traditional practices
  – Early and forced marriage
  – Female genital cutting
  – Bride dowry, widow inheritance
• Political will
Conclusion

• Maternal mortality is preventable and is a health and human rights issue

• Topics discussed:
  – Definitions and data
  – Millennium development goals
  – Major causes of maternal mortality
  – Interventions to address major causes
  – Emergency Obstetric Care
  – Human rights framework