Limits of Viability: Ethical and Medical Aspects

ETHIOPIAN VALENTINE’S DAY COURSE ON
MATERNAL, FETAL AND GYNECOLOGICAL MEDICINE
SUNDAY FEBRUARY 14TH, 2021 2PM – 6PM - ADDIS ABABA

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Outline

• Preterm birth: definition, epidemiology and significance
• Definition of the limits of viability
• Historical perspective of the limits of viability
• Limits of viability as an example of the world inequality
• How to improve care for infants at the limits of viability
• Ethics and limits of viability
• Conclusion
Preterm birth
Definitions of preterm infants – gestational age

- **LATE PREMATURITY**: 34+0 to 36+6 weeks of gestation
- **EARLY TERM**: 39+0 to 41+6 weeks of gestation
- **TERM**: 42+0 to 50+6 weeks of gestation
- **POST TERM**: >50+6 weeks of gestation

**Limits of Viability?**
- **≤1000g**
- **1000-2000g**
- **>3000g**

**Country** | **Prematurity rate** | **Term infants rate** | **Post term**
--- | --- | --- | ---
USA | 12.5%-9.56% | 86.5% | 1%
Croatia | 4.99%-6.5% | 93.6% | 0.9%
Ethiopia | 12.0% | |
Is prematurity social and medical problem?

• It is estimated that there were **14,8 million (12.5 million live-born)** preterm babies born in the world in 2014.

• **12 million** or **84.7%** are preterm babies between 32 and 36 weeks, or around 9% of live-borns.

• The highest prematurity rates are **in Bangladesh 19.1%**, and the lowest of **5%** in some European countries.

• Multiple births account for **20%** of preterm birth rate.

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Map of estimated percentages of preterm births in the world (2014)

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Preterm birth rate in countries with high quality data

• Of the 38 countries with high-quality data, preterm birth rates have increased since 2000 in 26 countries and decreased in 12 countries.

• Globally, we estimated that the preterm birth rate was 9.8% (8.3–10.9) in 2000, and 10.6% (9.0–12.0) in 2014.
Preterm birth rate by gestational age (estimates) in 2014

<table>
<thead>
<tr>
<th>Gestational age (weeks)</th>
<th>Europe</th>
<th>Latin America and Caribbean</th>
<th>North America</th>
<th>North Africa and Sub-Saharan Africa</th>
<th>Oceania</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;28</td>
<td>5.1%</td>
<td>8.9%</td>
<td>6.8%</td>
<td>3.3%</td>
<td>5.6%</td>
</tr>
<tr>
<td>28 to &lt;32</td>
<td>10.9%</td>
<td>9.8%</td>
<td>10.7%</td>
<td>12.8%</td>
<td>12.0%</td>
</tr>
<tr>
<td>32 to &lt;37</td>
<td>84.5%</td>
<td>81.2%</td>
<td>82.6%</td>
<td>83.8%</td>
<td>82.4%</td>
</tr>
</tbody>
</table>

*Underreported?*

*The Lancet Global Health* 2019 7, e37-e46 DOI: (10.1016/S2214-109X(18)30451-0)
Definition of viability
Definition of viability

• Definitions differed between countries including the definitions of fetal viability and preterm birth.

• ICD-10 does not advise a lower gestational age limit for fetal viability, rather advising use of “signs of life” to define a livebirth.

• In practice, definitions of livebirth may include thresholds for birthweight or gestational age. A lower threshold for fetal viability will capture more preterm births than would a higher threshold.

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Limits of viability definition by the organizations (WHO)

The WHO recommended ‘that national perinatal statistics should include all foetuses and infants delivered weighing at least \(500 \text{ g}\) or, when birth weight is unavailable, the corresponding gestational age \((22 \text{ weeks})\) or body length \((25 \text{ cm crown-heel})\) whether alive or dead’

How to define viability in neonatal period?

Certain gestational age or certain birth weight at which survival to discharge is above 50%

Risk of death

Risk of death in premature infants born before completed 28 weeks of gestation is 95% if neonatal intensive care is not available.

Only 1% of those who need, get intensive neonatal care.
Survival of the smallest premature infants from the literature

Porodna masa/Birth weight

387 g*: Can Med Association J year/godina: 1936
450g: Br Med J year/godina: 1950
395g: Acta Pediatr Jap year/godina: 1985
290g: Eur J Pediatr year/godina:2001

*weight on the 2nd day of life
Definition of viability at present

• Human viability, defined as gestational age at which the chance of survival is 50%, is currently approximately 22 to 24 weeks in developed countries.

• Infant girls, on average, have better outcomes than infant boys.

Limits of viability: a historical perspective

Birthweight specific survival since the beginning of institutional medical care of preterm infants: mean birthweight, at which half of the infants survived for at least 28 days or up to discharge home in selected centers. Data are extrapolated or averaged from studies which usually covered several years.

Neonatal survival of extremely preterm, live-born infants at 22 to 26 completed weeks’ gestation in Sweden between 1985 and 2016 by gestational age and year of birth.
Improved survival of infants from 22 to 26 GW in Sweden in two time periods

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2004 to 2007</th>
<th>2014 to 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of births (birth rate)</td>
<td>1009 (3.3 per 1000 births)</td>
<td>1196 (3.4 per 1000 births)</td>
</tr>
<tr>
<td>One year survival rate</td>
<td>70%</td>
<td>77% (p = 0.003)</td>
</tr>
<tr>
<td>Survival without major morbidity at 1 year</td>
<td>32%</td>
<td>38% (p=0.008)</td>
</tr>
</tbody>
</table>

Survival among extremely low birth weight (ELBW) babies in resource limited settings

• The overall survival rate of extremely low birth weight babies was 18%.

• Mortality in ELBW neonates weighing less than 750g was 100%.

Mortality of premature infants (<26 to 33 GW) in Ghana (2011-2015)

How development of neonatology improved outcome of infants at the limits of viability?

- **1980s**: CPAP, mechanical ventilation
- **EARLY 1990S**: Exogenous surfactant
- **MID/LATE 1990S**: Antenatal steroids
- **EARLY 2000S**: Avoiding postnatal steroids
- **MID 2000S**: Targeted oxygen therapy

What the future brings?

Significance of the environment in which the newborn is nurtured
"Baby Astronaut" (GATO) hypothesis

- Gravity
- Age
- Thermoregulation
- Oxygenation

Development of neonatal care

1890s

1990s

2090s

We cannot solve our problems with the same thinking we used when we created them.

Albert Einstein

https://www.brainyquote.com/quotes/quotes/a/alberthings121993.html

The development of artificial uterus in Philadelphia Children’s Hospital is the reality.
How to define limit of viability?

Biological limit of viability?

Developmental level of the society

Availability of medical care and technology

Early and late outcome: survival without major disability

Ethical issues and limits of viability

Development of medicine and technology

Instead of conclusion: development of the limits of viability
Limits of viability: ethical dilemmas
What is important from the point of view of medical staff?

• The challenges are that it is unclear whose best interest is to be taken into account (family vs infant)

• What that extremely preterm infant’s best interest looks like within the prospects of low quality of life and long-term neurodevelopmental impairment

On the other hand...

• NICU professionals operate around the *limit of viability* with vulnerable infants and parents as surrogate decision-makers.
• They make decisions about end of life right at its beginning at the age when technologies can prolong life without guaranteeing its quality.
• The main reasons that bring about tragedy are clinical uncertainty and ambiguity about best interest.

Limits of viability are they universal?

• They are not!

• From many aspects they are still not universal.

• They are source of inequity in the world and a huge gap in medical care between developed and developing countries.

• How the problem should be solved?

• What should be done?
What is important from the point of view of medical staff?

„Every action carried out under ethical principles during this extended stay will have a good impact and will give us the satisfaction of helping our fellow human beings, which has always been one of the main goals of medicine”.

José M. Ceriani Cernadas

Self perception of ELBW in adolescence

They consider themselves as a happy and satisfied persons despite the handicap

THANK YOU FOR YOUR ATTENTION