Hyponatraemia complicating labour

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Waterintoxication after large water intake during labor
Johansson, Acta Paediatr 2002; 91: 811- 4

Case A
Healthy 29 yr primipara, v 41
Drank >8 l over 13,5 hours
No intravenous fluid
Oxytocin 0.12 E i v
Vaginal delivery
Waterintoxication after large water intake during labor
Johansson, Acta Paediatr 2002; 91: 811- 4

APGAR 9-10-10

Age 1 hour: Irritability

Age 7 hours: Seizures

p-Na 122 mmol/l

Treatment: Fluid restriction normalising p-Na

Age 3 months: Normal development
Hyponatraemia - symptoms

- Tiredness
- Headache
- Nausea
- Vomiting
- Somnolence
- Coma
- Seizures
- Respiratory arrest
- Herniation
- Death
Hyponatraemia
(Normal p-Na 135-146 mmol/ l)

Severe hyponatraemia:
p-Na < 120 mmol/l

However:

Severity largely dependent of speed of lowering:

P-Na 130 mmol/l associated with symptoms of severe hyponatraemia
Studies regarding:

- Energetic supplies during labour
- Fluid administration during labour
- Hyponatraemia during labour...
- and in endurance sports
Effect of food intake during labour on obstetric outcome: randomised controlled trial

O´Sullivan et al BMJ 2009; 338: 784-9

Light meals during labour:

No difference obstetric/neonatal outcome

No increased vomiting
Energy and fluids during labour

NPO widespread practice:

USA, UK

Energy and fluids by iv infusion

Midwives often recommend food

Myths and beliefs flourish—very few studies
CONTINUOUS MATERNAL GLUCOSE INFUSION DURING LABOR: EFFECTS ON MATERNAL AND FETAL GLUCOSE AND LACTATE LEVELS

Conclusion: glucose 9 g/h safe

with respect to hyperglycaemia
lactate
insulin levels

but:
electrolyte free solutions
no discussion electrolyte balance
Glucose 9g/h as Glucose 5 %: 
180 ml/h   4,3 l/24 h
Fluid administration during labour


Fluid administration during labour

Prospective randomised study
195 primiparas (NPO)

Group A: 125 ml/h Ringer-acetate i v
Group B: 250 ml/h Ringer-acetate i v
Fluid administration during labour

Larger fluid volume may favour uterine contractility:

- Less Oxytocin
- Fewer instrumental deliveries

However:
No large differences in fluid volumes:
Group A 2 000 ml    Group B 2 500 ml

Reference: Fluid administration to athletes
Sports, athletes and water
Runner dies after London Marathon 2007

The cause of the 22-year-old's death –

Daily Telegraph reported : due to hyponatraemia

His is the ninth death since the London Marathon began in 1981 ....
Case proven: exercise associated hyponatraemia is due to overdrinking.

So why did it take 20 years before the original evidence was accepted?......

T D Noakes and D B Speedy
Hyponatremia among Runners in the Boston Marathon

Christopher et al. NEJM 2006

766 study participants in the race
488 fulfilled all study criteria
13 % Hyponatremia P-Na < 130 mmol/l
0.6 % P-Na < 120 mmol/l
Hyponatremia among Runners in the Boston Marathon

Christopher et al. NEJM 2006

13 % Hyponatremia (p-Na < 130 mmol/l)

0,6 % P-Na < 120 mmol/l

Hyponatremia associated with:

Fluid intake, weight gain, longer running time, extreme BMI
Current hydration guidelines are erroneous: dehydration does not impair exercise performance in the heat

Bradley A Wall,¹,² Greig Watson,¹,³ Jeremiah J Peiffer,² Chris R Abbiss,¹ Rodney Siegel,⁴,⁵ Paul B Laursen⁴,⁵


Conclusion When well-trained cyclists performed a 25 km cycling time trial under ecologically valid conditions and were blinded to their hydration status, performance, physiological and perceptual variables were not different between trials. These data do not support the residing basis behind many of the current hydration guidelines.
Hyponatraemia during labour?

Tarnow - Mordi, BMJ, 1981


Singhi, Br J Obstet & Gynaecol, 1994

Stratton, E J Obstet & Gynecol 1995
Hyponatraemia during labour?

Oxytocin (Syntocinon)
Intravenous fluids
Epidural analgesia

Correlate with:

Hyponatraemia in mother and child
Longer labours
Respiratory distress
Hyperbilirubinaemia
Consequences of earlier studies

Syntocinon
- electrolytes in fluid
- higher concentrations
- lower doses

Mechanical pump devices

PROBLEM RESOLVED?
What are pregnant women told?

During pregnancy fluid requirements increase.
- Drink at least a glass of water every hour.

Don’t wait until you get thirsty – then you are really way behind!

Concept from sports medicine: Voluntary dehydration.
What are pregnant women told?

...during active labour the body requires

Approx 500 kcal and 0.5-1 l fluid

....... Every hour!

https://www.google.se/#q=ladda+kungs%C3%B6rnen
Important for Daddy to know....

During labour it is important you make her drink all the time.

...if she despite of this vomits, make her drink again, as quickly as possible.

Ref:
Ladda Kungsörnen:
https://www.google.se/#q=ladda+kungs%C3%B6rnen
Hypothesis: High prevalence hyponatraemia during labour

Kalmar County Hospital

Included:
All pregnant women 37+6
Study: Hyponatraemia complicating labour

Treatment:

As usual (observational study)

Aim:

Hyponatraemia during labour?
Effects on the progress of labour?
Effects on the baby?
Study protocol mothers

Blood sampling before and after delivery:

ISTAT: electrolytes/glucose
blood gases

Central laboratory: p-osmolality

Registration of all oral intake (= drink)
i v fluids
Syntocinon

Pain relief

Duration of labour and mode of delivery
Maternal P-Na on admission: 136 mmol/l
P-Na pregnancy: ref values 131-140 mmol/l
Osmoregulation, the secretion of arginine vasopressin and its metabolism during pregnancy

Marshall D Lindheimer and John M Davison

*Eur J Endocrinol* 1995; 132: 133-43
Hyponatremia $\leq 130$ mmol/l
21 mothers after delivery
Reduction of p-Na in hyponatraemic mothers (p<0.001)

Hyponatraemic vs non-hyponatraemic mothers

Maternal Na reduction

<=130  >130

Median
25%-75%
Non-Outlier Range
Outliers
Extremes
Hyponatraemic vs non-hyponatraemic mothers: 300 ml/h (p=0.16)
### Significant hyponatraemia

P-Na < 130 mmol/ l

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#### Total fluid volume during labour

<table>
<thead>
<tr>
<th>Volume</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1000 ml</td>
<td>113</td>
<td>1%</td>
</tr>
<tr>
<td>1000-2500 ml</td>
<td>87</td>
<td>5%</td>
</tr>
<tr>
<td>&gt;2500 ml</td>
<td>61</td>
<td>26%</td>
</tr>
</tbody>
</table>
# Uni/ multivariate analysis

<table>
<thead>
<tr>
<th></th>
<th>Univariate</th>
<th>Multivariate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluids &gt; 2500 ml</td>
<td><em>p</em> &lt; 0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Oxytocin &gt; 5U</td>
<td><em>p</em> &lt; 0.001</td>
<td>0.07</td>
</tr>
<tr>
<td>Epidural</td>
<td><em>p</em> &lt; 0.001</td>
<td>-</td>
</tr>
<tr>
<td>Parity</td>
<td><em>p</em> &lt; 0.01</td>
<td>-</td>
</tr>
</tbody>
</table>
Significant hyponatraemia and failure to progress: $p < 0.001$

Instrumental deliveries and caesarean section vs spontaneous vaginal delivery

![Graph showing Na after delivery for spontaneous vaginal delivery vs failure to progress](image)
How often is a low Apgar score the result of substandard care during labour?
S Berglund, H Pettersson, S Chattingius, C Grunewald

Population based case-control study:
Substandard care APGAR 5 min <7: 62%
controls: 36%

Oxytocin:
Every fifth case AND control received oxytocin despite no signs of inertia
Ionkanaler i myometriet
Reduceras myometriekontraktiliteten vid låga natriumnivåer i blodet?

Moen V, Ekman-Oderberg G, Irestedt L, Ebberyd A, Brudin L

Metod: Biopsier vid planerad sectio v 39

Biopsi; 6 mm x 15 mm
Rensas, delas i 8 strips:
Organbad: 1) 120 mmol Na/L
2) 136 mmol Na /L
Metod:
Metod:

Spänna upp, vänta ca 1 timme till stabilisering.
KCL 100 mM för maximal kontraktion, skölja x 3

Oxytocin 0.001 IE,
observera kontraktioner 20 min, skölja x 3
0.01 IE
observera kontraktioner 20 min, skölja x 3
0.1 IE
observera kontraktioner 20 min, skölja x 3

KCL 100 mM för maximal kontraktion
Analys

• Frekvens och Amplitud (relaterad till maxamplitud efter KCL)

• Myometrieaktivitet:
• Frekvens x Amplitud: Montevideo Units

Intensitet av kontraktion:
• Area under the curve (AUC): gram x minut
Preliminärresultat:
Preliminärresultat

Frekvens

Amplitud
Preliminärresultat: Amplitud i % av maxamplitud vid olika OT-doser
Sammanfattningsvis...

- Hyponatremi uppkommer under förlossning vid endast måttligt ökad vätskeintag.
- Hyponatremin kan i sig vara skadlig för såväl moder som barn.
- Hyponatremi kan bidra till värksvaghet.
- Ökad uppmärksamhet om hyponatremin kan kopplas till verksvaghet?
Tack för uppmärksamheten!

Frågor?