Iron/Folic Acid Supplements Protect Against Early Neonatal Mortality in Indonesia

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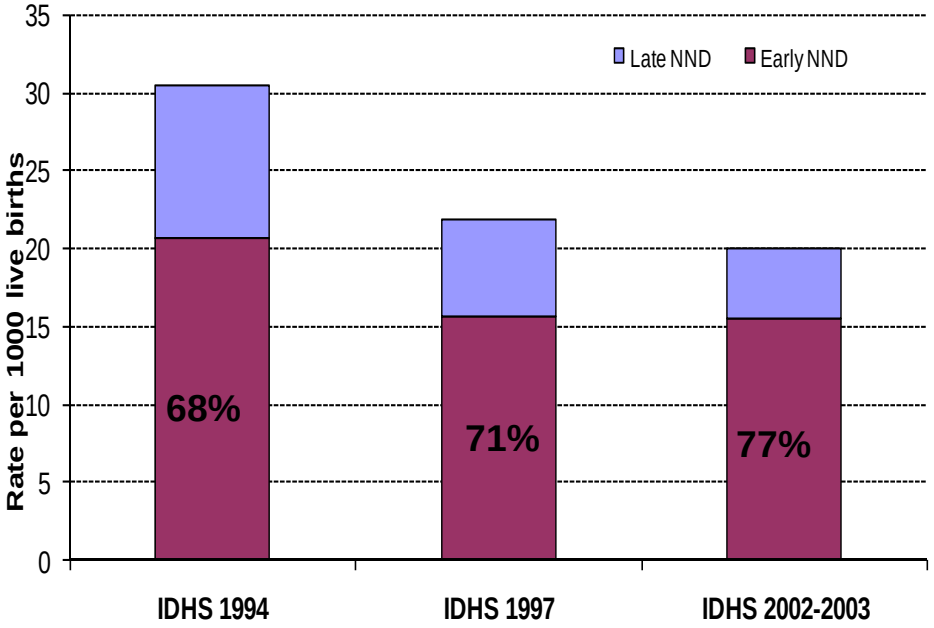
Neonatal Mortality

- Global estimate of 4 million infants deaths in the first 28 days of life (2002)
- 75% of these neonatal deaths occur in the first seven days (early neonatal period).
- Over the last 20 years, slower decline in neonatal vs. post neonatal infant deaths

Figure 1. Neonatal mortality rates in Indonesia: DHS 1994, 1997, 2002-2003



Iron/folic acid supplements & neonatal deaths

- RCT of micronutrient supplements in pregnancy, China (*Zeng L, 2008)*
  - 54% reduction of early neonatal mortality with FeFol compared to folic acid only
  - An increased duration of gestation and reduced the risk of early preterm delivery (<34 weeks) with FeFol.
- 75% of neonatal deaths among LBW newborns were attributed to preterm birth in Bangladesh (*Yasmin et al, 2001)*
- 65% of early neonatal deaths attributed to preterm-related causes in WHO multi-country trial *(Nguyen Ngoc et al, 2006)*

Study objectives

To assess if iron/folic acid (FeFol) supplements reduce early neonatal deaths in Indonesia

Data source

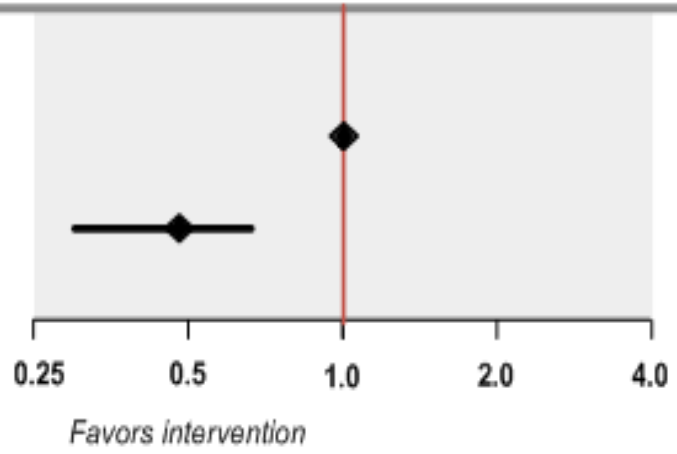
- Indonesia DHS for 1994, 1997 and 2002-2003
- Survival information for 40,576 singleton infants from the most recent delivery within 5 years prior to survey.
- 442 early neonatal deaths

Analysis method

- Cox Proportional Hazards models constructed to adjust confounding factors:
  - reported birth size and timing of delivery
  - delivery complications
  - child sex
  - maternal education
  - maternal age at childbirth
  - delivery attendance.
- Population Attributable Risk (PAR)
  - to determine the total risk for early neonatal deaths in the general population attributable to women who did not take iron/folic acid supplements during pregnancy

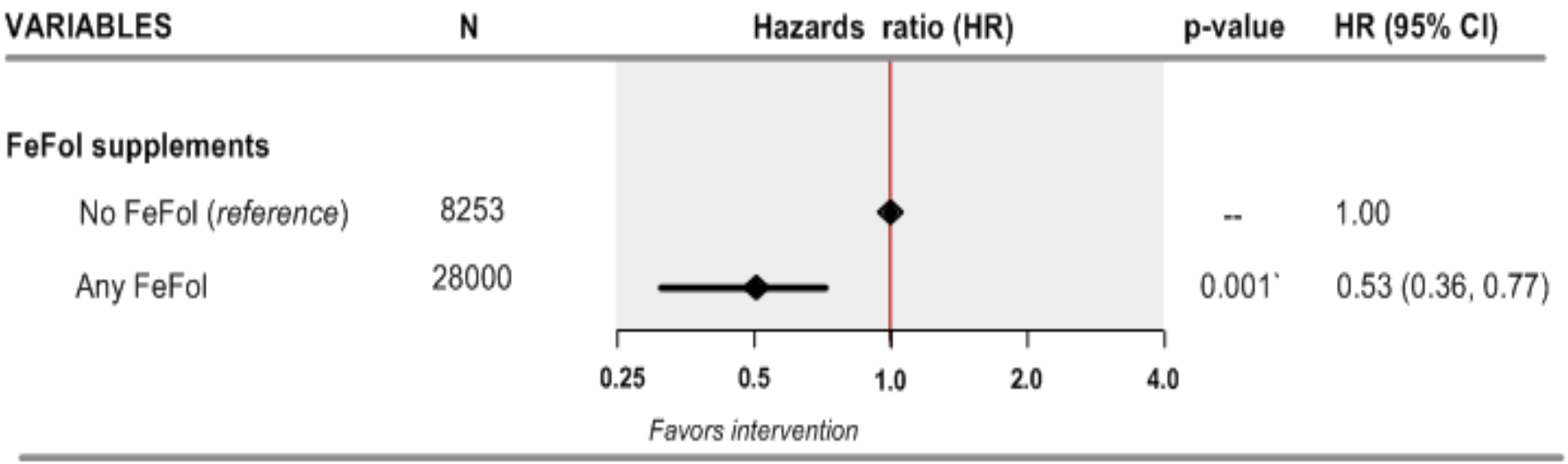
Antenatal care (ANC) & early neonatal mortality

VARIABLES	N	Hazards ratio (HR)	p-value	HR (95% CI)
Antenatal care				
No ANC (*reference*)	4211		--	1.00
Any ANC	35000		0.001	0.48 (0.31, 0.73)



- Model adjusted for reported birth size and timing of delivery, delivery complications, child sex, maternal education, maternal age at childbirth and delivery attendance.

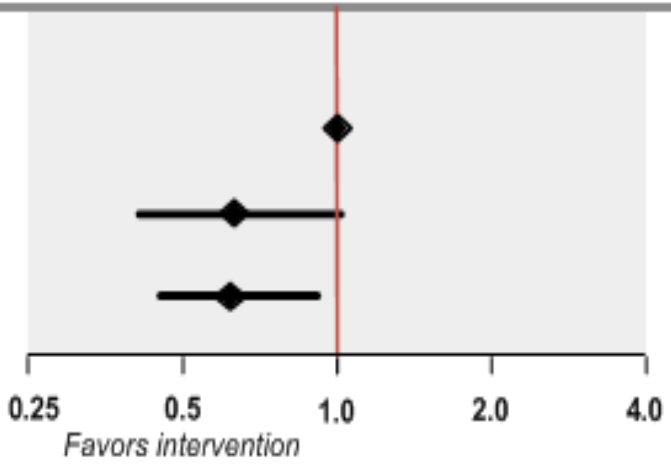
Iron/folic acid supplements & early neonatal mortality



- Model adjusted for reported birth size and timing of delivery, delivery complications, child sex, maternal education, maternal age at childbirth and delivery attendance.

Tetanus Toxoid (TT) vaccination & early neonatal mortality

VARIABLES	N	Hazards ratio (HR)	p-value	HR (95% CI)
Tetanus Toxoid				
No TT (*reference*)	11000		--	1.00
One TT	7366		0.09	0.67 (0.43, 1.06)
Two or more TT	20000		0.01	0.66 (0.48, 0.92)



- Model adjusted for reported birth size and timing of delivery, delivery complications, child sex, maternal education, maternal age at childbirth and delivery attendance.

Combined Iron/folic acid supplements (FeFol) & Antenatal care (ANC)

VARIABLE	N(%)†	Adjusted†‡	
		HR *(95% CI)*	p
No FeFol + No ANC	3862 (9.9)	1.00	
No FeFol + Any ANC	4309 (11.1)	0.61 *(0.35 – 1.06)*	0.08
Any FeFol + No ANC	294 (0.8)	**0.10** *(0.01-0.72)*	**0.02**
Any FeFol + Any ANC	27408 (70.3)	**0.41** *(0.25-0.66)*	**<0.0001**

Adjusted for reported birth size and timing of delivery, delivery complications, child sex, maternal education, maternal age at childbirth and delivery attendance

†) Weighted for the sampling probability ‡) 2574 missing cases were excluded

Combined Iron/folic acid supplements (FeFol) & Tetanus Toxoid (TT) vaccinations

VARIABLE	N(%)†	Adjusted†‡	
		HR *(95% CI)*	p
No FeFol + <2 TT	6713 (17.2)	1.00	
No FeFol + 2+ TT	1389 (3.6)	0.64 *(0.28 – 1.46)*	0.29
Any FeFol + <2 TT	10161 (26.1)	**0.46** *(0.29 – 0.73)*	**0.001**
Any FeFol + 2+ TT	17298 (44.4)	**0.49** *(0.32 – 0.74)*	**0.001**

Adjusted for reported birth size and timing of delivery, delivery complications, child sex, maternal education, maternal age at childbirth and delivery attendance

†) Weighted for the sampling probability ‡) 2574 missing cases were excluded

Population Attributable Risk

- The PAR of not taking iron/folic acid supplements: National PAR = 20%.

- ~ 15,000 early neonatal deaths could be prevented.

Conclusions

- Use of FeFol during pregnancy was significantly associated with a 47% reduction in early neonatal deaths.
- Combinations of use of FeFol, ANC and TT vaccination showed the main protective effect was from use of FeFol.
- 20% of early neonatal deaths could be averted each year in Indonesia if FeFol were universally delivered to pregnant women.
- FeFol in pregnancy should be included in neonatal care packages to reduce neonatal deaths in Indonesia and other low and middle income countries.

Funding and acknowledgement

- Australian Agency for International Development (AusAID) for funding CRT PhD scholarship in International Public Health at the University of Sydney, Australia
- CLR is supported by a NHMRC Research Fellowship.