

Circadian variation in cortisol concentration in mother's milk

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Introduction

In mammals, maternal glucocorticoids are transmitted through breast milk, particularly under stressful circumstances. (Sullivan et al. 2010, *Developmental psychobiology*)

In humans, it is unclear whether milk cortisol levels are dependent on stressful perinatal circumstances, such as preterm birth.

Objectives

To study glucocorticoid concentrations in preterm vs. term milk, longitudinally in the first month postpartum.

Methods

Subjects: 5 mothers of very preterm infants (GA <32 wks) and 5 mothers of full-term infants (GA ≥37 wks).

Exclusion criteria for the mother: multiple pregnancy, breast surgery, HELLP syndrome, pre-existing or gestational diabetes mellitus and autoimmune diseases.

Study procedures: Breast-milk samples were obtained weekly in the first month postpartum. After hexane extraction, cortisol and cortisone concentrations were assessed by our newly developed LC-MS/MS method. (Van der Voorn et al. 2015, *Clinica Chimica Acta*)

Analysis Cortisol and cortisone concentrations were logarithmically transformed. Longitudinal differences were assessed by generalized estimating equations (GEE).

Post hoc, exploration of our data suggested cortisol and cortisone concentrations to be dependent on time of collection, with a peak between 6am and 12am. (fig. 1) Therefore, we also analysed the influence of time of collection by GEE.

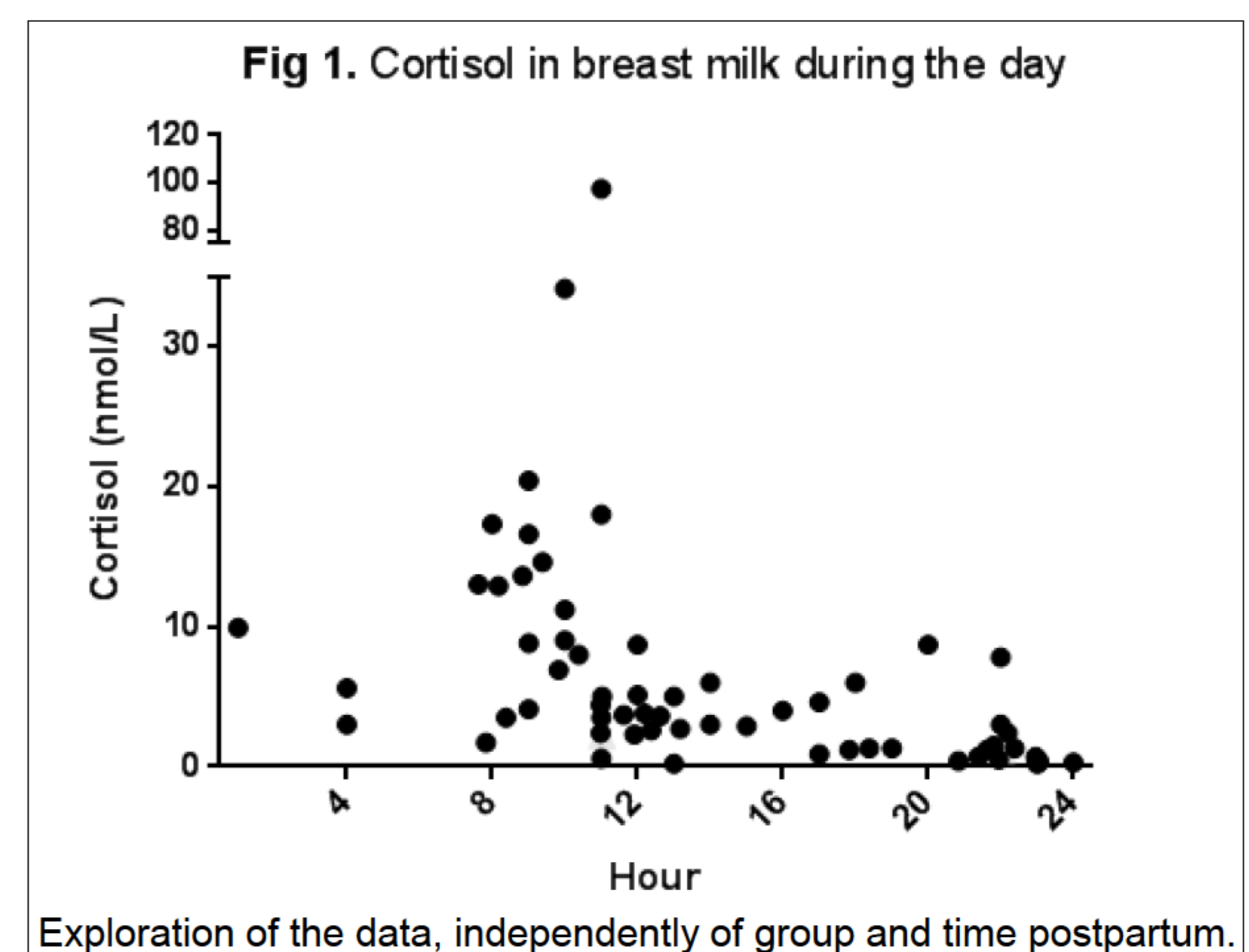
Results

Glucocorticoid concentrations in preterm and term milk in the first month postpartum

	Preterm	Term	P-value
Cortisol (nmol/L)	2.9 (0.2 - 9.9)	5.1 (0.5 - 97.4)	0.07
Cortisone (nmol/L)	16.0 (2.0 - 37.0)	34.3 (10.0 - 95.0)	0.02
Ratio	0.87 (0.68 - 0.94)	0.87 (0.49 - 0.95)	0.57

All variables are presented as median (range).

Giving birth to a very preterm infant is associated with lower breast-milk glucocorticoid concentrations.



Time of collection was strongly correlated with breast-milk cortisol and cortisone concentrations, p<0.001 for both.

Correlations between milk glucocorticoid concentrations and prematurity became stronger after correction for time of collection: p=0.04 for cortisol and p=0.01 for cortisone.

Conclusion

Breast-milk glucocorticoid concentrations follow a diurnal rhythm.

We are now exploring whether circadian variation in breast-milk glucocorticoids has the potential to exert biologically relevant effects on the developing newborn.

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