Re: Impact of analysis technique on our understanding of the natural history of labour

Jun Zhang¹, James Troendle², Joao Souza³, and Olufemi Oladapo⁴

¹Xinhua Hospital, School of Medicine, Shanghai Jiao Tong University ²Affiliation not available ³University of Sao Paulo, Sao Paulo, Brazil ⁴World Health Organization

February 15, 2022

Letter to Editor:

Re: Impact of analysis technique on our understanding of the natural history of labour

Jun Zhang,¹⁺ James Troendle,² João P. Souza,³ Olufemi T. Oladapo⁴

¹ Xinhua Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China

² National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, MD, U.S.A.

³ University of Sao Paulo, Sao Paulo, Brazil

⁴ UNDP-UNFPA-UNICEF-WHO-World Bank Special Programme of Research, Development and Research Training in Human Reproduction (HRP), Department of Sexual and Reproductive Health and Research, World Health Organization, Geneva, Switzerland

+ Corresponding author: Dr. Jun Zhang

Dr. Jun Zhang

Xinhua Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, 200092, China.

E-mail: junjimzhang@sina.com

Word count: 490

Sir,

De Vries et al. used data simulation to create two datasets, based on Friedman and Zhang labour curve models, respectively, to assess whether repeated-measures polynomial regression and interval-censored regression used by Zhang et al. are appropriate statistical methods to describe the first stage of labour.¹ It was concluded that these methods do not accurately reflect the underlying data. We respectfully disagree.

The key issue regarding the appropriateness of polynomial repeated measures regression hinges on whether the shape of the average labour curve matches the shape of the underlying individual curves. The authors demonstrated that when vaginal examinations are performed 1-3 hourly or more, the average labour curve is close to the underlying labour pattern (Figures 3B, S4 and S5). We suggest that the authors show a similar figure as Figures 3B and S4 with an increasing frequency of vaginal examinations, to illustrate how close the average curve becomes to the underlying labour pattern when the underlying labour pattern is assumed to be progressively accelerating. This evidence indicate that the polynomial regression is a reasonable method to model the labour curve when vaginal examinations are performed at least 1-3 hourly.

Labour patterns vary widely from woman to woman. Any single labour curve cannot truly represent the reality. Friedman curve is an idealized individual curve. The rigid one curve for all is too simplistic and has important clinical consequences. Whether the true active phase of labour follows a straight line or exponential curve still remains undetermined. Both trajectories, as well as other patterns, are likely to co-exist. Thus, it may not be totally accurate to use the piecewise linear curve as the gold standard to judge the appropriateness of a statistical method.

The estimate of labour duration, particularly the 95th centile, is influenced by the distribution of the transit time. While Figure 1 demonstrated the approximate log normal distribution of the latent phase, active phase and total duration, it is also important to show such a distribution in each cm-by-cm segment with varying frequency of vaginal examinations. If the distribution is not log normal, the estimate may be biased. In addition, it is overly simplistic to assume that every parturient enters the active phase of labour at 4 cm dilatation, which has been objected by Cohen and Friedman². Such an assumption is likely to result in substantially reduced variations of the average labour duration. Subsequently, the 95th centiles based on the simulated data are much smaller than those based on the real data¹ (Table 1). Oladapo et al. used a multistate Markov model and produced very similar results as the interval censored regression³, suggesting that the simulated data may be inappropriate to provide realistic results that have much greater variations than the simulated data have.

Nonetheless, we agree that the admission time to labour may bias the results of the latent phase due to potential selection bias. We had ignored the findings before 3 cm of cervical dilatation for the same reason⁴.

CONFLICT OF INTEREST

None declared. Completed disclosure of interests form available to view online as supporting information

References

1. de Vries BS, McDonald S, Joseph FA, Morton R, Hyett JA, Phipps H, et al. Impact of analysis technique on our understanding of the natural history of labour: a simulation study. Bjog. 2021 Oct;128(11):1833-42.

2. Cohen WR, Friedman EA. Perils of the new labor management guidelines. Am J Obstet Gynecol. 2015 Apr;212(4):420-7.

3. Oladapo OT, Souza JP, Fawole B, Mugerwa K, Perdona G, Alves D, et al. Progression of the first stage of spontaneous labour: A prospective cohort study in two sub-Saharan African countries. PLoS Med. 2018 Jan;15(1):e1002492.

4. Zhang J, Landy HJ, Ware Branch D, Burkman R, Haberman S, Gregory KD, et al. Contemporary patterns of spontaneous labor with normal neonatal outcomes. Obstet Gynecol. 2010 Dec;116(6):1281-7.