OBJECTIVE:
To derive an equation for prediction of fetal weight at any given gestational age, based on trend of individualized fetal growth parameters.

METHODS
The study was performed in two phases: The equation formulation followed by its implementation. Initially, 100, low risk, South Asian women with singleton pregnancy, irrespective of parity, underwent serial ultrasounds between 18-20 wks., 24-26 wks., and 30 weeks. All fetal variables of growth at different stages were incorporated in an equation to understand the growth velocity and predict fetal weight at term. The predicted weight was compared to actual weight and necessary corrections were done. The new equation was then prospectively applied to another 100 pregnant women for validation and corrections by repeating the regression analysis.

RESULTS
It is observed that BPD, HC and FL have a logarithmic relationship with the gestational age
\( \text{BPD, HC, FL} = k \log (\text{GA}) + C \) where \( k \) and \( C \) are two different constants having unique value for each fetus depending upon the previous scan values. AC has a linear relationship with the gestational age.
\( \text{AC} = m \times (\text{GA}) + C \), where \( m \) (slope) and \( C \) (intercept) are two different constants having unique value for each fetus depending upon the previous scan values.

The new formula derived, based on our study is:
\[
\log_{10} \text{EFW} = 0.827 + 0.0185(\text{HC}) + 0.0568(\text{AC}) + 0.472(\text{FL}) + 0.000068(\text{BPD}) - 0.0134(\text{AC})(\text{FL}) - 0.00013(\text{GA}) - 0.233(\text{BPD})
\]

Using the new equation, it was seen that 90% of the babies had < 10% birth weight deviation. This was compared to few standard weight equations and it is seen that the deviation is significantly less in case of new equation (p < 0.05).

CONCLUSIONS
Identifying a cohort of low risk pregnancies trending toward Low Birth weight or fetal growth restriction is an area of intense research. Most growth equations have consistently fallen short of this prediction. The bio-ellipse model is unique that it recognizes the fetal capacity to program its own growth and modulate final birth weight. Extrapolating birth weight gives the physician, the advantages of identifying babies that are failing to attain their own growth potential, who may be amenable to early intervention.

This is a 'proof of concept' paper. This is an EXCEL based tool which can be used with minimum training and supervision. This low cost model for early prediction of birth weight would of great utility and applicability for developing countries, where early delivery decisions are often met with the socio-economic constraints.

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