

FETAL GROWTH RESTRICTION

1. DEFINITION

Fetal growth restriction (FGR) is a leading cause of perinatal morbidity and mortality. FGR is defined as an ultrasound estimated fetal weight (EFW) of less than the 10th percentile or abdominal circumference <10% for gestational age. Adverse consequences of FGR usually do not develop until growth is less than the 3rd percentile, but sonographic weight estimates are variable enough that management decisions should be made when the EFW is reported as <10th percentile or the abdominal circumference <10%.

Some constitutionally small fetuses are growing normally when consideration is given to the size of their parents, or their ethnic group. Small fetuses should be treated as if they have FGR. The term “growth retardation” should not be used. The term “small for gestational age (SGA)” refers to infants, not fetuses, and should not be used.

Fetal surveillance is an important part of Monitoring and includes Doppler analysis and cardiotocography (CTG).

2. DIAGNOSIS

- a) A lag of more than 3 cm between fundal height and gestational age may identify patients at risk of FGR, who should then have an ultrasound performed.
- b) When FGR is suspected pregnancy dating should be confirmed for accuracy. If LMP was used to establish the Estimated Date of Confinement ensure it was a certain, normal period. Follow ACOG/SMFM pregnancy dating criteria. (See addendum- Table 1 Guidelines for Redating Based on Ultrasonography. Methods for Estimating the due date. Committee Opinion # 700 May 2017)
- c) The ultrasound diagnosis of FGR is defined as an estimated fetal weight less than the 10th percentile or abdominal circumference <10% for gestational age. If the weight percentile is not reported, it should be sought from the radiologist or the worksheet on the PACS system, or a standard fetal weight curve can be consulted. Our current ultrasound machines use the Hadlock curve. Customized growth curves, which correct for maternal height, weight, and ethnicity, are not currently in widespread use in the United States.
- d) Since fetal weight may vary by as much as $\pm 20\%$ in the third trimester, please err on the side of caution for borderline cases.
- e) An additional ultrasound parameter that may suggest the diagnosis of FGR is oligohydramnios (low amniotic fluid volume).

- f) If late care, and unsure if the pregnancy is misdated (less farther along than dates), if time allows, repeat the growth ultrasound in 3 weeks to see if the fetus follows the same curve, suggesting misdating, or flattens out, suggesting FGR. Monitor as below, as if FGR, until the situation is clarified.
- g) Early onset FGR is before 32 weeks
 - a. This tends to be more severe, associated with hypertensive disease and placental dysfunction
 - b. Up to 20% are associated with fetal or chromosomal abnormalities. The risk for chromosomal abnormalities is further increased in the presence of polyhydramnios or fetal malformation.
 - c. early onset FGR complicated by EFW < 3 %centile, oligohydramnios, abnormal cord doppler studies, or fetal anomalies should be considered in a higher risk cohort.
- f) Late onset FGR is after 32 weeks
 - d. This tends to be less severe with less placental dysfunction

3. ANTEPARTUM MANAGEMENT

- 1) Fetuses diagnosed as having FGR should have an anatomic survey performed.
- 2) Fetuses with an EFW < 10th percentile or abdominal circumference < 10% should have reflex Doppler studies done. The clinically relevant Doppler parameters for this disorder include:
 - a. systolic to diastolic ratio of the umbilical artery (S/D-UA)
 - b. pulsatility index of the umbilical artery (PI-UA)

Nomograms are available for the interpretation of these values (see attached).

Abnormal Doppler indices include:

- a. elevated S/D and/or PI of the UA
 - b. absent or reversed flow in the UA
- 3) Maternal Fetal Medicine consult should be considered when the diagnosis is made, especially in the setting of early onset FGR before 32 weeks.
 - 4) Early onset FGR complicated by any higher risk factors (EFW < 3 %centile, oligohydramnios, abnormal cord doppler studies, or fetal anomalies) should have weekly evaluation in MFM that is likely to include amniotic fluid assessment, cord doppler studies, and fetal heart rate monitoring looking for late decelerations *if the fetus is considered viable* and the patient has provided informed consent to the plan of care. Fetal heart rate monitoring for early onset FGR is looking for persistent late decelerations and may not be focused on a reactive tracing.
 - 5) Manage according to SMFM Algorithm Figure 1 (below) for the diagnosis and management of fetal growth restriction. Early onset FGR that does not have any

listed higher risk factors (EFW < 3 %centile, oligohydramnios, abnormal cord doppler studies, or fetal anomalies) will start surveillance starting at 32 weeks unless otherwise specified.

- 5) Surveillance will include Doppler assessment, cardiotocography, amniotic fluid assessment and nonstress test/biophysical profile when appropriate.
- 6) Discuss the need for patient to relocate to Anchorage (if they live out of town) for more careful monitoring once they have reached a gestational age of fetal viability and patient approval.
- 7) Smoking cessation has been shown to be beneficial for the growth restricted fetus. No other interventions (hospitalization for bedrest, oxygen therapy, nutritional supplements, aspirin, heparin, antihypertensive medication, etc.) have been demonstrated to have a favorable effect in established FGR.

4. DELIVERY

1. The evidence is controversial as to the risks vs benefits of early delivery in fetuses with growth restriction. Early delivery may prevent intrauterine fetal demise or future neurodevelopmental problems. Very early preterm delivery of the growth restricted fetus is associated with the worst prognosis.
2. If delivery is anticipated within 7 days, then administration of antenatal corticosteroids for fetal lung maturation is indicated in fetuses diagnosed with growth restriction prior to $\leq 33 \frac{6}{7}$ weeks.
3. If delivery prior to $32 \frac{0}{7}$ is anticipated, then consider neuroprotection with magnesium sulfate.
4. Growth restricted fetuses with abnormal Doppler velocimetry at less than 32 weeks should be discussed with Maternal Fetal Medicine.

4. Delivery

- | | |
|--|------------------|
| -EFW <3%-ile or abnormal UA Dopplers (S/D or PI >95%ile) | at ≤ 37 wks |
| -EFW ≥ 3 - ≤ 10 %-ile with normal UA Doppler | at 38-39 wks |

5. Continuous electronic fetal monitoring should be instituted in active labor.

Summary of antenatal testing and delivery

For FGR 3rd% - 9th%:

- Fetal heart rate monitoring once per week
- Doppler q 1 – 2 weeks, then if normal, q 2 – 4 weeks
- Fetal growth q 3 – 4 weeks
- Delivery at 38 – 39 weeks

For FGR < 3rd%:

- Fetal heart rate monitoring once per week
- Doppler q week
- Fetal growth every 2 weeks (although we will likely perform growth at 3 – 4 weeks)
- Delivery at 37 weeks or less

Revised 8/8/23 mt/njm

Revised 9/29/21 njm

Revised 4/16/21 njm

Revised 10/23/20 njm

Revised 10/17/18 njm

Reviewed 10/23/16 njm

Reviewed 11/17/14 njm

Reviewed 11/28/12 njm

Approved 10/16/10gg

REFERENCES

- Fetal growth restriction. ACOG Practice Bulletin No. 227. American College of Obstetricians and Gynecologists. Obstet Gynecol 2021;137:e16–28. (Accessed 8/8/23)
- Methods for estimating the due date. Committee Opinion No. 700.American College of Obstetricians and Gynecologists. Obstet Gynecol 2017;129:e150–4. (Reaffirmed 2022)
- Antiphospholipid syndrome. Practice Bulletin No. 132. American College of Obstetricians and Gynecologists. Obstet Gynecol 2012;120:1514–21. (Reaffirmed 2021)
- Medically indicated late-preterm and early-term deliveries. ACOG Committee Opinion No. 831. American College of Obstetricians and Gynecologists. Obstet Gynecol 2021;138:e35–9.
- Intrauterine Growth Restriction: Screening, Diagnosis, and Management SOGC Clinical Practice Guideline No 295, Society of Obstetricians and Gynaecologists of Canada.J Obstet Gynaecol Can 2013;35(8):741–748 (Accessed 8/8/23)
- Small-for-Gestational-Age Fetus, Investigation and Management (Green-top Guideline No. 31) Royal College of Obstetricians and Gynecologists, 2nd Edition February 2013, Minor Revisions January 2014 (Accessed 8/8/23)
- GRIT Study Group. Infant wellbeing at 2 years of age in the Growth Restriction Intervention Trial: Multicentred randomized controlled trial. Lancet 2004; 364:513-20.
- Boers KE, et al. Induction versus expectant monitoring for intrauterine growth restriction at term: Randomized equivalence trial (DIGITAT). BMJ 2010; 341: c7087.
- Society for Maternal Fetal Medicine. Doppler assessment of the fetus with intrauterine growth restriction. Am J Obstet Gynecol 2012; 206:300
- Truan OM, et al. Progression of Doppler abnormalities in intrauterine growth restriction. Ultrasound Obstet Gynecol 2008; 32:160-7.

- Baschat AA. Neurodevelopment following fetal growth restriction and its relationship with antepartum parameters of placental dysfunction. *Ultrasound Obstet Gynecol* 2011; 37: 501-14.
- Spong CY, et al. Timing of indicated late preterm and early term birth. *Obstet Gynecol* 2011; 118:323
- Williams RL, et al. Fetal growth and perinatal viability in California. *Obstet Gynecol* 1982; 59:624
- Hadlock FP, et al. Estimation of fetal weight with the use of head, body, and femur measurements--a prospective study. *Am J Obstet Gynecol* 1985: 151:333
- Hadlock FP, et al. In utero analysis of fetal growth: sonographic weight standards. *Radiology* 1991; 181:129-33.

Table 1. Guidelines for Redating Based on Ultrasonography ↩

Gestational Age Range*	Method of Measurement	Discrepancy Between Ultrasound Dating and LMP Dating That Supports Redating
≤13 6/7 wk	CRL	
• ≤ 8 6/7 wk		More than 5 d
• 9 0/7 wk to 13 6/7 wk		More than 7 d
14 0/7 wk to 15 6/7 wk	BPD, HC, AC, FL	More than 7 d
16 0/7 wk to 21 6/7 wk	BPD, HC, AC, FL	More than 10 d
22 0/7 wk to 27 6/7 wk	BPD, HC, AC, FL	More than 14 d
28 0/7 wk and beyond†	BPD, HC, AC, FL	More than 21 d

Abbreviations: AC, abdominal circumference; BPD, biparietal diameter; CRL, crown–rump length; FL, femur length; HC, head circumference; LMP, last menstrual period.

*Based on LMP.

†Because of the risk of redating a small fetus that may be growth restricted, management decisions based on third-trimester ultrasonography alone are especially problematic and need to be guided by careful consideration of the entire clinical picture and close surveillance.

FIGURE 1

Algorithm for the diagnosis and management of fetal growth restriction

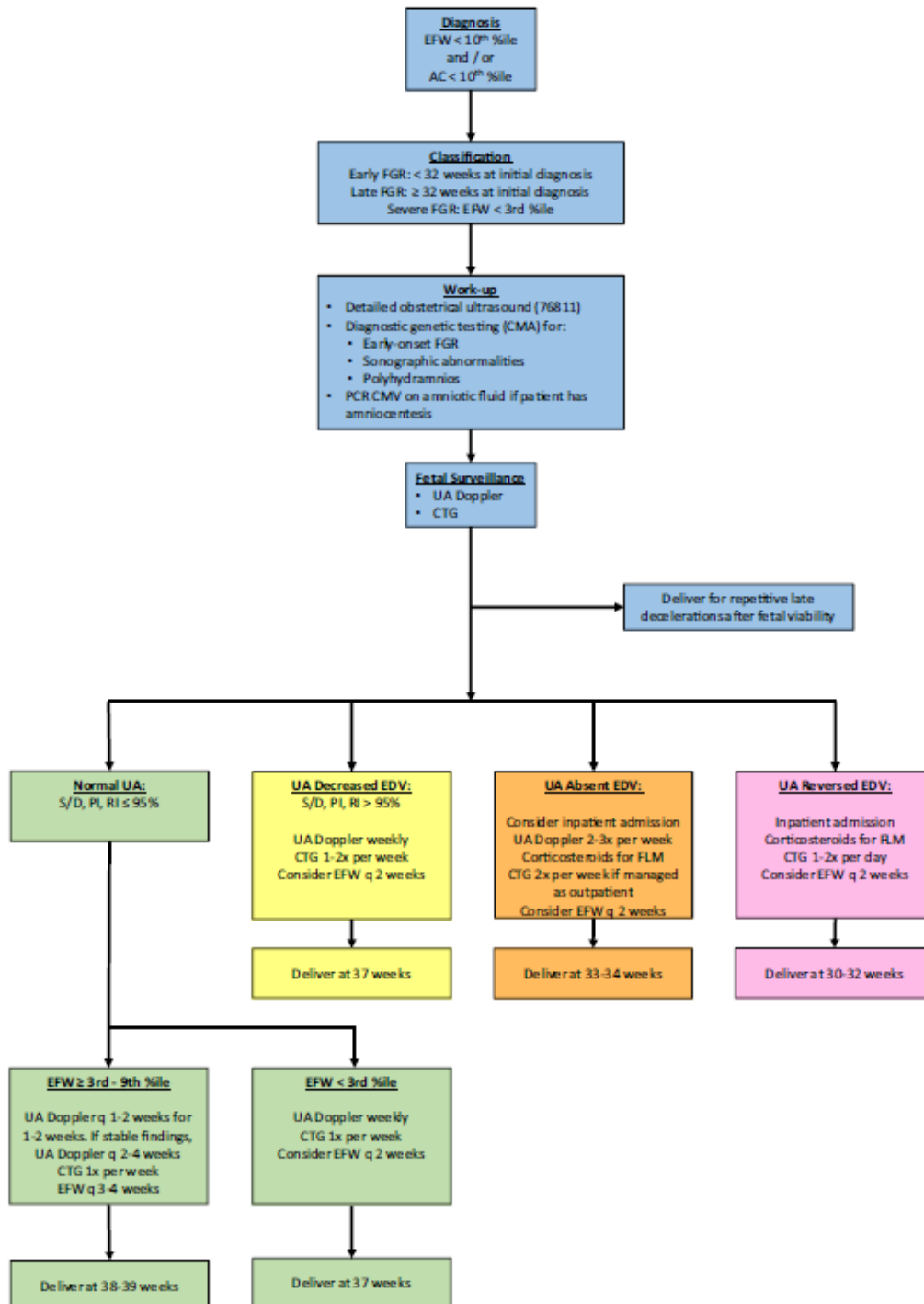


Table 1
In Utero Fetal Weight Standards at US

Menstrual Week	Percentiles (g)				
	3rd	10th	50th	90th	97th
10	26	29	35	41	44
11	34	37	45	53	56
12	43	48	58	68	73
13	55	61	73	85	91
14	70	77	93	109	116
15	88	97	117	137	146
16	110	121	146	171	183
17	136	150	181	212	226
18	167	185	223	261	279
19	205	227	273	319	341
20	248	275	331	387	414
21	299	331	399	467	499
22	359	398	478	559	598
23	426	471	568	665	710
24	503	556	670	784	838
25	589	652	785	918	981
26	685	758	913	1,068	1,141
27	791	876	1,055	1,234	1,319
28	908	1,004	1,210	1,416	1,513
29	1,034	1,145	1,379	1,613	1,724
30	1,169	1,294	1,559	1,824	1,949
31	1,313	1,453	1,751	2,049	2,189
32	1,465	1,621	1,953	2,285	2,441
33	1,622	1,794	2,162	2,530	2,703
34	1,783	1,973	2,377	2,781	2,971
35	1,946	2,154	2,595	3,036	3,244
36	2,110	2,335	2,813	3,291	3,516
37	2,271	2,513	3,028	3,543	3,785
38	2,427	2,686	3,236	3,786	4,045
39	2,576	2,851	3,435	4,019	4,294
40	2,714	3,004	3,619	4,234	4,524

Hadlock FP, et al. In utero analysis of fetal growth: sonographic weight standards. Radiology 1991; 181:129-33.

Table II Reference values for serial measurements of the umbilical artery pulsatility index

Gestation (wk)	Percentile								
	2.5th	5th	10th	25th	50th	75th	90th	95th	97.5th
19	0.97	1.02	1.08	1.18	1.30	1.44	1.57	1.66	1.74
20	0.94	0.99	1.04	1.14	1.27	1.40	1.54	1.62	1.70
21	0.90	0.95	1.00	1.10	1.22	1.36	1.49	1.58	1.65
22	0.87	0.92	0.97	1.07	1.19	1.32	1.46	1.54	1.62
23	0.84	0.89	0.94	1.04	1.15	1.29	1.42	1.50	1.58
24	0.81	0.86	0.91	1.00	1.12	1.25	1.38	1.47	1.55
25	0.78	0.83	0.88	0.97	1.09	1.22	1.35	1.44	1.51
26	0.76	0.80	0.85	0.94	1.06	1.19	1.32	1.41	1.48
27	0.73	0.77	0.82	0.92	1.03	1.16	1.29	1.38	1.45
28	0.71	0.75	0.80	0.89	1.00	1.13	1.26	1.35	1.43
29	0.68	0.72	0.77	0.86	0.98	1.10	1.23	1.32	1.40
30	0.66	0.70	0.75	0.84	0.95	1.08	1.21	1.29	1.37
31	0.64	0.68	0.73	0.82	0.93	1.05	1.18	1.27	1.35
32	0.62	0.66	0.70	0.79	0.90	1.03	1.16	1.25	1.32
33	0.60	0.64	0.68	0.77	0.88	1.01	1.14	1.22	1.30
34	0.58	0.62	0.66	0.75	0.86	0.99	1.12	1.20	1.28
35	0.56	0.60	0.64	0.73	0.84	0.97	1.09	1.18	1.26
36	0.54	0.58	0.63	0.71	0.82	0.95	1.07	1.16	1.24
37	0.53	0.56	0.61	0.69	0.80	0.93	1.05	1.14	1.22
38	0.51	0.55	0.59	0.68	0.78	0.91	1.04	1.12	1.20
39	0.49	0.53	0.57	0.66	0.76	0.89	1.02	1.10	1.18
40	0.48	0.51	0.56	0.64	0.75	0.87	1.00	1.09	1.17
41	0.47	0.50	0.54	0.63	0.73	0.85	0.98	1.07	1.15

Table IV Reference values for serial measurements of the umbilical artery systolic:diastolic ratio

Gestation (wk)	Percentile								
	2.5th	5th	10th	25th	50th	75th	90th	95th	97.5th
19	2.73	2.93	3.19	3.67	4.28	5.00	5.75	6.26	6.73
20	2.63	2.83	3.07	3.53	4.11	4.80	5.51	5.99	6.43
21	2.51	2.70	2.93	3.36	3.91	4.55	5.22	5.67	6.09
22	2.43	2.60	2.83	3.24	3.77	4.38	5.03	5.45	5.85
23	2.34	2.51	2.72	3.11	3.62	4.21	4.82	5.22	5.61
24	2.25	2.41	2.62	2.99	3.48	4.04	4.63	5.02	5.38
25	2.17	2.33	2.52	2.88	3.35	3.89	4.45	4.83	5.18
26	2.09	2.24	2.43	2.78	3.23	3.75	4.30	4.66	5.00
27	2.02	2.17	2.35	2.69	3.12	3.63	4.15	4.50	4.83
28	1.95	2.09	2.27	2.60	3.02	3.51	4.02	4.36	4.67
29	1.89	2.03	2.20	2.52	2.92	3.40	3.89	4.22	4.53
30	1.83	1.96	2.13	2.44	2.83	3.30	3.78	4.10	4.40
31	1.77	1.90	2.06	2.36	2.75	3.20	3.67	3.98	4.27
32	1.71	1.84	2.00	2.29	2.67	3.11	3.57	3.87	4.16
33	1.66	1.79	1.94	2.23	2.60	3.03	3.48	3.77	4.06
34	1.61	1.73	1.88	2.16	2.53	2.95	3.39	3.68	3.96
35	1.57	1.68	1.83	2.11	2.46	2.87	3.30	3.59	3.86
36	1.52	1.64	1.78	2.05	2.40	2.80	3.23	3.51	3.78
37	1.48	1.59	1.73	2.00	2.34	2.74	3.15	3.43	3.69
38	1.44	1.55	1.69	1.95	2.28	2.67	3.08	3.36	3.62
39	1.40	1.51	1.64	1.90	2.23	2.61	3.02	3.29	3.54
40	1.36	1.47	1.60	1.85	2.18	2.56	2.96	3.22	3.48
41	1.33	1.43	1.56	1.81	2.13	2.50	2.90	3.16	3.41

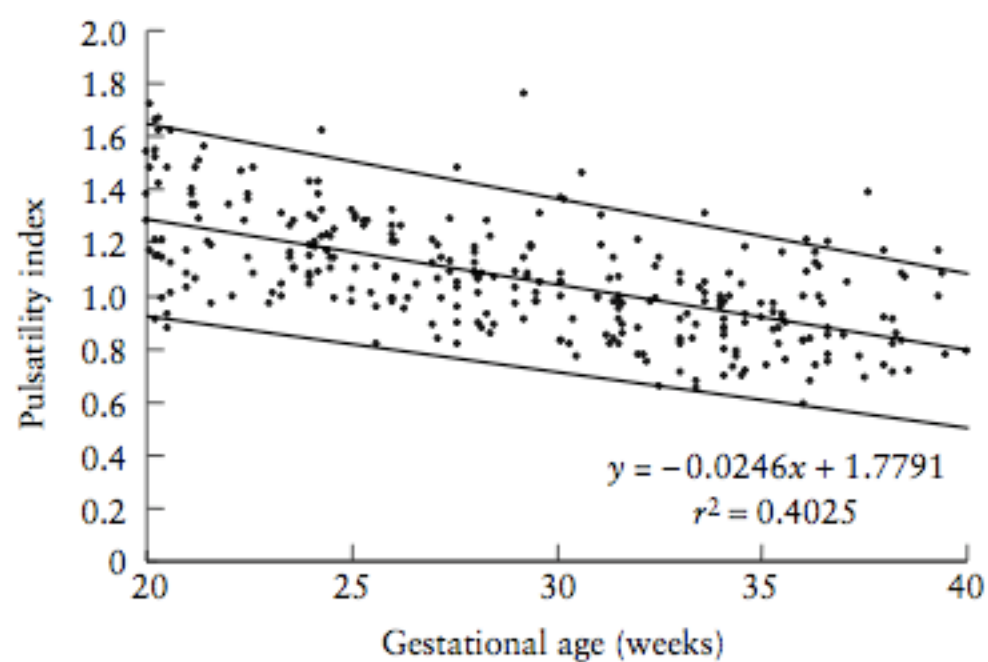


Figure 1 Graph showing the reference ranges (mean and 95% CI) of the umbilical artery pulsatility index.

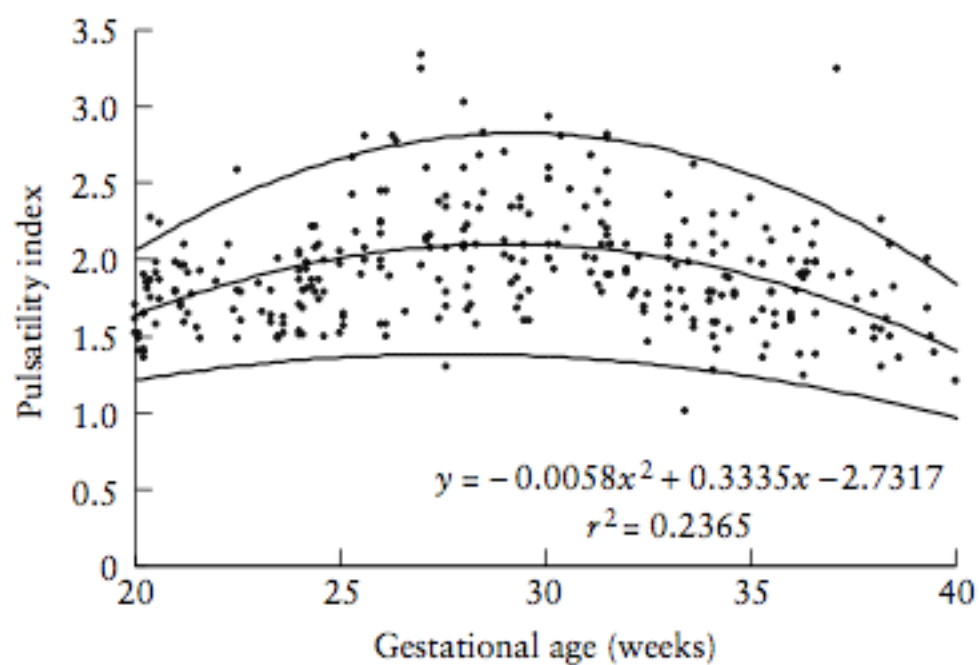


Figure 2 Graph showing the mean and 95% CI of the middle cerebral artery pulsatility index.