A re-look at the duration of human pregnancy

Bhat R A, Kushtagi P

ABSTRACT

Introduction: The duration of human pregnancy is arbitrarily taken as 280 days (40 weeks). Foetuses are considered to be at high risk once pregnancy goes beyond the expected date of confinement. This study was carried out with the aim of determining the mean gestation age of low-risk pregnancies that went into spontaneous labour and the incidence of adverse outcomes in relation to gestation.

Methods: Low-risk singleton pregnancies admitted in spontaneous labour at a single community hospital in the Udupi district of Karnataka in South India, from December 2002 to December 2003, were analysed for mean gestational age at the onset of spontaneous labour and rates of perinatal complications by gestational age.

Results: Among the 1,094 women who went into spontaneous labour, the mean gestational age was 272.1 +/- 9 days. A significantly increased incidence of meconium-stained amniotic fluid beyond 39 weeks of gestation was observed. 783 of 1,094 women (80 percent) had delivered during the period of 261-280 days of pregnancy (period of one standard deviation around the mean gestational age at delivery). There was significant increase in perinatal morbidity indicators and mortality rates once the pregnancy carried beyond 280 days.

Conclusion: Mean gestational age at the onset of labour for women native to the area of study was 272 days (standard deviation 9 days). Pregnancies beyond a duration of 280 days showed significantly increased perinatal morbidity. It is suggested that there is a need for determining the length of gestation and to compile gestation-wise incidence of meconium-stained amniotic fluid as an indicator of foetal maturity or the undisclosed risk factor, in addition to other neonatal morbidity indicators for different populations.

Keywords: human pregnancy, low-risk pregnancy, meconium-stained amniotic fluid, perinatal morbidity, pregnancy duration

Singapore Med J 2006; 47(12):1044-1048

INTRODUCTION

Currently, it is assumed that 40 weeks is the appropriate normal length of human gestation. Post-term pregnancies are cause for more intensive clinical evaluation and, as indicated, intervention[1]. Studies where pregnancies were terminated at 38 weeks[2], and between 39 and 40 weeks[3], to address the increasing perinatal deaths in the mature unexplained category have shown that the interventional group had lower perinatal morbidity and mortality, and fewer operative deliveries in women of Northern Ireland and the west of Scotland. This may indirectly indicate that the length of pregnancy was different in this group of women. Persistent ethnic disparities in the average duration of pregnancy have prevailed[4,5]. The determinants of these differences remain largely unexplained.

Whenever the pregnancy goes past the calculated expected date of confinement of 280 days, it brings anxiety to the obstetrician and parents-to-be. Hence, it is necessary to look at the average gestational age at which the labour ensues in uncomplicated pregnancies in different regions. Paucity of this information in areas/groups where the mean gestational length is shorter than 40 weeks may lead to poor perinatal outcome due to inappropriate intervention. This study is an effort to determine mean duration of normal pregnancy in the regional population with reference to the incidence of non-reassuring foetal status.

METHODS

Case files of normal pregnant native women who were admitted in spontaneous labour from December 1, 2002 to December 31, 2003, at Kasturba Hospital, Manipal, India were studied following approval of the hospital's ethics committee. Normal pregnancy

Department of Obstetrics and Gynaecology
Kasturba Medical College
Manipal 576104
India

Bhat R A, MBBS, MS
Assistant Professor

Kushtagi P, MBBS, MD, DNB
Professor

Correspondence to:
Prof Pralhad Kushtagi
Tel: (91) 820 257 2185/ (91) 820 292 2592
Fax: (91) 820 257 0061/2
Email: pralhadkushtagi@hotmail.com

was defined as one with more than 36 completed weeks of singleton pregnancy, cephalic presentation (vertex as presenting part), appropriate foetal growth, and no maternal or foetal complications. A woman was considered to be native, if she belonged to the local ethnic group of South Asia and was from the Udupi district of Karnataka in South India. Gestational age was estimated on the basis of the last menstrual period in women with regular cycles and correlating clinical findings in early pregnancy, and/or first trimester ultrasonography (US) dating. Cases with pre-eclampsia, gestational diabetes mellitus, multiple pregnancies, contraindications to vaginal delivery (e.g. placenta previa) or antenatal evidence of foetal or maternal compromise were excluded from analysis.

A foetus/neonate was considered to have had non-reassuring status if any of the following were present: (i) meconium staining of liquor during labour; (ii) Apgar score of <5 at one minute; (iii) cord blood pH <7.2; and (iv) need for intensive neonatal care in specialist nursery. For the management of labour with meconium-stained liquor, the clinical guidelines of the Royal Australian and New Zealand College of Obstetrician and Gynaecologists[6] for intrapartum foetal surveillance, were used. Gestation-wise incidences of indicators of non-reassuring status were compiled. Further, the number of patients falling within a standard deviation on either side of the mean gestation at which women entered spontaneous labour was considered as one group and the perinatal outcome was compared with the group whose pregnancy was carried beyond that period of gestation. To determine the significance of difference between averages and proportions, t-test and chi square test, as applicable, were performed using the Statistical Package for Social Sciences (SPSS) version 10.0 for Windows (Chicago, IL, USA).

RESULTS

Of the 1,946 deliveries during the study period, there were 1,094 uncomplicated pregnancies beyond 36 completed weeks (259 days) of gestation admitted to labour ward in spontaneous labour (56%; 95% confidence interval [CI] 54-58%). As no data regarding socioeconomic status was collected, all women were considered as belonging to a similar class. The study was conducted in a private hospital where treatment is not subsidised. There were 559 (51%) women of first parity, 383 (35%) of second parity, and the rest were of third or higher parity. The average age of women was 24 ± 2.7 years (range 18 to 34 years). First trimester US to confirm the clinical findings of gestational age were available for 798 cases (80%). Mean duration of pregnancy at the onset of spontaneous labour was 272.1 ± 9 days (39 weeks), ranging from 256 to 289 days. Gestation-wise distribution of women in spontaneous labour was 7% at 36 weeks, 11% at 37 weeks, 30.5% at 38 weeks, 31.8% at 39 weeks, 18.7% at 40 weeks, and 0.9% at 41 weeks.

Meconium-stained amniotic fluid (MSAF) was found in 153 of 1,094 live births (14%), and a fifth of these had thick MSAF (31 of 153, 20.3%). Meconium aspiration syndrome (MAS) was seen in 29 cases (90.6%) with thick MSAF, and 25 (20.7%) with thin MSAF. Though meconium staining of amniotic fluid was found even at 36 weeks of gestation (four of 76, 5%), the frequency of occurrence increased with the gestational age. At 40 and 41 weeks of gestation, the incidence of MSAF was two and two and half times, respectively, compared to the incidence at 39 weeks of pregnancy. The proportion of cases with MAS noted for 37 and 38 weeks of pregnancy were similar, at 2.5%. But, thereafter, the incidence of MAS increased by two-fold, compared to the preceding week (Table I).

The risk of a low Apgar score (<5 at one minute) did not appear to be significantly different at different gestational ages. But the proportion of cases with low Apgar scores showed an increasing trend from 0.6% at 39 weeks to 2% at 40 weeks, and 10% at 41 weeks of pregnancy. There was a significant and increasing incidence of low cord blood pH (<7.2) and need for specialised neonatal care beginning from 39 through 41 weeks. Though neonatal deaths were recorded from 38 weeks, the occurrence was as high as one in ten cases at 41 weeks of pregnancy (Table I). Instrumental and caesarean deliveries were performed more frequently from 39 weeks (11.8%, 13.2%, 15%, 16.4%, 23.9% and 30% from 36 through 41 weeks, respectively). The majority (151 of 184, 82%) of operative deliveries were done for non-reassuring foetal status, and the others for failure to progress. Average birth weight of babies was 3,101 ± 434.8 (range 1,900 to 3,900) grammes. No notable relationship was found between mean birth weight, duration of gestation and mode of delivery (Table II).

783 of 1,094 women (79.8%) had delivered during the period of 261 and 280 days of pregnancy (Fig.1). The incidence of indicators of poor perinatal outcome was significantly higher in the group of women whose pregnancies carried beyond 280 days than those who delivered between 261 and 280 days of gestation (Table III). Pregnancy outcome in all the 1,946 cases, including cohorts of low risk women in spontaneous labour, showed significantly higher rates

of instrumental vaginal and caesarean deliveries and poorer perinatal outcomes, compared to the latter group when studied separately (Table IV). The total group had every tenth patient with either a pregnancy going beyond 280 days (40 weeks) and requiring induction of labour (194 cases, 10%), admitted in preterm labour (188 cases, 9.7%), or had a medical disorder (208 cases, 10.7). In addition, the group also comprised pre-eclampsia – eclampsia (136 cases, 7%), twin gestation (58 cases, 3%) and antepartum haemorrhage (68 cases, 3.5%).

DISCUSSION

It has been traditionally accepted that complications are at their minimum in term pregnancy, defined as 38-42 weeks (266 days to 294 days) of gestation.

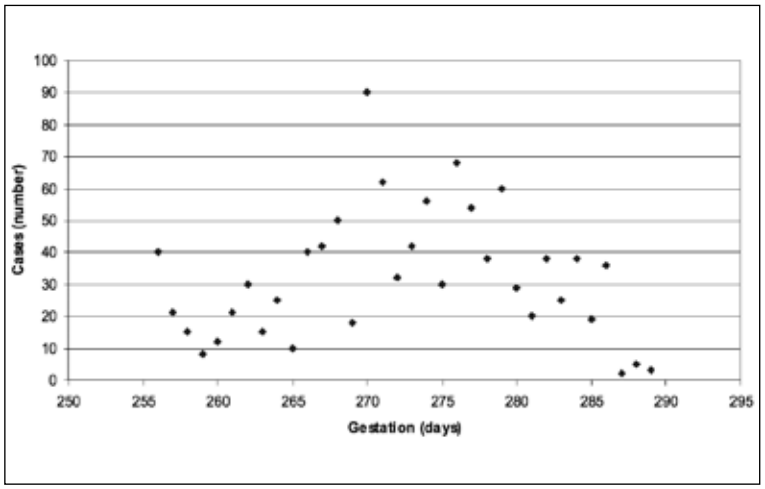

Fig.1 Distribution of 1,094 cases according to duration of gestation shows most deliveries occurring between 261 and 281 days of pregnancy.

Table I. MSAF and indicators of perinatal outcome according to gestation period.

Duration of pregnancy	Cases	MSAF		MAS		Low Apgar at 1 min <5		Low pH		Intensive care admission		Neonatal death	
(days)	n	n	%	n	%	n	%	n	%	n	%	n	%
≤258	76	4	5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
259-265	121	12	9.9	3	2.5	0	0.0	2	1.7	2	1.7	0	0.0
266-272	334	32	9.6	9	2.7	0	0.0	7	2.1	6	1.8	1	0.3
273-279	348	48	13.8	16	4.6	2	0.6	30***	8.6	19**	5.5	2	0.6
280-286	205	54	26.3	24	11.7	4	2	25	12.2	24**	11.7	2	1
287-289	10	3	30	2	20	1	10	3	30	2	20	1**	10
Total	1,094	153	14	54	4.9	7	0.6	67	6.1	53	4.8	6	0.6

Statistically significant results as compared with the rate of complication during the period of gestation.

* p<0 .05 (χ^2 test) Significant.

** p<0 .01 (χ^2 test) Highly significant.

*** p<0.001 (χ^2 test) Very highly significant.

Table II. Mean birth weight and mode of delivery according to gestation period.

Duration of pregnancy	Cases	Birth weight (g)		Vaginal deliveries				Caesarean deliveries	
				Normal		Instrumental			
(days)	n	Mean	SD	n	%	n	%	n	%
≤258	76	2,885.5	277.2	67	88.2	5	6.6	4	5.3
259-265	121	3,101.7	388.9	105	86.8	9	7.4	7	5.8
266-272	334	3,082.9	404.6	284	85	21	6.3	29	8.7
273-279	348	3,096.3	441.7	291	83.6	29	8.3	28	8.4
280-286	205	3,215.6	397.2	156	76	19	9.3	30	14.6
287-289	10	3,111	412.9	7	70	1	10	2	20
Total	1,094	3,101	434.8	910	83.2	84	7.7	100	9

Table III. Perinatal outcome in reset "period of term and post-term".

Gestational age in days	MSAF		MAS		Low Apgar		Low pH		Intensive care admission		Neonatal death	
(n)	n	%	n	%	n	%	n	%	n	%	n	%
≤260 (96)	4	4.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
261-280 (783)	97	11.9	28	3.4	2	0.3	39	4.8	27	3.3	3	0.4
≥281 (215)	52***	28	26***	14	5***	2.3	28***	15	26***	14	3*	1.6
Total (1,094)	153	14	54	4.9	7	0.6	67	6	53	4.8	6	0.6

Statistically significant results as compared with the rate of complication during period of gestation.

* $p<0.05$ (χ^2 test) Significant.

** $p<0.01$ (χ^2 test) Highly significant.

*** $p<0.001$ (χ^2 test) Very highly significant.

Table IV. Pregnancy outcome in all cases.

Obstetrical performance	All cases N=1,946 n	(%)	Study cases N=1,094 n	(%)	95% confidence interval	Odds-ratio
Mode of delivery						
1. Instrumental vaginal	401	(20.6)***	84	(7.7)	0.26-0.39	0.14
2. Caesarean	393	(20.2)***	100	(9.1)	0.33-0.47	0.19
Perinatal outcome						
1. Stillbirths	11	(0.6)**	0	(0.0)	-	-
2. Neonatal deaths	16	(0.8)	6	(0.6)	0.33-1.09	0.46

* $p< 0.05$ (χ^2 test) Significant.

** $p<0.01$ (χ^2 test) Highly significant.

*** $p<0.001$ (χ^2 test) Very highly significant.

Perinatal morbidities due to conditions such as foetal asphyxia, intrapartum distress and meconium aspiration start after 40 weeks gestation[7,8] and increase significantly each week from then on[9], adding to perinatal mortality. Therefore, it is widely accepted not to prolong pregnancy beyond 42 weeks[10-13]. It has been documented that the mean duration of pregnancy is influenced by ethnicity, being shorter in black and Asian patients[14]. Perhaps even religious affiliation as manifested by dietary and lifestyle differences may affect the duration of gestation. Hindus and Muslims have a shorter length of gestation than Europeans[15]. In the present study, the mean length of gestation in the hospital attending South Asian women who started labour spontaneously was 272.1 ± 9 days, shorter by a week compared to that of European women[16,17].

Considering meconium passage as a manifestation of normal maturation indicating increased myelination and responsiveness of the foetal gastrointestinal tract[18,19], it is hypothesised that incidence of MSAF increases with each week of gestational age and may vary among ethnic groups[18,20,21]. Since the extent of foetal maturation for a specific duration of pregnancy is not equivalent for different ethnic groups, it may not be appropriate to universally apply the conventional definition of post-term. Though MSAF was recorded from 36 weeks onwards in the study population, the proportion of such instances increased significantly from 39 weeks. More babies were born with low pH (<7.2), occurrence of MAS, significant and more intensive neonatal care admissions were noted at/after 39 weeks of pregnancy. Of the six neonatal deaths, five were babies born at or after 39 weeks (Table I & III).

In an attempt to reset the duration of term pregnancy for the study population, a standard deviation on either side of the mean gestation at which women entered spontaneous labour was considered

to indicate the "period of term" pregnancy, since such an assumption would encompass 68% of the population. The proportion of pregnancies entering labour during the "period of term" will also be similar after considering the rates for spontaneous abortions, preterm deliveries and post-term pregnancies (12-15%, 5-10% and 3-15%, respectively)[22]. It means that 261 to 281 days of the pregnancy will be the duration of term pregnancy (mean duration at spontaneous labour 272 ± 9 days) for women studied in the area, and not 266 to 294 days, as is generally applied. As the present study is retrospective, details of nutritional status of the cases could not be obtained. This information, if available, would have removed one of the confounding variables.

A significant increase in indicators of suboptimal perinatal outcome, once the duration of pregnancy in women of the region goes beyond 280 days (Table III), suggests the need for termination of pregnancy beyond that period. It should be remembered that in health systems in which reliable early pregnancy US is available at an acceptable cost, it should be performed routinely and the expected date of delivery should be revised, to avoid unnecessary termination of pregnancy for a mistaken diagnosis of post-term pregnancy[23]. Although the determinants of these differences remain largely unexplained, it may be safe to assume that ethnic and regional variations for "period of term" exist. Hence, there is a need for determining length of gestation and to compile gestation-wise incidence of MSAF as an indicator of foetal maturity or the undisclosed risk factor in addition to other neonatal morbidity indicators for different populations.

ACKNOWLEDGEMENT

The statistical input provided by Ms Asha Kamath, Department of Community Medicine at Kasturba Medical College, Manipal is thankfully acknowledged.

REFERENCES

1. Cunningham FG, Gant NF, Leveno KJ, Gilstrap III LC, Hauth JC, Wenstrom KD eds. Williams Obstetrics. 21st ed. New York: McGraw-Hill, 2001.
2. Martin DH, Thompson W, Pinkerton JH, Watson JD. A randomized controlled trial of selective planned delivery. Br J Obstet Gynaecol 1978; 85:109-13.
3. Cole RA, Howie PW, MacNaughton MC. Elective induction of labour. A randomised prospective trial. Lancet 1975; 1:767-70.
4. Papiernik E, Alexander GR, Paneth N. Racial differences in pregnancy duration and its implications for perinatal care. Med Hypotheses 1990; 33:181-6
5. Anderson NA, Brown EW, Lyon RA. Causes of prematurity III. Influence of race and sex on duration of gestation and weight at birth. Am J Dis Child 1943; 65:523-34.
6. Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG). Intrapartum fetal surveillance clinical guidelines. Available at: www.ranzcog.edu.au/publications/womenshealth.shtml#IFSG. Accessed November 14, 2002.
7. Caughey AB, Musci TJ. Complications of term pregnancies beyond 37 weeks of gestation. Obstet Gynecol 2004 ; 103:57-62.
8. Grausz JP, Heimler R. Asphyxia and gestational age. Obstet Gynecol 1983; 62:175-9.
9. Arias F. Predictability of complications associated with prolongation of pregnancy. Obstet Gynecol 1987; 70:101-6.
10. McClure-Brown JC. Postmaturity. Am J Obstet Gynecol 1963; 85: 573-82.
11. Anderson GG. Postmaturity: a review. Obstet Gynecol Surv 1972; 27:65-73.
12. Vorherr H. Placental insufficiency in relation to postterm pregnancy and fetal postmaturity. Evaluation of fetoplacental function; management of the postterm gravida. Am J Obstet Gynecol 1975; 123:67-103.
13. Callenbach JC, Hall RT. Morbidity and mortality of advanced gestational age: post-term or postmature. Obstet Gynecol 1979; 53:721-4.
14. Tuck SM, Cardozo LD, Studd JW, Gibb DM, Cooper DJ. Obstetric characteristics in different racial groups.Br J Obstet Gynaecol 1983; 90:892-7.
15. McFadyen IR, Campbell-Brown MC, Abraham R, North WR, Haines AP. Factors affecting birthweights in Hindus, Moslems and Europeans. Br J Obstet Gynaecol 1984; 91:968-72.
16. Patel RR, Steer P, Doyle P, Little M, Elliott P. Does gestation vary by ethnic group? A London-based study of over 122,000 pregnancies with spontaneous onset of labour. Int J Epidemiol 2004; 33:107-13. Comment in: Int J Epidemiol 2004; 33:114-5.
17. Alexander JM, McIntire DD, Leveno KJ. Forty weeks and beyond: pregnancy outcomes by week of gestation. Obstet Gynecol 2000; 96:291-4.
18. Ostrea EM Jr, Naqui M. The influence of gestational age on the ability of the fetus to pass meconium in utero. Acta Obstet Gynecol Scand 1982; 61:275-7.
19. Papiernik E, Alexander GR, Paneth N. Racial differences in pregnancy duration and its implications for perinatal care. Med Hypotheses 1990; 33:181-6.
20. Alexander GR, Hulsey TC, Robillard PY, De Caunes F, Papiernik E. Determinants of meconium-stained amniotic fluid in term pregnancies. J Perinatol 1994; 14:259-63.
21. Matthews TG, Warshaw JB. Relevance of the gestational age distribution of meconium passage in utero. Pediatrics 1979; 64:30-1.
22. Chamberlain G, Steer P. Turnbull's Obstetrics. 3rd ed. Edinburgh: Churchill Livingstone, 2002.
23. Crowley P. Interventions for preventing or improving the outcome of delivery at or beyond term (Cochrane Review). In: The Cochrane Library, Issue 4, 2003. Chichester: John Wiley & Son, 2003.