In conclusion, the use of urine as a specimen for diagnosis of *C. trachomatis* in symptomatic men can be recommended because it is almost as reliable as examination of urethral swabs. The advantage to the patient of submitting a urine specimen is that this procedure is non-invasive and non-traumatic.

We thank T. S. Maaga, Department of Physiology, Medical University of Southern Africa, as well as members of the clinical staff at Proes Street STD Clinic, Pretoria City Health Department, for their help in specimen collection, and the Medical Officer of Health, Pretoria, for permission to publish this article.

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Accepted 16 Aug 1994.

A centile chart for birth weight for an urban population of the Western Cape

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Evidence from large epidemiological studies has supported concern that being born light for gestational age (LiGA) may be detrimental. The incidence of LiGA babies is an important indicator of the health of women of reproductive age in deprived communities. In the assessment of LiGA in the Western Cape, centile charts constructed for populations in other parts of the world are generally used. These charts, however, may not be appropriate.

Patients residing in the area served by the Tygerberg Hospital obstetric service, who booked early with singleton pregnancies, had their gestational age confirmed by early ultrasound and delivered between 1 March 1989 and 28 February 1990 were included in the study. The sample consisted of 3 643 patients. The mean birth weight was 2 995 g (SD 573 g) and the range 760 - 5 080 g. The distribution of birth weight at each week of gestation from 28 to 42 weeks was not normal. The 4-parameter Johnson family of densities was used to model the distribution of birth weight at each gestational age.

A comparison of the distribution of birth weight in the study relative to the perinatal growth chart for international reference constructed by Dunn was also made. In addition to considering an overall chart, the sample was subdivided according to a number of characteristics (e.g. gender, firstborn and latter-born babies, smoking habit, hypertensive disorders and induction of labour) in order to explore their impact on the distribution of birth weight. Having explored the potential impact of all these factors, it was concluded that a single chart including all patients could be constructed.

S Afr Med J 1995; **85:** 1289-1292.

Evidence from large epidemiological studies has supported concern that being born with a birth weight below the 10th

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centile (light) for a given gestational age (LiGA) may be detrimental. The increased perinatal death rate of these babies is an immediate concern and spastic cerebral palsy may manifest itself in early childhood.[1,2] Recent attention has also focused on the long-term consequences in adulthood.[3,4] The incidence of LiGA babies is an important indicator of the health of women of reproductive age in deprived communities.

The weight for gestational age centile charts currently in use have definite shortcomings. The charts previously constructed for the Western Cape population included adequate numbers only between 34 and 41 weeks' gestation with gestational age calculated neonatally from a Dubowitz score,[5] or from the history of the last menstrual period.[6] Centile charts constructed for populations in other parts of the world are therefore generally used.[7,8] These charts, however, may not be appropriate for the population of the Western Cape. A perinatal growth chart for international reference was published by Dunn in 1985.[9] He concludes that this chart does not obviate the need to collect information on different populations, which is essential to discover how a particular population relates to the reference.

This study was therefore carried out to construct a weight for gestational age centile chart for the population served by the Tygerberg Hospital obstetric service.

Patients and methods

Patients who booked early with singleton pregnancies, who had their gestational age confirmed by early ultrasound and delivered between 1 March 1989 and 28 February 1990 were included in the study. Only patients residing in a circumscribed urban area served by Tygerberg Hospital and the attached antenatal clinics in the community were included in the study. Rural referrals and patients from other urban areas were excluded. Information collected on these patients included: age, parity, population group, smoking status, antenatal complications, gestational age at delivery, the presentation of the fetus at delivery, the method of delivery and whether labour was induced. Apart from the weight of the babies, the 5-minute Apgar score and the sex were also known.

Hypertensive disorders were diagnosed when the blood pressure was at least 140/90 mmHg on two occasions 4 hours apart and/or when dipstick testing demonstrated 1+ proteinuria on 2 occasions or 2+ or more on one occasion. Intra-uterine growth retardation was suspected if any of the following symphysis-fundus (SF) growth patterns were present on the SF growth chart before 37 weeks' gestational age: 2 consecutive or 3 intermittent values below the 10th centile, no growth for 3 consecutive readings or a last reading lower than the third-last reading.[10] Abruptio placentae was diagnosed if an adherent blood clot causing an indentation was present on the maternal surface of the placenta covering at least 15% of the surface, or where the presence of physical signs allowed a clinical diagnosis. Births were also classified according to the location of their birth weight on Dunn's[8] perinatal growth chart for international reference.

Centile charts for birth weight by gestational age were constructed for this population. The 4-parameter Johnson family of densities was used to model the distribution of birth weight at each gestational age. The parameters were fitted by smooth linear and quadratic functions of gestational age by the method of maximum likelihood. This procedure is described in more detail elsewhere.[11]

In addition to consideration of an overall chart, the sample was subdivided according to a number of characteristics in order to explore their impact on the distribution of birth weight. Separate centile charts for boys and girls were constructed to evaluate the possible effect of the sex of the babies on the birth weight and whether separate charts may be necessary for boys and girls. First- and latter-born babies and whether or not the mother smoked were also compared to determine whether separate charts may be required for these groups of babies. The effect of hypertensive disorders, induction of labour and whether the babies were white, black or Asian (92,1% of the sample were coloured) were evaluated by establishing whether exclusion of patients with these characteristics made any difference to the chart. Comparison of the charts at specific gestational ages was carried out using approximate Z-tests with standard deviations estimated from the maximum likelihood method.

Results

During the study period, a total of 6 851 patients with singleton pregnancies who resided in the circumscribed urban area were delivered. These patients are mostly from a lower socio-economic class, no home deliveries are done in this area and a small number of patients will be delivered in private hospitals. The study sample consisted of the 3 643 (53,2%) patients who had their gestational age confirmed by early ultrasound. The mean age of this group was 25,1 years with a standard deviation of 5,8 and a range of 14 - 46 years. The first quartile was at 21 years, the median at 24 years and the third quartile at 29 years. There were 1 480 (40,6%) primigravidas, 2 092 (57,5%) multiparas and 71 (1,9%) grand multiparas. As regards population group, 3 356 (92,1%) were coloured, 158 (4,3%) white, 123 (3,4%) black and 6 (0,2%) Asian. Smoking during pregnancy was reported by 1 005 (27,6%) of the patients.

Hypertensive disorders were diagnosed in 483 (13,3%) patients. Intra-uterine growth retardation, as evinced by poor SF growth, was suspected in 280 (8,4%) patients. Abruptio placentae was diagnosed in 36 patients (1,0%) and placenta praevia in 12 (0,3%). The number of patients delivered at each week of gestation from 28 to 42 weeks is shown in Fig. 1. Gestational age at delivery was less than 34 weeks in 166 (4,6%) patients and less than 37 weeks in 664 (18,2%). The presenting part of the fetus was a vertex at delivery in 3 539 (97,1%) patients, a breech in 97 (2,7%) and a transverse lie in 6 (0,2%). Vaginal delivery took place in 2 997 patients (82,3%), caesarean section in 480 (13,2%), vacuum extractions in 103 (2,8%) and forceps deliveries in 63 (1,7%). Spontaneous onset of labour occurred in 3 152 (86,5%) patients and 491 were induced or had elective deliveries.

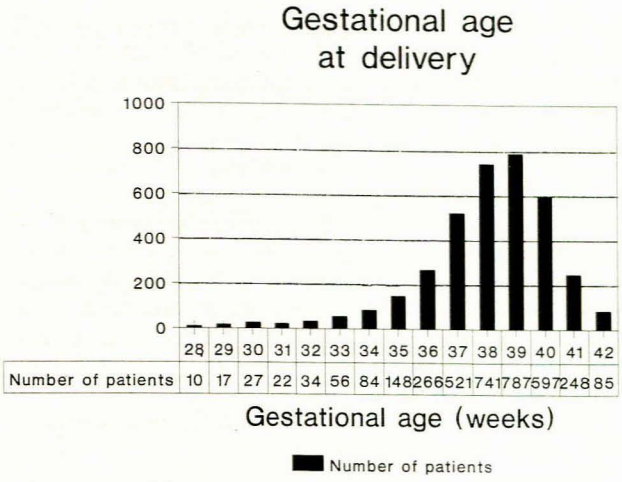

Fig. 1. The number of patients delivered at each week of gestation from 28 to 42 weeks.

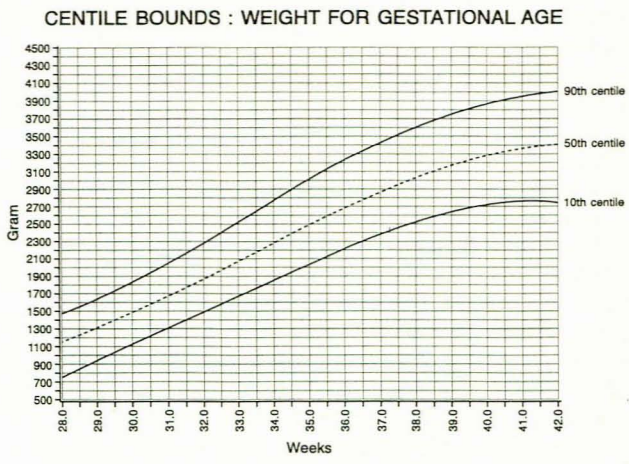

Fig. 2. The single centile chart including all patients.

The mean birth weight was 2 995 g (SD 573 g) and the range 760 g - 5 080 g. The median birth weight was 3 010 g, with the first quartile at 2 670 g and the third quartile at 3 360 g. The distribution of birth weight at each week of gestation from 28 to 42 weeks was not normal. With regard to gender, there were 1 845 (50,6%) girls and 1 798 (49,4%) boys. A 5-minute Apgar score of less than 7 was recorded in 71 (2,0%) of the babies. Table I shows the distribution of birth weight by gestational age of the babies in the study relative to the perinatal growth chart for international reference.

In comparing the centile charts for boys and girls, the 90th percentile for boys was significantly higher than that for girls ('significance' throughout is $P < 0,05$) from gestational age 34 weeks onwards. The median for boys was significantly higher than that for girls from gestational age 36 weeks onwards and the 10th percentile was significantly higher in boys for gestational ages 39 and 40 weeks. However, the differences here are small from a clinical perspective (the maximum difference in estimated centiles being 143 g); statistical significance therefore does not translate here into practical significance for term babies. Similarly, the birth weight centiles for the firstborn babies were below those of the latter-born babies for later gestational ages in terms of statistical significance; the maximum difference was 230 g. The comparison between birth weights of babies born to smokers and those of non-smokers also showed statistically significant differences in the centiles for later gestational ages (with babies born to smokers being lighter); the maximum difference was 247 g. Although the patients with hypertensive disorders had smaller babies, the chart excluding these babies did not differ significantly from the chart including all patients. Excluding white, black and Asian babies also did not affect the chart significantly, and neither did excluding those babies delivered electively and those in whose mothers labour was induced. Having explored the potential impact of all these factors, it was concluded that a single chart including all patients could be justified (Fig. 2).

Discussion

Knowledge of gestational age is a prerequisite for a study like this. A study conducted in the same geographical area as ours showed that knowledge of last normal menstruation differed by $\geqslant$ 14 days in 39,8% and $\geqslant$ 21 days in 30,1% of the patients when compared with early ultrasound.[12] The data used in this study were collected while ultrasound examinations were performed routinely on all patients with an estimated gestational age of 22 weeks or less who booked for antenatal care. Because of insufficient evidence of improved pregnancy outcome and in order to promote cost-effectiveness, routine ultrasound was stopped during 1991. The database collected during the study period therefore provides a last opportunity to conduct a study of adequate size with confirmed gestational age for this population. Most charts currently in use were compiled prior to the routine use of ultrasound.[7,13] Gestational age was calculated according to the last normal menstruation[7,13] whereas the one locally compiled chart determined gestational age neonatally by means of the Dubowitz score[5] and the other according to the last menstrual period.[5] The chart compiled by Keen and Pearse used a combination of last menstruation, ultrasound and the Dubowitz score.[8]

Factors known to have an influence on birth weight were investigated.[5,14,15] Separate charts for boys and girls, first- and latter-born babies as well as smokers and non-smokers did not differ enough to warrant their individual use. The observed differences, although statistically significant, were not of clinical importance. When differences existed, they were at later gestational ages and, for example, whether a first-born baby at term weighs 3 000 g and a latter-born term baby weighs 3 230 g will be a difference of very little practical relevance. Excluding pregnancies complicated by hypertensive disorders, deliveries following induction of labour, whether babies were white, black or Asian did not affect the chart. Therefore, a single chart could be constructed for use in clinical practice. However, given the nature of the population served by Tygerberg Hospital, the chart may only be appropriate for coloured babies and

different charts may be necessary for other population groups.

When the chart is compared with the perinatal growth chart for international reference (Table I), it is apparent that the babies in the study populations are, on average, heavier. The growth chart for international reference would therefore have led to the underdiagnosis of LiGA babies. A more detailed comparison of the international chart with that under consideration here reveals some noteworthy differences. The international centiles increase linearly with gestational age, whereas the evidence from the current study points to the rate of change of birth weight increasing at about 30 weeks and slowing at about 38 weeks, so that the centiles are non-linear. In comparison with the international chart, the 10th percentile of the local chart is, in fact, below that of the international reference for low (less than 32 weeks) and high (greater than week 39) gestational age; the local chart would therefore differentially diagnose LiGA, relative to the international reference, on the basis of gestational age.

Table I. Distribution of birth weight by gestational age of the babies in the study relative to the perinatal growth chart for international reference

Comparison with Dunn	No.	%
< 10th centile	293	8,0
⩾ 10th, < 50th centile	1 354	37,2
⩾ 50th, < 90th centile	1 557	42,7
⩾ 90th centile	439	12,1

The local chart is clearly of value in describing the distribution of birth weight in the population under consideration. Its merits in terms of identifying LiGA babies are not as clearcut. The definition of LiGA in any setting is arbitrary. Why not birth weights below the 8th percentile or the 12th? Should the international chart be used because it represents in some sense a 'target' growth? This link is, in fact, rarely established when the leap is made from reference population to implementation of the reference as a standard. If an association has been established between LiGA, as defined by the international standard, and morbidity and mortality, does it necessarily follow that the same relationships will hold for LiGA infants defined according to a local chart? Such questions can only be addressed by follow-up studies in which the sensitivity, specificity and predictive values of definitions of LiGA in screening for morbidity and mortality outcomes can be assessed. It is possible that the local chart may provide a more sensitive screen in that it more accurately reflects the behaviour of the population under consideration.

The preterm delivery rate of 18,2% as well as the very preterm delivery rate of 4,6% in the study are very high. These figures rise to 20,3% and 5,3% respectively if patients from the same area who book late or are unbooked are included. The inclusion of rural referrals increases these already high rates even more. Identification of preterm babies that are also LiGA is important in the management of these babies as they have a particular disadvantage with regard to both their short- and long-term outcome.[16] A chart that includes lower gestational ages is therefore a necessity.

Early detection of poor intra-uterine growth may allow its being remedied by intervention with low-dose aspirin therapy.[17,18] The management of subsequent pregnancies following delivery of a LiGA infant should also include low-dose aspirin therapy from 14 weeks' gestational age and a Doppler ultrasound scan of the umbilical artery at 24 weeks.[19]

An appropriate single centile chart for birth weight for gestational age for babies in the urban areas of the Western Cape that also provides for a lower range of gestational age has been made available by this study. The modelling methodology used in constructing the current chart will be useful for similar endeavours.

We thank Ms E. van der Vyfer for assistance with the data analysis.

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Accepted 16 May 1994.