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The development of a local symphysis-fundal height chart in a rural area of Tanzania

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Abstract

In this prospective community-based study, a symphysis-fundal height chart was constructed, derived from 403 measurements in 83 women, in a local rural population. Using the recommended Cardiff chart, 132 measurements (32.9%) were below the 10th centile line, while only two measurements were above the 90th centile line. This may indicate that a high percentage of the Tanzanian fetus are growth retarded or genetically small. The relative importance of each of these remains unknown. Use of the Cardiff chart in rural Tanzania could result in unnecessary referrals, which is undesirable in view of both the women involved and strained resources. Therefore, the use of a symphysis fundal height chart, based on measurements in the local population, is recommended.

Keywords: Symphysis-fundal height chart; Community based study; Tanzania

1. Introduction

Growth is frequently used to measure the nutritional status of populations and individuals. Well known examples include infant weight charts and ultrasound biometry during pregnancy. Symphysis-fundal height (SFH) measurements improve the diagnostic value in assessing fetal growth, and are a good alternative to ultrasound biometry [1]. A SFH chart from Cardiff, Wales [2], has been recommended for use in developing countries [3]. However, others have developed local SFH charts for populations in developing countries, as these will better reflect the local population [4–7]. Data were collected prospectively in a rural Tanzanian community to construct such a chart.

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2. Methods

A prospective community-based study in five rural villages around Sumve District Hospital in a north-western part of Tanzania was conducted from August 1989 to March 1991.

Maternal inclusion criteria were as follows: (a) known date of the last menstrual period; (b) gestational period <24 weeks at intake; (c) regular menstrual cycle of 28 ± 2 days; (d) uneventful singleton pregnancy and delivery; (e) delivery between 37 and 42 weeks gestation. Infant inclusion criteria were: (a) weight between the 10th and 90th centile for gestational age according to the Lubscenco birthweight curves [8]. The Sumve birthweight-for-gestational-age curve closely follows the Lubschenco curve. The close similarity of the means and standard deviations seems to justify the use of Lubschenco's centiles (based on a study of 5635 newborns) in this Tanzanian population; (b) no congenital malformations.

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2.1. Examination methods

Fundal heights were measured in cm using a standard tape. Women were asked to empty the bladder before measurement. The fundal height was measured with the woman lying flat on her back with her head slightly raised. The measurement was made, to the nearest cm, from the superior rim of her pubic bone in the midline to the fetal pole at the top of the uterine fundus. The observer measured the fundal height in each subject twice and the average of these measurements was taken to represent the fundal height obtained. Newborns were weighted with a beam-balance scale within 24 h of birth to the nearest 10 g.

Measurements were done at each antenatal visit by one of us (RM), who held clinics in the villages every 2 weeks. Early enrolment and regular attendance for antenatal care was encouraged by village health workers. The women delivered either at home, in a dispensary or in Sumve Hospital.

2.2. Statistical methods

To derive the normal SFH curve, adjusted weekly means were obtained using the multiple classification option in the analysis of variance programme in the Statistical Package for the Social Sciences (SPSS). The standard deviations of measurements at each individual week of gestation were used to calculate centile norms, assuming normal distributions. These means and centiles were then weighted according to the number of measurements and smoothed by fitting a quadratic curve.

The statistical methods used here are in agreement with the study conducted in Cardiff [2], where also only pregnancies in which the birthweight was between the local 10th and 90th centiles for gestation were included.

3. Results

The construction of the local chart was based on data from the 83 women who fulfilled all inclusion criteria. Their characteristics are listed in Table 1. The number of measurements, means and standard deviations at each week of gestation are presented in Table 2. The standard deviations at each week varied between 1.0 and 3.5 cm, but there was no clear pattern apart from a slight increase with gestational age. The calculated residual S.D. was 2.2 cm. Both the standard and residual standard deviations are similar as those found by Calvert et al. [2]. Fig. 1 shows the scatter plot of the 403 measurements in these 83 women in combination with the Cardiff chart [2]. One-hundred thirty-two measurements (32.9%) were below Calvert's 10th centile line, while only two measurements were above Calvert's 90th centile line (Fig. 1). The composed local chart by definition fits better in the local situation, with a clear shift to the right of the centile lines (Fig. 2).

Table 1
Characteristics (means or percentages) of the 83 women who fulfilled all inclusion criteria

Variable	Mean	Minimum	Maximum	S.D.
Age (years)	24.2	13	45	6.1
Parity	2.7	0	12	2.9
Number of children alive	2.4	0	10	2.3
Education (years)	4.6	0	12	3.0
Primigravida (%)	21			
Height (cm)	154	145	172	8.5
Predelivery Weight (kg)	57.3	42.3	81.0	6.0
Arm circumference (cm)	24.5	19.0	31.0	2.0

4. Discussion

Although tape measurement of SFH is simple, inexpensive, and non-invasive, the technique is still not widely used in clinical practice worldwide. This is prob-

Table 2
Mean uterine height (cm) for gestational age (weeks) of the study group ($n = 83$)

Weeks of gestation	Number of measurements ($n = 403$)	Mean	(S.D.)
12	3	6.7	(1.5)
13	5	9.6	(1.1)
14	2	8.5	(0.7)
15	3	12.7	(1.5)
16	9	11.8	(2.8)
17	7	14.3	(2.0)
18	10	14.2	(1.9)
19	10	15.0	(2.5)
20	16	16.2	(1.8)
21	17	16.1	(2.0)
22	21	17.5	(2.2)
23	27	19.4	(2.2)
24	19	20.3	(1.5)
25	16	20.0	(1.7)
26	16	22.4	(2.4)
27	20	22.8	(2.1)
28	19	23.6	(1.0)
29	17	24.7	(3.0)
30	16	25.9	(1.9)
31	17	27.3	(2.3)
32	17	27.8	(2.1)
33	19	29.0	(3.5)
34	15	29.6	(1.7)
35	20	30.3	(2.1)
36	17	31.2	(2.1)
37	16	32.0	(3.1)
38	10	33.1	(2.4)
39	10	33.2	(2.5)
40	5	33.6	(2.3)
41	4	31.8	(2.2)

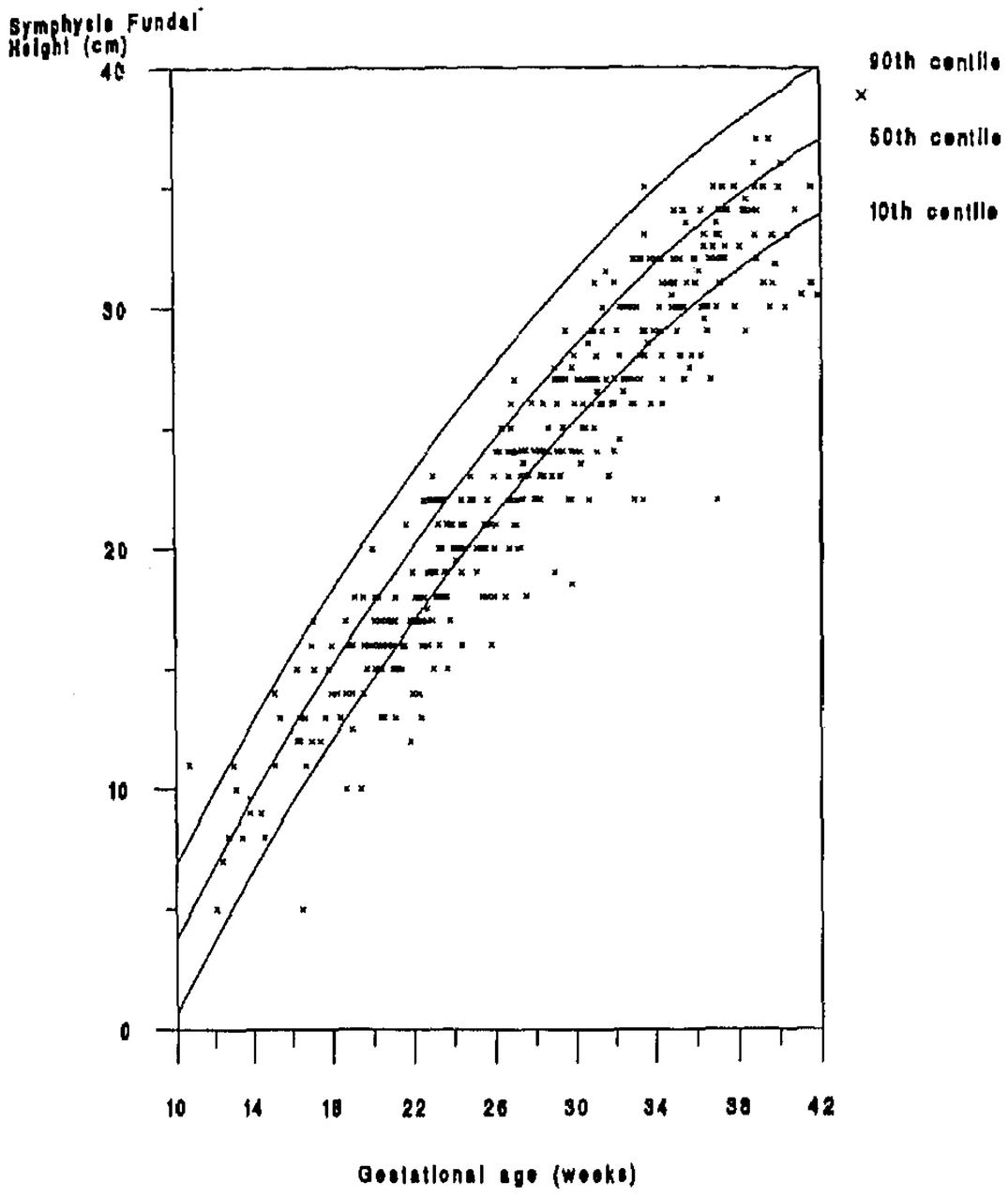

Fig. 1. Scatterplot of symphysis-fundal height vs. gestational age (based on 403 measurements) combined with the 10th, 50th and 90th centile curves from the Cardiff data [2].

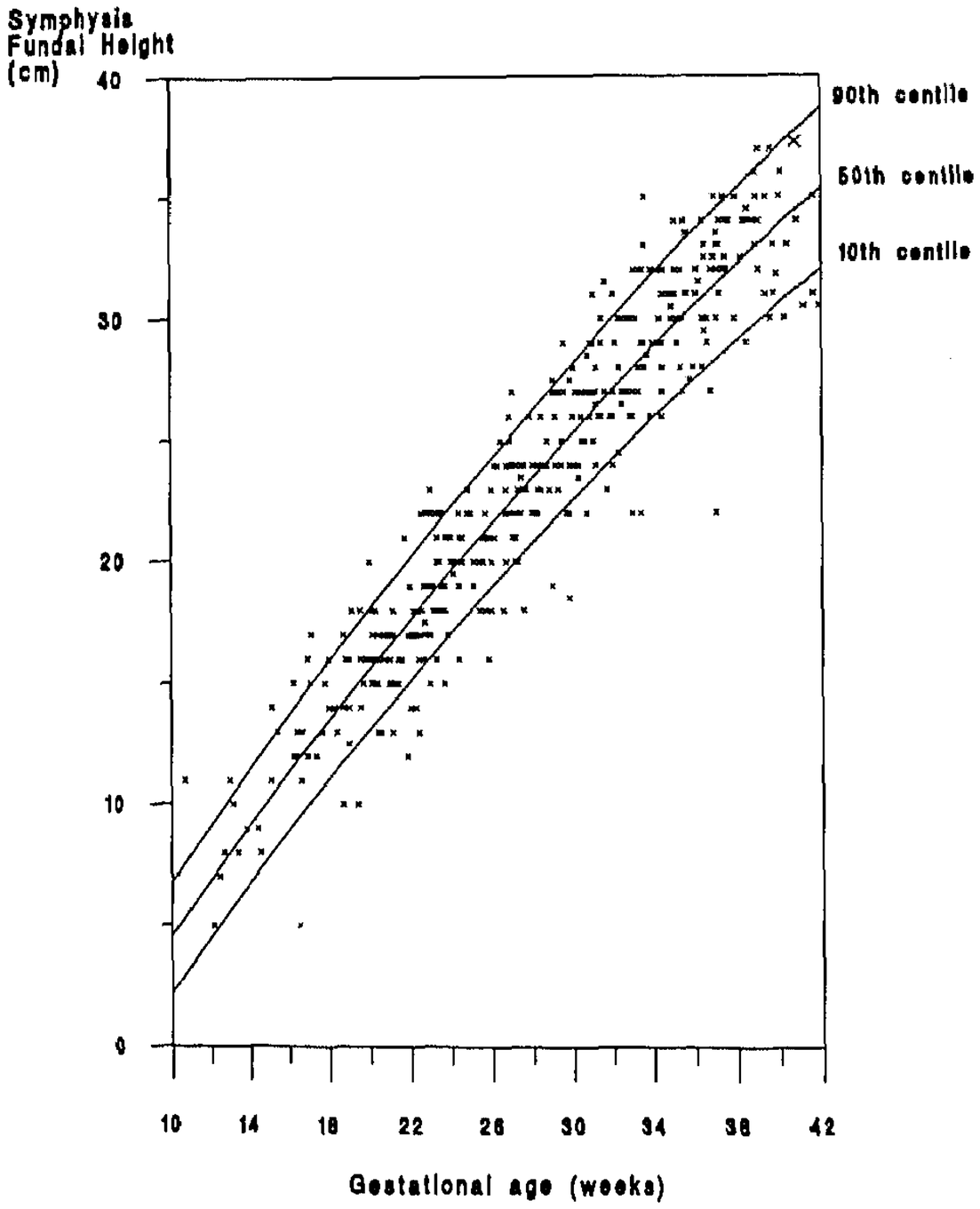

Fig. 2. Scatterplot of symphysis-fundal height vs. gestational age (based on 403 measurements) combined with the locally composed 10th, 50th and 90th centile curves.

ably because of the unavailability of standards for the charts, and the supposed need for SFH charts for each community. There is also the problem of intra- and inter-observer variations, the relatively moderate screening power, and interpretation difficulties in women who are not sure about the date of their last menstrual period.

Significant observer variations indicate that measurements of SFH are not precise [2,9,10]. However, we agree with Kennedy [11] that this does not invalidate the method. Important are repeated measurements and consultation as they tend to regress to the mean and compensate for individual measurement differences. In this study the single observer measured all fundal height in each subject twice. It has been found that the technique can be used by paramedical staff without additional loss of precision [2].

SFH tape measurement studies obtain generally good results on specificity, and relatively moderate test performances for sensitivity and positive predictive value. Alternative approaches are, however, limited. A comparison of serial measurements of SFH with a single measurement of fetal abdominal circumference by ultrasound (often not available in less privileged countries) in the third trimester for the prediction of fetal growth retardation showed only a slightly higher sensitivity for ultrasound measurements [1].

The number of women included in this study is limited. This is related to the study being community based, and the inclusion criteria. In particular, uncertainty of the last menstruation limited the number of women who fullfilled the inclusion criteria. A single SFH measurement just before delivery for the detection of low birthweight and macrosomia/twin pregnancy could be an alternative method for these women. Further study on this is warranted.

The fact that a high percentage of SFH measurements in uncomplicated pregnancies fall below the 10th centile on a recommended chart from Cardiff [2] (Fig. 1), might indicate that a high percentage of the Tanzanian fetus are growth retarded or genetically small. The relative importance of each of these remains unknown. Use of the Cardiff chart in rural Tanzania could result in unnecessary referrals, which is undesirable in view of both the women involved and strained resources. Due to differences (e.g. anthropometric, endemicity of malaria, cultural habits) between populations and areas, the construction of local charts is recommended. Uniformity in the development of local charts will ease comparisons.

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