

A SYMPHYSIS FUNDAL HEIGHT  
NOMOGRAM FOR LUSAKA

Thesis  
MTO  
1994

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BSC HB 1980 UNZA

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE  
REQUIREMENT AND FOR THE DEGREE OF MASTERS OF MEDICINE IN  
THE DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY.

THE UNIVERSITY OF ZAMBIA

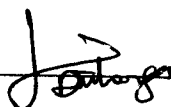
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CANDIDATE

(iii)

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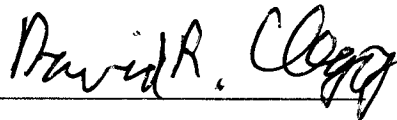
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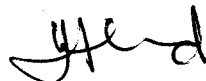
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CORRECTIONS APPROVED BY MR Y. AHMED



APPROVAL

This dissertatuion of **Dr. Velepi Catherine Mtonga** is approved as fulfilling part of the requirements for the award of the degree of Master of Medicine (Obstetrics and Gynaecology) by the University of Zambia.

Signature	Date
<i>W. M. de Silva</i>	.....07.08.1993
<i>David R. Clegg</i>	.....7/8/93
<i>Shankar</i>	.....7-8-93
<i>[Signature]</i>	.....7-8-93

(v)

Dedication

This piece of work is dedicated to  
F.U. Shamenda, Children Chidumayo and  
Kabalukila and my family, especially  
my Mum and Dad, for giving me  
encouragement, moral and material  
support without which I would not have  
made such an achievement.

(v)

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to 42 weeks.

Key words, Definitions and Abbreviations

Key words - Symphysis fundal height  
small for gestational age  
large for gestational age

Definitions - 'Lightening' - a phenomenon where the head enters the pelvis or engages before labour.

Macdonald's Rule - Holds for women who are 22 weeks pregnant and is calculated by multiplying the SFH by 8/7 (1.143 cm) to get the gestational age in weeks.

Abbreviations- SFH = Symphysis fundal height  
CMS = Centimetres  
IUGR = Intrauterine growth retardation

Most clinics do not even calculate the gestational age from the last menstrual period and relate it to the fundal height in order to get a better idea of fetal growth i.e. whether the fundus is "large for gestational age or small for gestational age" or normal for gestational age.

Since fetal growth in the longitudinal axis is reflected fairly accurately by SFH, measurement of SFH by tape has been proposed to be more useful as a screening test for normal and altered fetal growth (2,3,4) although one study found SFH measurements were not helpful in prediction of an altered fetal growth rate, namely intrauterine growth retardation (5).

Although serial ultrasonic measurement is a more precise method in detecting altered fetal growth with 90-95% accuracy (6,7), it is available only in big Government Hospitals e.g. University Teaching Hospital in Lusaka, and private owned Hospitals e.g. Monica Chiumya Memorial Hospital in Lusaka but not in peripheral Urban Clinics. We therefore, need a simple inexpensive and effective method to assess fetal growth which can be used by trained health personnel.

time of pregnancy would diagnose multiple pregnancy.

Measuring SFH in their study screened 86 out of 88 patients with multiple pregnancy. The study used the 95th centile as the upper limit to minimise false positives.

Literature Review: Comparison of values obtained from different

SFH charts

Gestation Age in Weeks	Mean						10th Centile			90th Centile		
	(10)	(4)	(14)*	(9)	(15)*	(4)	(9)	(15)*	(4)	(9)	(15)*	
	Munjanja et al	Calvert	Westin	Belizan et al	Quaranta et al	Calvert	Belizan et al	Quaranta et al	Calvert	Belizan et al	Quaranta et al	
16	14.9	12.8				9.7			15.9			
20	19.4	18.8	18.00	18.5	20.2	15.7	16.0	16.7	21.9	23.0	23.8	
24	23.3	22.9	22.00	22.5	24.1	19.8	20.0	21.0	26.0	25.3	27.4	
28	27.5	26.8	26.00	26.5	28.1	23.7	23.5	25.1	29.9	29.3	31.2	
32	30.3	30.2	29.6	30.5	31.8	27.3	27.3	28.7	33.3	33.3	34.8	
36	33.8	33.7	33.0	33.5	34.7	30.6	30.5	31.6	36.8	36.8	38.0	
40	36.7	36.2	35.5	34.5	36.3	33.1	32.0	33.6	39.3	38.5	39.7	

\* From published graph

Chapter 2PROJECT JUSTIFICATION

This study is being done because although Western SFH nomograms are available, these cannot be used in all races. Studies done in India showed some differences in their SFH nomogram compared to the Western SFH nomogram and they concluded that local SFH curves should be generated for best results (3). Also limited studies have been done in Africa to determine the African nomogram. Studies done in Zimbabwe determined a nomogram for Central Africa (10) which includes Zambia. No study has been done to reproduce these results in the Zambia except for an unpublished one study done in the UTH Department of Community Medicine. The investigators found that the average growth of SFH was 1cm per week after the 22nd week of gestation and onwards and that McDonald's correction of this is not applicable in our setting here (11).

This study will determine a baseline nomogram for Lusaka which can be used by the Urban Clinics in diagnosis of altered growth.

CHAPTER 3AIMS AND OBJECTIVESMAIN OBJECTIVE

1. To determine a nomogram of SFH in Lusaka Zambia.

SUBSIDIARY OBJECTIVES

1. To analyse the use of the nomogram retrospectively in the diagnosis of multiple pregnancy proven by ultrasound scan or delivery
2. To determine whether the head enters the pelvis or engages before labour in primipara in Zambia as it does in the "WEST" - the phenomenon of lightening.

## CHAPTER 4

METHODOLOGYSFH NOMOGRAM STUDY(1) STUDY DESIGN

This study was a descriptive study of 100 pregnant women at the University Teaching Hospital and 8 Urban Clinics between September, 1992 to February, 1993.

(2) INCLUSION CRITERIA

- (i) Any pregnant woman - attending antenatal care at a designated clinic.
- (ii) Singleton pregnancy confirmed by ultrasonograph or delivery.
- (iii) Pregnancy must be greater than 20 weeks gestation. Patients book late in the clinics. They rarely book before 20 weeks and Symphysis fundal height measurements are more accurate predictor of abnormal fetal growth from 20 weeks gestation onwards.

- (iv) Must have no complicating factors such as:-
  - (a) Hypertension and Pre-eclampsia
  - (b) Cardiac disease
  - (c) Pulmonary Tuberculosis
  - (d) Diabetes
- (v) Must live within 10 kilometers of designated health facility.
- (vi) Must be a resident of the area served by the Clinic
- (vii) Must give written consent to participate in the study (8)
- (viii) Must be sure of last menstrual period with regular cycles.

#### Neonatal Criteria

Neotatal birth weight between 10th and 90th centile for Gestational Age and no abnormalities.

#### (3) STUDY SITE

This study was done at 8 Urban Clinics in Lusaka namely:- Chelston, Kanyama, George, Chawama,

Chipata, Kalingalinga, Chilenje and Matero

Reference. These Clinics offer both antenatal care and delivery facilities for their catchment areas.

A pilot study conducted in these clinics showed that antenatal clinics (ANC) are done on Tuesday and Thursday. Tuesday is only for booking new patients and Thursday for reviewing already booked patients. The number of antenatal patients seen per month was approximately 400 per clinic.

An average of 50 patients per day are seen per clinic. Number of visits by Obstetrician each clinic was once per week. There exists a referral system of high risk patients to the University Teaching Hospital which is facilitated by radio controlled transport system which is shared by the clinics.

(4) FUNDAL HEIGHT/GESTATIONAL AGE STUDY - SAMPLE SIZE DETERMINATION (13)

Assume that 10% of fetuses are growth retarded by fundal height measurement at any gestational age from 20 to 40 weeks.

Then:-

Population proportion  $P=0.1$  (10%)

confidence level = 95%

Absolute precision  $d=0.05$  (5 percentage points each way).

Sample needed = 138

Design effect (to allow for non random sampling) = x2.

Therefore sample = 276

##### 5. TIME FRAME

This study was done over a period of six months between September 1992-February 1993. Recruitment took two months at the local clinics and follow up took 4 months to allow patients to deliver.

##### 6. PATIENT SELECTION AND RECRUITMENT

Recruitment was done during antenatal clinic days at the 8 urban clinics.

## 7. PATIENT MANAGEMENT

At recruitment history relating to gestation age, LMP cycle, contraception, lactation in previous pregnancy, parity, age, social economic class was taken using a standard questionnaire (Appendix 2).

A general examination was done to exclude those patients with problems that may complicate the pregnancy. The SFH was measured and the gestation age determined from the last menstrual period using a rotating disc and was confirmed by ultrasonography at the University Teaching Hospital.

These patients came for ultrasonography within the same week.

Baseline Haemoglobin, VDRL, and urinalysis was done. Grouping and Rh typing was also done.

## 8. S.F.H. MEASUREMENTS

Symphysis-fundal height measurements were taken from 22 weeks gestation until delivery in women attending the peripheral Urban Clinics by the investigator and later at the University Teaching Hospital.

#### 9. TECHNIQUE USED TO MEASURE SFH

Measurements were taken with a non-elastic metric tape from the top of the symphysis pubis to the top of the uterine fundus with tape following the curve of uterus. No special allowance was made for abdominal lie or presentation of the foetus, obesity or liquor amnii.

The patient was first asked to empty her bladder and lie in the supine position with legs extended. Care was taken to avoid supine hypotension.

The top of the uterine fundus was defined by light pressure from the ulnar edge of the hand at right angles to the abdominal wall.

#### 10. FOLLOW UP

Patients were followed up monthly up to 28 weeks then fortnightly up to 36 weeks, then weekly up to delivery. Review was done at the University Teaching Hospital as it was not convenient for the investigator to travel to the local clinics as she had to attend to clinical duties as well. At reviews blood pressure, weight, urinalysis, SFH was done.

Deliveries were conducted at U.T.H. and the Clinic when difficulties arose when coming to the Hospital. Baby's birth weight was taken by the attending Nurse and when necessary assessment of gestation and any complications was done by a paediatrician using Dubowitz criteria.

### Twin Pregnancy Study

To analyse the use of the nomogram retrospectively in the diagnosis of multiple pregnancy proven by ultrasound scan.

#### Methodology

10 Twin pregnancies confirmed by ultrasound at UTH were recruited and serial SFH measurements were taken from time of diagnosis to term. Patients were reviewed fortnightly up to 36 weeks then weekly till delivery. All the 10 twin pregnancies were analysed regardless of whether they delivered before 37 weeks.

2. Financial constraints made it difficult to conduct a pilot study and pretest the questionnaire which provides a means of finding and solving unforeseen problems in the administration of the questionnaire and the study.

Chapter 5

## Results

The completed questionnaire was entered in a computer for analysis and the software package EPT Info was used. Only 100 patients; giving 420 SFH measurements were included in constructing the SFH nomogram. Table II shows reasons and percentage of excluded patients. Table III shows the mean SFH measurements at each week of gestation and one standard deviation.

The growth rate of the SFH per week was approximately 1cm between 22 and 40. The mean values of SFH were 1cm less than the number of weeks between 23 and 30 weeks, they were 2cm less between 31 and 36 weeks and 3cm less thereafter. Figure 1 shows the nomogram in graphic form with the mean, 10th and 90% smoothed centile for gestation. The curves were drawn using polynomial curve fitting (Table iv). The 10th centile was taken as the lower limit of normal values and corresponds with the lower limit used by Westin (1977). There was linear growth of SFH until 30th week followed by deceleration of growth. More data at 41-42 weeks is required. The SFH did not decrease towards term and the often described phenomenon of "lightening" was not observed.

The head engaged during the active phase of labour in the majority of primigravidae.

#### Diagnosis of Multiple Pregnancy

A study of 10 Twin pregnancies revealed that 9 out of 10 patients had 2 or more SFH measurements above the 90th centile for gestation. In the one patient who would have been missed by this method four out of six measurements were below the 90th centile for gestation and two were on the 90th centile on the SFH chart and both twins were small for gestational age.

Table II: Reasons for Exclusion in Constructing the nomogram

276 Patients

	No of Patients	Percentage
1. Lost to follow up	120	43.5%
2. Patients followed up to term who delivered babies Birthweight of less than 2500gm.	36	13.0%
3. Patients who developed complications -		
Hypertension	4	1.4
Premature delivery	10	3.6
Anaemia	4	1.4
4. Patients who delivered macerated still birth.	2	0.72

Table IIIStandard values of S.F.H in 100 normal pregnancies

Gestation (Weeks)	No of Observation	Mean SFH (cm)	SD (cm)
20	10	19.04	2.60
21	7	20.77	1.87
22	22	20.0	2.85
23	26	21.67	2.23
24	20	23.23	1.05
25	21	23.88	2.22
26	28	24.61	2.44
27	26	25.68	2.38
28	22	27.05	2.05
29	20	28.14	2.98
30	28	28.55	2.31
31	28	28.63	4.98
32	28	29.88	2.21
33	21	31.03	2.25
34	24	31.99	2.08
35	20	33.55	1.88
36	23	34.27	2.60
37	28	34.10	2.61
38	28	35.05	2.41
39	19	36.05	2.94
40	10	36.30	3.04
41	5	36.70	4.84
42	1	34.00	00.00

### Symphysio-fundal height (SFH) by gestation

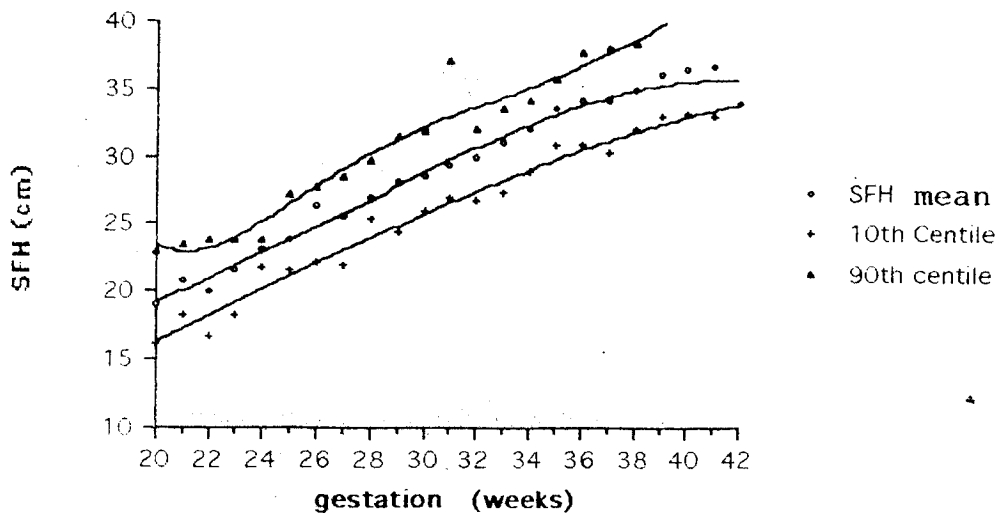


Figure 1

Table ivPolynomial curve fitting Equations

Polynomial power of 3 (mean) =  $y = 32 - 2.7x + .14x^2 - 3x^3$   $R^2 = .983$

" " 3(10thC) =  $y = -9 \times 10^{-2} + .5x + 2.4 \times 10^{-2} x^2 + 4 \times 10^{-3} x^3$   
 $R^2 = .976$

Polynomial power of 4 (90thC) =  $y = x^4$   $R^2 = 0.966$

Chapter 6Discussion, Conclusion and Recommendation

The aim of this study was to construct a SFH nomogram for Lusaka and to assess its use in the diagnosis of multiple pregnancy. The results obtained are almost similar to those observed by Munjanja et al (10), suggesting that one chart can be used for Central Africa.

The object of searching for larger for gestational age fetuses, multiple pregnancy and small for gestational age pregnancies in antenatal care is to reduce perinatal mortality and morbidity in these high risk pregnancies. There is a higher perinatal mortality in undiagnosed than diagnosed twins. Macrosomia produces adverse maternal effects due to dystocia and increased operative deliveries. In addition, polyhydramnios is associated with higher risk of perinatal mortality and morbidity. Therefore detection of altered fetal growth demands a proper plan of management which includes intensive monitoring of antenatal and intranatal fetal and maternal well being. It also draws attention to maternal conditions among large for dates fetuses e.g. diabetes or small for dates fetuses e.g. hypertension.

In Zambia where ultrasound and Xray departments are only available in large hospitals serial SFH are valuable and useful in screening patients with multiple pregnancy and intra uterine growth retardation. It is a simple, cheap and effective method of charting uterine growth in the urban and rural health centres where there is a shortage of experienced health personnel (8). Any measurements below 10th centile and above 90th centile for gestation can form a basis for referral to secondary or tertiary centres for confirmation of diagnosis by ultrasound and/or xray.

Although reproducibility of SFH measurement has a great bearing on the use of the nomogram as neither end points are easy to identify and the intraobserver and interobserver coefficient of variation of 4.6% and 6.4% respectively show that measurements of the SFH are not precise (4), the use of SFH in diagnosing small for gestational age is well documented.

## Conclusion

I believe that SFH measurements provide an easy method of detecting altered fetal growth and that a SFH nomogram should be introduced into the routine antenatal care at University Teaching Hospital and other centres providing Antenatal care. A study with a slightly bigger sample size for constructing the SFH nomogram will have to be conducted.

I strongly recommend that a study should be done at the UTH to critically analyse the value of SFH measurements in diagnosing small for Gestational Age, using the above nomogram.

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CONSENT FORM FOR SYMPHYSIS FUNDAL HEIGHT NOMOGRAM

I ..... of .....  
..... have agreed to take part in the  
symphysis-fundal height nomogram research. The research has  
been explained to me and I understand I can leave the research  
at anytime I feel like without any consequences.

Signed:

Date:

Witness:

RECRUITMENT QUESTIONNAIRE

All pregnant women Name of interviewer  
meeting the inclusion criteria.

1. Date of interview
2. Identification Number
3. Name of patient
4. Age
5. Address residential
6. Occupation
7. Clinic attended
8. Parity                      Gravida
9. Previous confinement

DATE	PREGNANCY	DELIVERY	BIRTH WEIGHT	OUTCOME A, S, B, D, EED

10. History of past illnesses: History of twins:-

	YES	NO
HYPERTENSION		
CARDIAC DISEASE		
CHRONIC COUGH		

10/.....



11. GYNAE HISTORY

1. Last normal menstrual period (L.M.P.)

2. CYCLE: No. of days

Regular

Irregular

3. HISTORY OF CONTRACEPTION

If yes, method used - combined oral contraceptive  
or mini pill

- Barner method

- I.U.C.D.

- Natural or Rhythm

4. LACTATION HISTORY

1. Lactational amenorrhoea

2. Resumed menses

if yes, when .....

12. Expected date of delivery

CLINICAL INFORMATION

1. General examination - Pallor

Oedema

BP

Pulse

Weight

Urinalysis ) ALB

) SUGAR

2. Examination of - C.V.S.

R.S.

G.I.T.

3. Investigations:-

DATE	HB	VDRL	BLOOD GROUP	RHESUS



4. DETAILED EXAMINATIONS OF ABDOMEN

DATE SEEN	PREGNANCY GA BY DATES	FUNDUS IN CMS	PRESENTA TION	ENGAGE MENT	FHR	REMARKS

5. CONFINEMENT AND PUEPERIUM

1. Date of confinement
2. Details of delivery
3. Date of discharge
4. Mother:-

- (a) ~~General~~ condition on discharge
- (b) Pallor, BP
- (c) Condition of breasts
- (d) RS
- (e) CVS
- (f) ~~Abdominal~~ examination - uterine height  
in CMS
- (g) Condition of perineum - intact  
- episiotomy
- (h) Urinalysis - Alb  
- Sugar

5. Baby:-
  - (a) Birth weight
  - (b) Apgar score
  - (c) Dubowitz chart
  - (d) Method of feeding
  - (e) Discharge weight

6. Date of post-natal examination

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