

MONITORING FETAL GROWTH IN RURAL AREAS: AN ALTERNATIVE UTILIZING NONPROFESSIONAL PERSONNEL¹

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This article describes a new method by which nonprofessional health workers can monitor fetal growth. Its ultimate goal is to enhance prenatal health coverage in rural areas—by increasing the effectiveness of empirical health workers, identifying women with abnormal pregnancies, and enabling such women to receive appropriate prenatal care.

Introduction

Low birth weight is a serious public health problem and a grave obstacle to development in many countries. Its role as an important cause of perinatal and infant disease and death, and of subsequent retarded development among school-age children, has been amply demonstrated (1-3).

Moreover, low-weight births are numerically very important in developing countries. Specifically, it is estimated that 22 million infants weighing 2,500 g or less were born throughout the world in 1975. Of these, 20.5 million were born in underdeveloped countries, while the other 1.5 million were born in developed countries. Looking at this another way, the risk of delivering a low-weight baby (2,500 g or less) is 19.1 per cent in the former countries, as compared to only 7.1 per cent in the latter (4).

These differences are influenced by an array of factors that can be grouped under two general headings: environmental conditions and matters relating to health care. Among the many environmental conditions involved, malnutrition and infection stand

out (5, 6); while with respect to health care, it should be noted that perinatal care has many deficiencies in the developing world, the most important being the low coverage achieved by health services. A number of strategies have been suggested for overcoming this coverage problem, strategies that assign great importance to utilization of nonprofessional and traditional personnel in combination with active community participation (7-9).

Monitoring Fetal Growth

Within this framework, it is worth noting that early detection of deficient fetal growth would make it possible to take timely measures—measures that have been shown to considerably improve affected children's subsequent physical and mental performance (10, 11).

Either of two approaches may be adopted for making these early determinations. One is based on high-risk criteria that take account of the mother's obstetric history as well as socioeconomic and anthropometric indicators. Naturally, development of such indicators needs to be done in accord with conditions prevailing in the particular region involved, also keeping in mind the capabilities of the interviewers and the patients interviewed. The other approach relies on clinical methods, of which there appear to be three types: (a) simple clinical

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evaluation of fetal growth, which has been shown to involve such a considerable margin of error as to be unreliable (12, 13); (b) measurement of uterine height (with a tape measure) and comparison of the results with standard normal curves (14, 15); and (c) complex techniques requiring costly, hard-to-operate instruments (such as ultrasonic devices), sophisticated laboratory methods (e. g., hormonal determinations), and blood or urine specimens that may be difficult to obtain. Accordingly, developing countries with hard-to-reach areas served by traditional personnel have few options available for making any precise evaluation of fetal growth and referring abnormal pregnancies to special services on a timely basis.

Measurement of Uterine Height

The method for measuring uterine height is simple. The literature tends to downplay it because of the boom in sophisticated technologies, and because medical journals tend to focus their attention on the technologies of the developed world. Nevertheless, as Table 1 indicates, it has been shown recently that careful measurement of uterine height and comparison of this measurement with standard normal curves yields sensitive and specific results—

as good or better than those obtained with more complex and costly methods (14, 15).

Despite its simplicity, however, this method requires some training—because the values obtained must be graphed on an ad hoc chart such as that shown in Figure 1. Consequently, while the method can be used by nursing auxiliaries, traditional personnel (midwives) and community health workers would find it hard to apply. For this reason, the following steps have been taken to further simplify the procedure:

(1) Based on a plot of a standard normal curve (15), upper and lower limits of uterine height (percentiles 10 and 90) were established for the beginning of the sixth, seventh, and eighth months of pregnancy—corresponding to weeks 26, 30, and 35 (Figure 1, Table 2). It was assumed that those fetuses with normal growth—at least up to the beginning of the particular number of months indicated since the mother's last menstruation—would be found between the upper and lower limits.

(2) Color-coded areas corresponding to the range of values for the beginning of each of the three months in question were marked off on an ordinary tape-measure of the kind commonly used in obstetric practice (Figure 2).

To make a measurement with this tape, one terminus is placed over the upper end of the pubis, and with the side of the hand toward the little finger exerting light pressure, the tape is drawn tightly but gently over the maternal abdomen to the uterine

Table 1. Success of various methods in diagnosing retarded intrauterine growth.

Diagnostic method used	Cases of retarded growth		
	Diagnosed	Undiagnosed	Total
Measurement of:			
Uterine height (Belizán et al.—15)	38 (86%)	6 (14%)	44
Biparietal diameter (Campbell and Dewhurst—16)	101 (69%)	46 (31%)	147
Urinary estrogens (Dickey et al.—17)	31 (70%)	13 (30%)	44
Intrauterine volume, with ultrasonics (Gohari et al.—18)	21 (75%)	7 (25%)	28

Figure 1. Normal ranges of uterine height, in centimeters, by week of gestation, showing 10th percentile as lower limit and 90th percentile as upper limit. Thick lines correspond to normal ranges for weeks 26, 30, and 35.

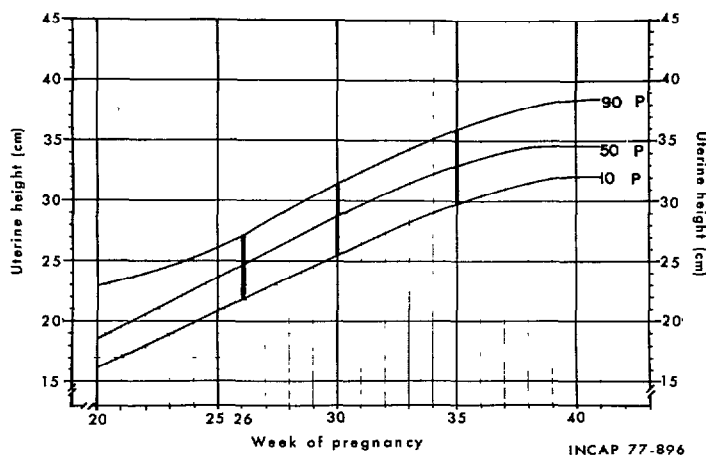


Table 2. Limits of normal values for uterine height at 26, 30, and 35 weeks of gestation.

Duration of pregnancy		Uterine heights for percentiles 10 and 90 of subjects examined	
Months	Weeks	Percentile 10	Percentile 90
6	26	21.5 cm	27 cm
7	30	25.2 cm	31.2 cm
8	35	29.75 cm	36 cm

Source: Belizán et al. (15).

fundus. The color of the tape at the point where it reaches the fundus is then noted (Figure 3).

Using this procedure, measurements are taken at weeks 26, 30, and 35 of amenorrhea. For example, if a 26-week fetus has grown to a point where the uterine fundus is within the blue area on the tape, it is considered to be in the normal range. If less growth (or more) has occurred, the mother is referred to the local health post or health center. Table 3 presents one set of

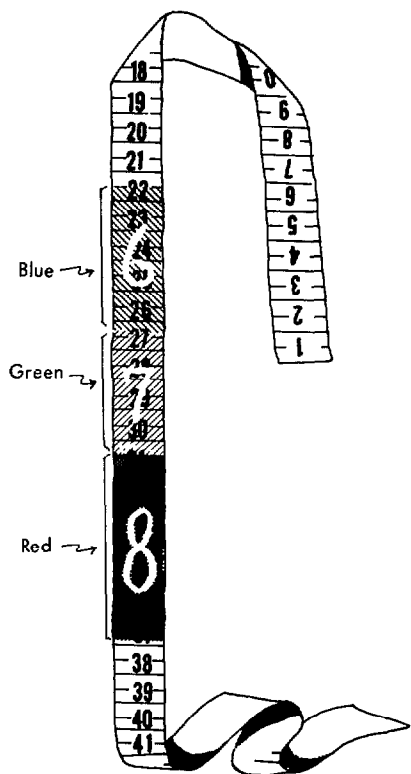
guidelines specifying actions to be taken in response to various possible eventualities.⁴

Using this method, empirical health personnel (midwives or community health workers) monitoring pregnant women in their homes on the indicated dates can determine those whose fetal growth measurements, combined with other information, call for referral to a health center (see Table 3).

In conducting this type of prenatal monitoring, the health worker can use a special form that serves as a checklist and also helps in supervising the work performed. Figure 4 shows as an example the form

⁴As Figure 1 indicates, there is some overlapping between percentile 90 of week 26 and percentile 10 of week 30, as well as between percentile 90 of week 30 and percentile 10 of week 35. Since subnormal rather than supra-normal growth poses the major public health problem, and since the incidence of syndromes that increase uterine growth is low, this overlapping will cause only minimal problems in applying the method. Nonetheless, an increase is to be expected in the number of women referred to more sophisticated facilities with a "false positive" diagnosis of possible polyhydramnios or twin pregnancy.

Figure 2. Measuring tape showing ranges of uterine heights appropriate for the beginnings of months 6, 7, and 8 by means of blue, green, and red segments. (On this tape the distance in centimeters indicated by each unbroken line is shown by the number above that line.)



INCAP 78-36

used in the Simplified Medical Care System of the Human Development Division of the Institute of Nutrition of Central America and Panama (INCAP). This form indicates the weeks of pregnancy in which the measurements should be taken, according to a pre-established routine. The nurse gives this form to the health worker on the proper date for visiting the expectant mother. As is evident, all the tasks involved can be performed in the subject's home. Also, if referral is required the form shows that fact—all the replies marked with the number 1 indicating that the patient should be referred to a health post. For example, if the height of the uterus, as measured by this method, has not reached the green area of the tape by the thirtieth week of gestation, referral to a health post or center should be made.

When the referred patient arrives, a complete prenatal examination can be carried out at the health post and the measurement reported can be checked for accuracy. If the size of the uterus does not correspond to that expected for the length of gestation involved, more highly qualified personnel should try to determine whether the discrepancy is due to one of the following causes: (a) the date of the last menstruation is incorrect; (b) there has

Figure 3. A drawing showing the proper way to measure uterine height. The tape-measure is held above the maternal abdomen, and the end where the numbers start is placed at the upper edge of the pubis. Pressing down lightly with the other hand, the tape is then extended to the center-point of the uterine fundus, and a reading is made at that point.

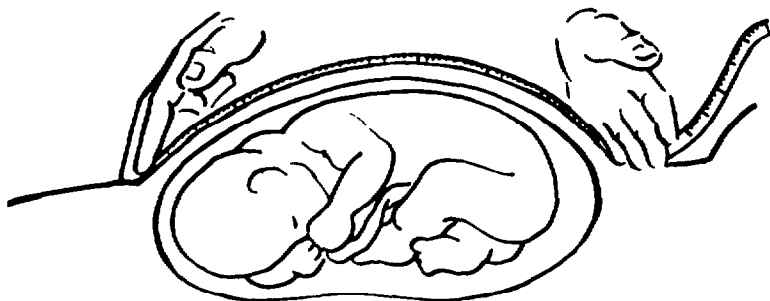


Figure 4. A form used by nonprofessional health workers to record uterine heights and other pertinent data. (This particular form is employed in the Simplified Medical Care System of INCAP's Division of Human Development.)

HEALTH WORKER'S PRENATAL EXAMINATION

Form No. _____ Card No. _____ Examiner _____

Name: _____

Identification: Town _____ Family Number _____

Date of first examination:

--	--	--	--

Baby's date of birth or date of miscarriage:

--	--	--	--

LMP

--	--	--	--

Are data of LMP reliable?: Yes ☐ No ☐

Visit number	1	2	3	4	5																				
Health worker's number																									
Date of examination	Day Month Year																								
Weeks of pregnancy	20	26	30	33	35																				
Hemorrhage	1 YES 2 NO	1 YES 2 NO	1 YES 2 NO	1 YES 2 NO	1 YES 2 NO																				
Fetal movements	<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					2 YES 1 NO	2 YES 1 NO	2 YES 1 NO	2 YES 1 NO																
Weight (kg)	<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>				
Temperature	<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>				
Arterial pressure	Max. Min.	<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>								
Swelling (edema)	1 YES 2 NO	1 YES 2 NO	1 YES 2 NO	1 YES 2 NO	1 YES 2 NO																				
Uterine height	<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					Blue area YES 2 NO 1	Green area YES 2 NO 1	<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					Red area YES NO												
Location of fetal head	<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					Below YES 2 NO 1	Below YES 2 NO 1	Below YES 2 NO 1												
Referral to health post	YES NO 1 2	YES NO 1 2	YES NO 1 2	YES NO 1 2	YES NO 1 2																				
Treatment																									

Should go to health post _____ / _____ / _____

Refer to health post if the number 1 occurs alongside any box checked.

(Observations noted on reverse)

Table 3. Examples of standardized instructions for care of pregnant women by traditional personnel using the proposed tape-measure method.

Finding	Interpretation	Course of Action
1) Consultation performed on schedule. Uterine height coincides with gestational age.	1) Fetal growth within normal limits.	1) Make appointment for the following month.
2) Consultation not performed on schedule (e.g., at 28th instead of 26th week). Uterine height appropriate for time of scheduled appointment (e.g., 26 weeks, blue area on tape).	2) Fetal growth presumed to have been within acceptable limits up to time of scheduled appointment (e.g., 26 weeks).	2) Make appointment for next normally scheduled date (e.g., 30th week) to determine if measurement at that time indicates normal uterine height (within green area of tape).
3) Consultation performed when date of last menstruation unknown or uncertain.	3) Fetal growth presumed to have been within acceptable limits up to the gestational height measured. The color of the tape at the height measured is tentatively accepted as indicating the month of gestation.	3) Make appointment for the following month to monitor fetal growth.
4) Uterine height less than expected.	4) Retardation of intrauterine growth or error in reporting date of last menstruation (in latter case the fetus should continue to show an appropriate rate of growth while remaining one month behind schedule).	4) Patient should be reinterviewed, an appointment should be made for patient to visit health center or consult with more qualified personnel, and monitoring of uterine height should continue.
5) Uterine height greater than expected.	5) Polyhydramnios, oversize fetus, twin pregnancy, or error in reporting date of last menstruation.	5) Same as number 4 above.
6) Woman in labor; uterine height insufficient to reach red area (eighth month) on tape.	6) Delivery of a baby that is probably underweight or premature.	6) Dispatch patient to hospital at once.

been an actual retardation of fetal growth; (c) some syndrome exists that has increased uterine size. The course of action to be taken will be determined by the findings made. However, should there be any doubt, a follow-up of the patient—accom-

plished by more frequent scheduling of consultations or referral to a regional hospital—will permit adoption of more sophisticated measures to protect the mother and unborn child.

SUMMARY

This article describes a method that can be used by nonprofessional health personnel to monitor fetal growth. Its basic tool is a tape-measure with colored segments; the segments indicate appropriate uterine heights for pregnant women at the beginning of six, seven, and eight months of gestation.

Using this method, an expectant mother can be monitored at home periodically to see if fetal growth (as indicated by uterine height) is appro-

prate for the time elapsed since her last menstruation. If uterine height is outside the normal range, the patient is then referred to a health post or center—where a more thorough examination can be provided and where the home measurements obtained can be checked. Other elements of the method include a system for scheduling home visits at appropriate times (in the 26th, 30th, and 35th weeks of pregnancy); a set of guidelines indicating courses of action to

cover most contingencies; and recording form that clearly shows whether referral is indicated and that provides a record of results should further care be required.

The ultimate goal of this method is to contribute toward broader prenatal health coverage

in rural areas—by increasing the effectiveness of empirical health workers, identifying women with abnormal pregnancies, and increasing the opportunities for such women to receive appropriate prenatal care.

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