MATERNAL ANTHROPOMETRY AND PREGNANCY OUTCOMES: A REVIEW

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OBJECTIVES

- To assess the degree of anthropometric indicators being useful and predictive of maternal outcomes in pregnancy (including complications during pregnancy, labour and delivery).
- To determine the association of anthropometric indicators and fetal outcomes (including LBW, Preterm birth).
- To determine quantitative association of specific indicators and combinations of indicators and pregnancy outcomes.

Types of maternal undernutrition

Type	Definition
Underweight mother	Prepregnancy wt/ht.<90%ref.wt ; Ht.> 10th percentile
Chronic maternal undernutrition	Wt./ht.<90% ref. wt. Ht.< 10th percentile
Gestational undernutrition	Total wt. Gain < 15% ref.wt. Weekly gain < 350 gms
Combined (1 or 2+3)	

Rosso,1990.

Key indicators and the times at which these are measured

Maternal indicator	Frequency
Height	Any time before or during pregnancy
Mid-upper -arm circumference	Prepregnancy and change in pregnancy
Prepregnancy weight Attained weights-month5,7,and9	Prepregnancy and during , 2nd, and 3rd trimesters
Weight gain : month5-7 month5-9 month7-9	Weight change during 2nd, and 3rd trimesters
Weight gain : prepregnancy-5, 7, 9	Prepregnancy and or 2nd and 3rd trimester
Body mass index and Attained BMI	Prepregnancy and change during pregnancy

List of maternal & fetal outcomes of interest

Stage	Outcomes & complications
Pregnancy	Pre-eclampsia, Anaemia
Labour & Postpartum	Assited delivery, Postpartum haemorrhage
Fetus	Low birth weight Intrauterine growth retardation Preterm birth Mortality : peri&neonatal mortality

Summary of Odds ratio for each indicator of LBW

Indicator	Odds ratio for each indicator of LBW LBW	with low maternal height	With low maternal weight.
Maternal height	1.7(1.4-1.8)		
Mid-upper-arm-circumference	1.9(1.6-2.0)		
Prepregnancy weight	**2.3*(2.1-2.5)**	2.6(2.3-2.9)	
Attained weight by month 5	**2.4*(2.0-2.8)**	2.5(2.0-3.2)	2.4(1.8-3.3)
Attained weight by month 7	**2.4*(2.1-2.7)**	2.6(2.2-3.1)	2.7(2.1-3.5)
Attained weight by month 9	**2.5*2.2-2.9)**	2.9(2.5-3.4)	2.8(2.1-3.5)

Summary of Odds ratio for each indicator of LBW

Prepregnancy BMI	1.8(1.7-2.0)		
Weight gain			
Prepregnancy to month 5	1.5(1.3-2.0)	**1.9(1.3-2.9)**	**2.6(1.5-4.3)**
Prepregnancy to month 7	1.5(1.1-1.9)	**2.0(1.4-2.9)**	**3.4(2.2-5.1)**
Prepregnancy to month 9	1.6(1.6-2.1)	**2.2(1.6-3.1)**	**3.2(2.1-4.9)**
Month 5-7	1.6(1.3-2.0)	2.6(1.9-3.6)	2.0(1.2-3.5)
Month 5-9	1.6(1.3-2.0)	2.7(1.9-4.0)	1.6(0.8-2.8)

Summary of Odds ratio for each indicator of IUGR

Indicator	Odds ratio for combined profiles		
	IUGR	With low maternal HT.	With low maternal WT.
Maternal height	1.9(1.8-2.0)		
Mid-upper arm circumference	1.6(1.4-1.8)		
Prepregnancy weight	**2.5*(2.3-2.7)**	**2.9(2.7-3.2)**	
Attained weight by month 5	**2.7*(2.3-3.2)**	**3.2(2.6-3.7)**	**3.8(2.9-5.0)**
Attained weight by month 7	**3.0*(2.7-3.3)**	**3.5(3.0-4.0)**	**4.0(3.2-4.8)**
Attained weight by month 9	**3.1*(2.7-3.4)**	**3.4(3.0-3.9)**	**3.7(3.2-4.8)**

Summary of Odds ratio for each indicator of IUGR

Prepregnancy BMI	1.8(1.7-2.0)		
Prepregnancy to month 5	1.8(1.4-2.4)	2.7(1.9-3.9)	**5.4*(3.6-8.2)**
Prepregnancy to month 7	1.8(1.5-2.2)	2.8(2.1-3.7)	**5.2*(3.6-8.2)**
Prepregnancy to month 9	2.0(1.7-2.4)	3.1(2.4-4.0)	**5.5*(4.1-7.4)**
Month 5-7	1.7(1.4-2.0)	2.6(1.9-3.4)	2.7(1.7-4.2)
Month 5-9	1.7(1.4-2.1)	2.6(1.9-3.5)	2.4(1.5-3.7)
Month 7-9	1.4(1.2-1.6)	2.2(1.8-2.6)	2.6(2.0-3.5)

Summary of Odds ratio for each indicator of Preterm birth

Indicator	Odds ratio for combined profiles Preterm birth	with low maternal HT.	With low maternalWT.
Maternal height	1.2(1.1-1.2)		
Mid-upper-arm circumference	1.2(1.0-1.3)		
Prepregnancy weight	**1.4*(1.3-1.5)**	1.4(1.3-1.6)	
Attained weight by month 5	0.9(0.8-1.1)	1.0(0.8-1.3)	0.9(0.7-1.2)
Attained weight by month 7	0.9(0.8-1.0)	0.9(0.8-1.1)	1.0(0.8-1.3)
Prepregnancy BMI	**1.3*(1.3-1.5)**		

Preterm birth

- None of the indicators are strongly predictive of a risk for the outcome of preterm birth.

Odds ratios of indicators for pre-eclampsia

Prepregnancy BMI	0.7(0.6-0.8)
BMI month 5	1.2(0.9-1.7)
BMI month 7	0.9(0.7-1.0)
BMI month 9	0.6(0.5-0.8)
Prepregnancy to month 5	1.1(0.8-1.5)
Prepregnancy to month 7	0.8(0.6-0.9)
Prepregnancy to month 9	0.6(0.5-0.7)

Anthropometric indicators&pre-eclampsia

- None of the indicators is strongly predictive of risk of pre-eclampsia.
- Maternal anthropometry is a poor predictor of increased risk of pre-eclampsia.

Summary of Odds ratio for each indicator of assisted delivery

Indicator	Odds ratio for assited delivery
Maternal height	1.6*(1.5-1.7)
Mid-upper-arm circumference	0.8(0.8-0.9)
Prepregnancy weight	1.0(0.9-1.0)
Attained weight by month 5	1.0(0.8-1.2)
Attained weight by month 7	0.9(0.8-1.0)
Attained weight by month 9	0.8(0.7-0.9)

Anthropometric indicators & assisted delivery

- There is a recognised relationship between maternal height and risk of cephalopelvic disproportion, (Krasovec K.,1991).
- Only maternal height is predictive of a risk of assisted delivery with an odds ratio of 1.6 with confidence intervals of 1.5-1.7.
- Most other indicators have odds ratios below 1

Odds ratio for each indicator of postpartum haemorrhage

Indicator	Odds ratio for postpartum haemorrhage
Maternal height	0.7(0.5-1.0)
Mid-upper-arm circumference	0.6(0.5-0.8)
Prepregnancy weight	0.6(0.4-1.1)
Attained weight by month 5	0.9(0.4-1.7)
Attained weight by month 7	0.9(0.6-1.5)
Attained weight by month 9	0.6(0.4-0.8)

Anthropometric indicators & postpartum haemorrhage

- As with assisted delivery and pre-eclampsia, all estimated odds ratios for various indicators are below 1.
- Most of the indicators have insufficient strength and reliability to be useful predictors of risk of postpartum haemorrhage.

CONCLUSIONS: fetal outcomes

- Studies confirmed the inherent value of maternal weight, height,and BMI as predictive of specific fetal outcomes
- Prepregnancy weight and attained weights at 5 ,7, and 9 months are strongly associated with fetal risk.
- Weight gain is also useful if prepregnancy weight is available

CONCLUSIONS

- The predictive capacity of these indicators strengthens when applied to low weight and height subgroups.

Maternal outcomes

- ***Prediction of maternal risk was found to be weak with the exception of assisted delivery***

CONCLUSIONS

- Peripheral health workers assess women`s health and nutritional status by using simple, low technology methods to detect problems.
- Based on this assesment decision can be taken regarding referral to higher levels of care at the appropriate time.
- Emphasis on the need to continue service contacts.

Framework for maternal anthropometric indicator analysis

	Scales available		No scales available	
Service delivery constraints	(1) None	(2) Some	(3) None	(4) Some
Single measurement	Early in pregnancy MUAC Height Weight attained	Late in pregnancy MUAC Height Weight attained	Early in pregnancy MUAC Height	Late in pregnancy MUAC Height
Screening	Weight gain MUAC Height	Weight gain MUAC Height		
Multiple measurements	Throughout pregnancy Weight gain MUAC Height	Late in pregnancy Weight gain MUAC Height	Early in pregnancy MUAC	Not applicable

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