THE NUTRITIONAL STATUS OF SOUTH INDIAN WOMEN IN CHILD BEARING AGE AND ITS INFLUENCE ON BIRTH WEIGHT AND MATURITY OF OFFSPRING

N. THILOTHAMMAL ● SUJARITHA RAMANUJAM ● K. BANU ● S. R. RATNAM ● S. EZHILARASI

SUMMARY

A cross sectional survey was conducted to find out the influence of maternal nutritional status on fetal complications like low birth weight and prematurity. To assess nutritional status of mothers anthropometric measurements like weight, height and weight height product index (WHPI) and biochemical parameters like serum albumin and hemoglobin were assessed. Birth weight and maturity were measured for all the new born babies.

It was found that 51% of severely malnourished mothers gave birth to babies weighing less than 2.5 kg, whereas 27% of moderately malnourished mothers and 25% of well nourished mothers gave birth to low birth weight babies. There was no difference in the number of preterm deliveries among the three groups.

The birth weight correlated well with maternal height and weight but not with maternal albumin or hemoglobin values.

Key words : Maternal malnutrition, low birth weight, prematurity.

INTRODUCTION

Maternal nutritional status is an important factor in determining the outcome of pregnancy, Intrauterine growth retardation is a known complication of maternal malnutrition. There is documented relationship between pregnancy weight gain and birth weight (Pitkins, 1976). Severe maternal malnutrition in early pregnancy is known to impair the linear growth and weight gain of the fetus (Evans & Leonard 1976). Literature on the nature and magnitude of maternal malnutrition leading to fetal complications like low birth weight and premature birth is inadequate especially with respect to this region of our country.

It is necessary to establish standards for

Dept. of Clinical Epidemiology, Institute of Child Health, Madras.

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various nutritional parameters like height and weight as they are not available for women in the reproductive age group. Nutritional parameters involving both height and weight also need to be devised as a comprehensive measurement.

A study was carried out to find out the association between maternal malnutrition and perinatal complications such as low birth weight and prematurity. The objective of this study was also to collect data on nutritional parameters of mothers like height, weight, WHPI, serum albumin and hemoglobin.

MATERIALS AND METHODS

The cross sectional survey was carried out at the Institute of Obstetrics and Gynaecology, Madras, between may 1990 and December 1990. The study population consisted of mothers in the age group of 20 - 28 yrs who had come to the hospital for delivery. Mothers with chronic ailments like congenital heart disease, rheumatic heart disease, hypertension, diabetes, renal and hepatic insufficiency, epilepsy, infectious diseases like tuberculosis and leprosy were excluded. Total number of mothers recruited were 615. The mothers after recruitment were subjected to a questionnaire eliciting details of demographic features like age, educational and economic status etc.

For assessment of the nutritional status of the mothers anthropometric measurements like weight (Wt), height (Ht) and Weight Height Product Index (WHPI) were recorded. Serum hemoglobin (Hb) and serum albumin estimations were also done. height

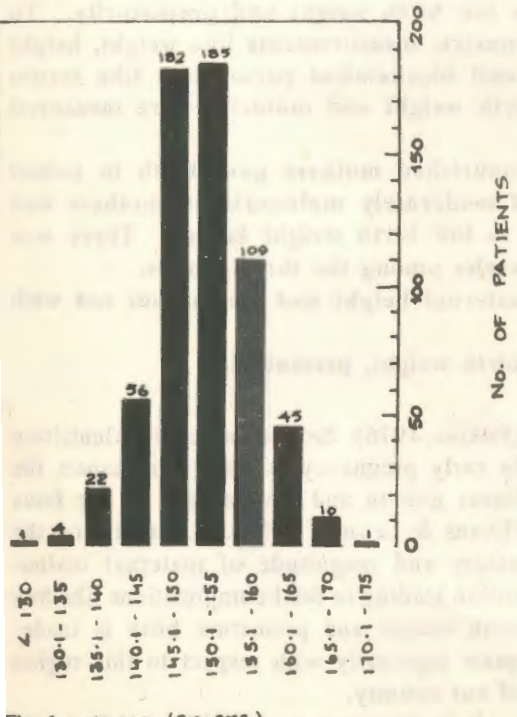

Fig. 1 HEIGHT (IN CMS)

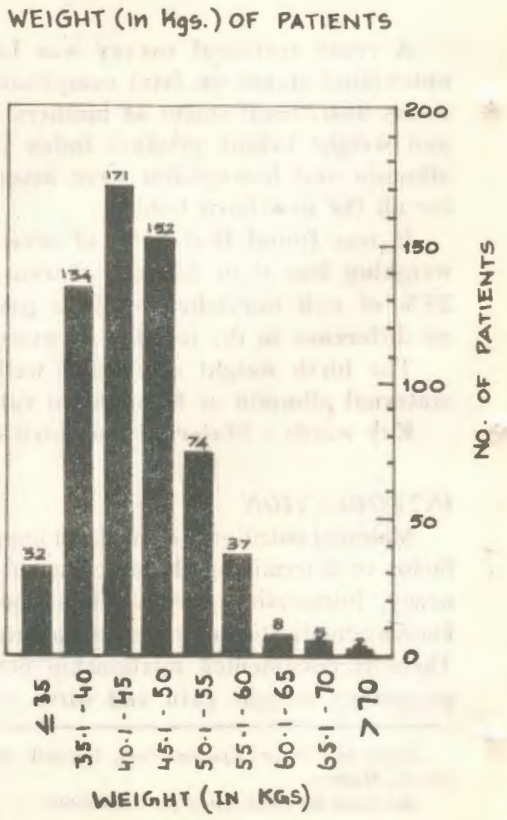

Fig 2 WEIGHT (IN KGS)

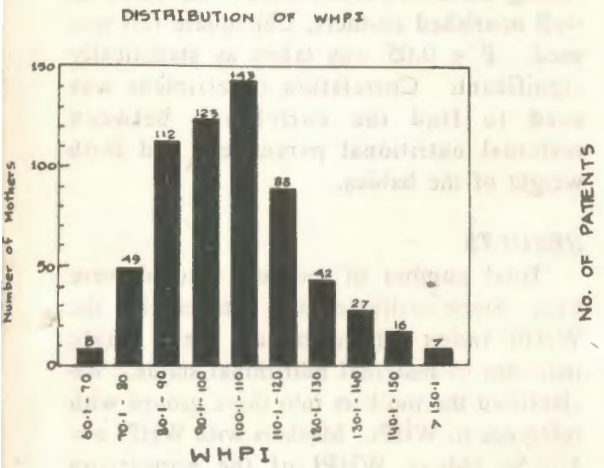

Fig. 3

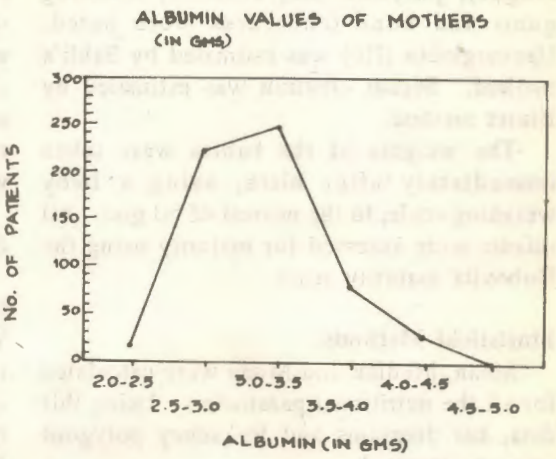

Fig. 4

was taken to the nearest of 0.5 cms using a non-stretchable tape by making the mother stand erect against the wall and keeping a flat block over the head perpendicular to the wall and measuring the distance between the floor and the under surface of the block. Weight was recorded to the nearest of 0.5 Kg with minimum possible clothes. To avoid inter observer variation only one observer took measurements throughout the study. The same instrument was used to minimize errors due to the instruments. To avoid biological variation of height and weight, all the mothers were subjected for measurements on the 3rd post-natal day in the morning hours. Morse et al (1975) found that mothers had returned to pre-pregnancy weight after 15 days of delivery and maternal post delivery weight in first 15 days was higher than the pre-pregnancy weight only by 2.4 kg.

Weight Height Product Index (WHPI) was calculated using the following formula : (Bhatia et al 1988).

$$\frac{\text{Weight in kgs x Height in cms}}{\text{45 kgs x 150 cms}} \times 100$$

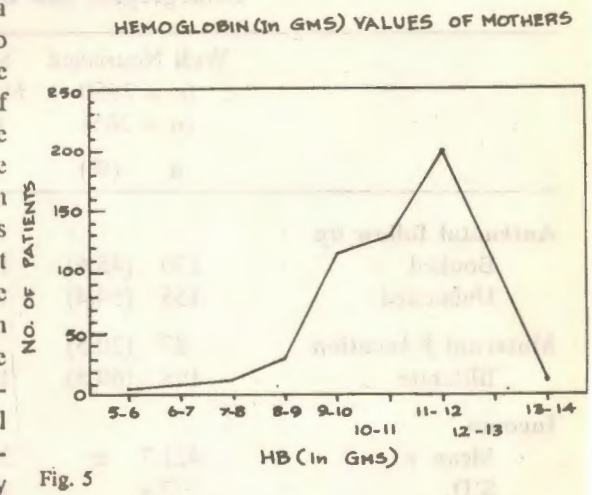

Fig. 5

Forty five kgs and 150 cms were used as denominators as they represent the 50th percentile of height and weight in this age group. WHPI was found to be a reliable indicator of maternal nutritional status in our country (Bhatia et al 1988). Apart from these measurements clinical evidence of various nutritional deficiencies like

angular stomatitis, glossitis (Smooth magenta tongue), phrynoderma, anaemia, bleeding gums and bone tenderness were noted. Haemoglobin (Hb) was estimated by Sahli's method. Serum albumin was estimated by Biuret method.

The weights of the babies were taken immediately after birth, using a baby weighing scale, to the nearest of 50 gms. All infants were assessed for maturity using the Dubovitz maturity scale.

Statistical Methods

Mean, Median and Mode were calculated for all the nutritional parameters. Using this data, bar diagrams and frequency polygons were constructed.

To compare the fetal complications among malnourished mother with those of well nourished mothers, Chi square test was used. $P < 0.05$ was taken as statistically significant. Correlation co-efficient was used to find the correlation between maternal nutritional parameters and birth weight of the babies.

RESULTS

Total number of mothers studied were 615. Since earlier reports showed that the WHPI index would be an ideal single indicator of maternal nutritional status. We classified the mothers into three groups with reference to WHPI. Mothers with WHPI > = 102.56 (Mean WHPI of the population

Table I

Demographic and Baseline Features

	Well Nourished (n = 2850 (n = 285)		Moderately Malnourished (n = 245)		Severely Malnourished (n = 85)		Total (n = 615)	
	n	(%)	n	(%)	n	(%)	n	(%)
Antenatal follow up								
Booked	130	(45.6)	111	(45.3)	24	(28.2)	365	(43.1)
Unbooked	155	(54.4)	134	(54.7)	61	(71.8)	350	(56.9)
Maternal Education	87	(30.5)	95	(38.8)	40	(47.1)	222	(36.1)
Illiterate	198	(69.5)	150	(61.2)	45	(52.9)	393	(63.9)
Income								
Mean +	421.7	±	390.8	±	365.4	±		
S.D.	277.4		213.9		202.3			
Parity								
Primi	133	(46.7)	99	(40.4)	35	(41.2)	267	(43.4)
1 child	133	(39.6)	109	(44.5)	33	(38.8)	255	(41.5)
2 children	34	(11.9)	34	(13.9)	15	(17.6)	83	(13.5)
3 children	5	(01.8)	3	(01.2)	2	(02.4)	10	(01.6)
Mean age	23.2	±	22.8		22.8			
	2.6		2.5		2.2			

sampled) were labelled as well nourished (WN), those with values between 83.7 (-1 SD of the population sampled) and 102.55 as moderately malnourished (MMN) and those with values < 83.69 as severely malnourished (SMN). Out of 615 mothers, 285 were well nourished, 245 moderately malnourished and 5 severely malnourished.

Angular stomatitis and glossitis were observed in 12 mothers and phrynoderma in 26 mothers. Evidence of vitamin C deficiency was present in 23 mother. Serum haemoglobin was less than 10 gms/dl in 105 mothers (17%). In practice, it has been observed that maternal and foetal prognosis is impaired if haemoglobin level drops below 8.7 gms/dl. (Mudaliar & Menon 1990). In our study, 40 mothers (6%) had haemoglobin values below 8 gms/dl. In pregnant women serum albumin levels below 2.4 gms/dl indicate hypoproteinemia (Mudaliar & Menon 1990). In our study 22 mothers (4%) had levels below this.

Demographic data of these mothers like mean age, maternal education, income and parity are shown in Table I. Mean, mode and Standard deviation of weight, height and WHPI for the entire sample is shown in Table II. The mean height of the population was 152 cms and the mean weight was 45 kgs. Mean serum albumin for the entire population was 3.1 ± 0.7 gms% and the mean hemoglobin value was 10.9 ± 3.8 gms% (Table II).

Distribution of anthropometric measurements (Height, Weight and WHPI) of the entire population are shown in figures 1-3. Frequency polygons for serum albumin and hemoglobin are shown in figure 4 & 5.

Fifty one percent of babies born to severely malnourished mothers weight less than 2.5 kg at birth, but in moderately malnourished group only 27% of babies weighted less than 2.5 kg. This difference was statistically significant. In well nourished group, 25% of mothers gave birth to babies weighing less than 2.5 kg. The

Table II

Nutritional indicators for women in child bearing age

Parameters	Mean values with SD n = 615
Weight in Kg	45.4 ± 7.1
Height in Cms	151.7 ± 6.5
W. H. P. I.	102.4 ± 19.2
Albumin (Gms/dl)	3.1 ± 0.7
Hemoglobin (Gms/dl)	10.9 ± 3.8

Table III

Distribution of birth weight of babies born to the three groups of mothers

	Babies Born To SMN mothers (n = 85)	MMN mothers (n = 245)	WN mothers (n = 285)
Mean birth Wt. in kgs	2.5 ± 0.45	2.75 ± 0.39	2.84 ± 0.43
No. : of babies with birth Wt. < 2.5 kg	43 (51%)	67 (27%)	700 (25%)

Table IV

Correlation of maternal factors with birth weight (BW)

Factors compared	R value	Significance
BW and Maternal weight	0.3	$p < 0.01$
BW and Maternal height	0.22	$p < 0.01$
BW and Maternal WHPI	0.3	$p < 0.01$
BW and Maternal hemoglobin	- 0.03	$p > 0.05$
BW and Maternal albumin	- 0.08	$p > 0.05$

difference observed between moderately malnourished and well nourished group was not statistically significant. (Table III).

The mean birth weight of the babies born to well nourished, moderately malnourished and severely malnourished mothers were 2.84 ± 0.43 kg, 2.75 ± 0.39 kg and 2.5 ± 0.45 respectively (Table III). Though the difference observed in the mean birth weight of babies among the three groups was statistically significant, the difference in birth weight was not very striking clinically. Totally 19 babies were prematurely delivered. There was no significant difference in the proportion of preterm babies among the three groups of mothers.

There was a positive correlation between birth weight of the baby and maternal height, weight and WHPI (Table IV). There was no such correlation between birth weight and maternal serum albumin and hemoglobin levels (Table IV).

DISCUSSION

Only very few reports are available from our country on maternal nutritional status during pregnancy and in non-pregnant women in child bearing age. Hence our data can from a standard for the nutritional status of women in the age group of 20-28 yrs in a low and middle socioeconomic strata of urban and semiurban areas.

The mean maternal weight in the present study 45.36 ± 7.08 kgs is comparable with that of Bhatia et al (1988) which was 46.2 ± 6.22 kgs. Over values are slightly higher when compared to these of Venkatachalam (1962) reported from low socio economic South Indian population from Coonoor, Hyderabad and Madras. Clarke (1966) screened a selective population namely medical and nursing students in the age group of 16-29 years. The mean weight of this population (48.6 kgs) was higher than that in our study. The difference is explainable since Clarke's study included women from better socio economic background alone. A study from Vellore in 1971, reported that the mean maternal weight was 44.7 ± 6.82 kgs in the age group of 20-24 yrs and 46.6 ± 7.6 kgs in 25-29 yrs (Kanpur et al 1971) which is in accordance with the observation of the present study.

Mean maternal height of the mothers in the present study was 151.65 ± 6.56 cms which is in agreement with the earlier report by Bhatia et al (1988). Tripathi et al (1987) reported average height of rural non pregnant women in the age group of 16-45 yrs as 148-5.2 cms. Kapur et al (1971) 72% of mothers were less than 155 cms in height. Average height of medical and Nursing students (16 to 29 yrs) represented from many

states of India was found to be 156 cms (Clarke, 1971). It was higher than the presently study which could be explained by the higher selective nature of the population.

The mean WHPI observed in our study in 102.56 which is more or less similar to that reported by Bhatia et al (1988).

It has been observed over the years that the average birth weight of babies increased with increase in height and weight of mothers (Kanpur 1971, Tripathi 1987). This is well brought out in the present study. WHPI was found to be a good parameter to assess nutritional status and it correlated well with birth weight of the babies.

Mean Hb observed in our study was similar to that reported by Bhatia et al (1988) viz 19.7 ± 1.8 gms/dl. In their study 51.32% had Hb values less than 11 gms/dl. Larger proportion of mothers in our sample had normal haemoglobin values. This could be due to active Maternal and Child Welfare Programme and ICDS programme in Madras City. Mean serum albumin concentration in the present study is closer to that reported earlier (3.4 ± 0.47 gms/dl) by Bhatia et al (1988). Maternal hemoglobin and serum albumin levels did not correlated with birth weight in our study. This is similar to the findings of Moghissi et al (1975).

As the parameters observed in the present study are closer to earlier reports, these findings can be used a standard for the women in the age group 20-28 yrs.

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