

## MATERNAL HEIGHT AND REPRODUCTIVE PERFORMANCE

by

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Reproduction is influenced not only by heredity but also by customs, tradition, standard of education and other socio-economic factors. The social gradient in turn is related to the different levels of physique and general health women from more affluent classes being on an average taller and healthier than those from the poorer classes. During the last 3 decades, mainly due to the pioneering work of Baird (1947,1949 and 1952) in Great Britain, the influence of height on reproductive efficiency has been clearly demonstrated. In India, basic data are not available about the height of women in reproductive age groups from different

healthy college girls from the city. The second group (B) was formed by 500 healthy antenatal mothers of all parity groups attending the prenatal clinic. The third group (C) was formed by 300 primigravidae and 300 multigravidae admitted at term or in labour into the hospital. Women with haemoglobin of 8% and below were not included in group 'C' to avoid the findings being vitiated by premature deliveries due to anaemia. The income of father in group 'A' and of the husband (together with her earnings, if any) in the other 2 groups were noted and they were grouped into 4 social classes as follows:-

Social Class 1	:	Professional workers, executives and businessmen	Rs. 500 & over per month
Social Class 2	:	Professional workers of intermediate status—trade and agriculturists	Rs. 300-Rs. 500
Social Class 3	:	Skilled and semiskilled workers	Rs. 101-300
Social Class 4	:	Unskilled and unemployed	Rs. 100 & Below

parts of the country. An attempt is made in this paper to find out the relationship of height to reproductive performance of women in and around Madurai, south India.

### Material and Methods

Three groups of women in reproductive age (16-40 years) were studied in 1970. The first group (A) consisted of 500

The height of each patient was first accurately recorded in centimeters and she was examined carefully. Those at term or in early labour were studied as to the duration and outcome of labour, including nature of delivery, weight of the baby, perinatal loss, etc. The results obtained were statistically analysed considering maternal height as one of the parameters of reproductive performance. Spontaneous delivery of vertex within 24 hours without maternal or foetal injury was accepted as normal labour for this

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study and those beyond 24 hours as prolonged labour.

### Results

The height of different groups is given in Table 1. The mean height in all

classes 1 and 2 and they were all taller than 150 cms. Eighty per cent in this group belonged to the social class 4 and of these 72% were not more than 150 cms. in height. This disparity could be explained as most college girls were from

TABLE I  
Distribution of Patients According to Height in Different Groups

Height in cms.	Group A (500 cases)	Group B (500 cases)	Group C (300 cases)	Multis.
131-135	0.4	4.0	2.0	0
136-140	2.8	7.6	5.6	1.3
141-145	17.3	16.8	12.3	3.3
146-150	37.8	36.0	53.0	62.3
151-155	23.8	26.0	25.0	32.6
156-160	13.6	8.6	2.0	0.3
161-165	3.2	1.0	—	—
166 & above	0.8	0.0	—	—
	100.0	100.0	100.0	100.0

the groups was 150 cms. Those below this were considered as short. In group 'A' the height ranged from 134-167 cms and 41.4% of them were above 150 cms. In group 'B' the range was 133-162 cms. and 35.6% were above 150 cms. and in group 'C' it varied from 131-160 cms. and only 30% were over 150 cms. Distributed according to social classes 36.4% of group 'A' were in social classes 1 and 2 and of these 70% were above average in height. In group 'B', only 3.4% were in social

upper middle classes and the hospital patients were mostly from the lower social classes. In group 'C', 15.6% were in social classes 1 and 2 and most (85%) of them were over 150 cms. compared to only 16.6% of women in social classes 3 and 4. All patients in social class 1 were over 150 cms. in groups 'B' and 'C'.

*Reproductive Performance:* The number of spontaneous deliveries increased with the maternal height (Table II). Similarly, the incidence of operative deli-

TABLE II  
Height of Parturients (Group C) and Nature of Delivery (in per cent)

Height in Cms.	Total No.	Natural	V.E.	Forceps	Cranio-tomy	Caesarean section
131-140	27	22.2%	3.4	14.8%	14.8	40.7%
141-150	393	73.2	19.4	4.7	4.7	4.6
151-160	180	78.3	6.1	1.6	—	0.6*
	600					

\* For persistent Mentoposterior.

veries decreased when the height exceeded the average (150 cm.), most of them delivering spontaneously or with low forceps. There was only one caesarean section due to persistent mentoposterior in this group. All other caesareans (29) were done in patients below 150 cms. Of these, 7 were elective sections for gross cephalopelvic disproportion and all were below 140 cms. in height. In 15, caesarean was for failed trial labour and in 5 others it was for abnormal uterine action. Only one out of four patients below 140 cms. in height had delivered spontaneously or assisted with vacuum extractor. Forty-one per cent had caesarean section and 15% craniotomy for late labour with moribund or dead foetus. Thus over two thirds of the parturients with height of 140 cms. and below had operative deliveries as against 2.1% of those who were 150 cms. and over.

The labour was delayed in short women. Only one third of the primigravidae less than 140 cm. in height delivered within 24 hours. This included 7 elective caesareans. In those over 150 cms, 7% had prolonged labour.

The birth weight of babies in the whole series ranged from 1900 to 4000 gms. The prematurity rate was 34.6%. In those with height of 140 cms. and less it was 81% compared to 1.3% in those over 150 cms. suggesting that short women had smaller babies and taller ones had larger babies (Table III). The perinatal loss in

this series was 9.2% mainly due to prematurity, anoxia and birth trauma. In those over 150 cms. it was 3.8% compared to 41% in those 140 cms. and below in height.

Considering the social classes, the prematurity and perinatal mortality rates were 55.8% and 23.6% respectively in social classes 3 and 4 compared to 8% and 3.6% for social classes 1 and 2 (Table IV). However, the number of patients in first 2 groups were relatively small.

TABLE IV  
*Fetal Outcome Relation to Social Class*  
(Figures in %)

Fetal Outcome	Social classes			
	1	2	3	4
Prematurity rate	2.0	6.0	15.0	40.2
Perinatal loss	1.6	2.0	4.6	19.0

#### Discussion

Height is determined by genetic and environmental factors, especially nutrition and housing. Boyd Orr (1937) emphasised the close association between proper nutrition, good health and height. Poor social conditions lead to malnutrition, ill health and often short stature. The mean height of females aged 25-29 years in Latin American and Asian countries varied from 147.6 cm. in Vietnam to 155.5 cm. in Uruguay (Frisch & Reville, 1969). Baird (1949) found that short women (below 5 ft. 1" or 152.5 cms.)

TABLE III  
*Birth Weight of Babies in Different Height Groups*

Baby Wt. in Kg.	131-140 cms.	141-150 cms.	151-160 cms.	Total	%
2.5 Kg. & less	22	184	2	208	34.6
Over 2.5 Kg. to 3 Kg.	5	167	84	256	42.2
Over 3 Kg.	—	42	94	136	22.7
	27	393	180	600	100.0

were 5 times more common in the hospital group than in the nursing home group of parturients. He believed that most of them were small not because of heredity but due to poor nutrition during growing years. In social classes 1 and 2, only 10% were short compared to 29% in social classes 4 and 5 in Aberdeen. In India, Bhatt *et al.*, (1967) reported an average height of 159 cms. amongst 448 primiparae and 1858 women of all parity in Baroda. In 1965, in a study of 1000 consecutive women admitted into our labour wards the mean height was  $148 \pm 5.7$  cms. In the present study, it was 150 cms. In our series, 2.3% of short mothers were seen in social classes 1 and 2 compared to 68.3% in social classes 3 and 4. The tall mothers formed 81% of social classes 1 and 2 compared to only 16.6% in social classes 3 and 4. Thus, it appears that there is a definite relationship between height and social class of mothers. Most of our hospital patients were poor and short.

Besides genetic and endocrine factors the size and shape of the pelvis is influenced by nutrition and height of the individual. Greulich and Thoms (1939) found that taller women had more favourable pelvis due to better nutrition. Ince & Young (1940) showed that there is a distinct correlation between the height of women and length of the conjugate diameter of the pelvic brim. Bernard (1952) reported that short women had smaller pelvis, often flat, compared to the taller women.

Baird (1949; 1964) found that high fertility and uncomplicated pregnancy ending in a spontaneous delivery of a live vigorous child followed by a successful lactation and involution indicates good reproductive efficiency, whereas inability to deliver spontaneously is an index of poor reproduction. He found that caesa-

rean rate was 4 times higher in women under 5 ft. 1" compared to taller women (5 ft. 4"). It was highest in short women and lowest in tall women. Bhatt *et al.*, (1967) reported that the caesarean section rate increased 4 times in women below 140 cms, compared to those 160 cms and over. Moley (1969) found the incidence of caesarean sections 3 times more in short women. In our series, it was 10 times higher in those below 140 cms. compared to taller women. Nearly two-thirds of short mothers had operative deliveries compared to 2.1% of tall ones. In 25 consecutive cases of urinary fistulae of obstetric origin seen in this department in 1970 none was over 150 cms. in height.

In short women, uterine dysfunction may result from cephalopelvic disproportion. The labour was prolonged in 44% of short primiparae compared to 3.5% of tall primigravidae. Only 33% of primigravidae delivered in 24 hours in the group whose height was 140 cms. and less.

Shorter the patient, higher the prematurity (Kaltreider, 1965). The prematurity rate was 3 times more in unhealthy small women compared to the tall and healthy (Thomson, 1957). Thoms (1937) found that the babies weighed 278 g. less in women with small pelvis compared to those with medium or larger pelvis. Butler and Alberman (1969) also found that tall mothers have heavier babies compared to short mothers. They found at 40 weeks a difference in birth weight of 250 g. between a child whose mother was 164 cms. or more compared to that of a mother of 158 cms. and less. In our series the average birth weight was 2,800 gms. The incidence of low birth weight babies was as high as 81% when the maternal height was 140 cms. compared to 1.3% when it was over 150 cms. It was 7 times higher in social classes 3 and 4 compared to the