

BIRTH WEIGHT AND MATERNAL & FOETAL FACTORS

by

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Introduction

The birth weight of an infant is an important criterion for judging the health and maturity of the new-born. It is a known fact that this weight is affected by a number of factors such as nutritional status of the mother, care during the antenatal period, the period of gestation, parity, age of the mother, sex of the baby, etc. Again, the birth weight may be the only factor, in some cases, to influence the type of labour. The material consists of 899 consecutive births in the Lady Hardinge Hospital during the first three months of 1958. The minimum weight accepted in this study is 2½ lbs. The birth weights have been reviewed with a view to study their relationship with:

1. Maternal age
2. Parity
3. Sex of the baby
4. Live or still-birth
5. Type of labour

Analysis

1. *Birth Weight and Its Distribution.* A study of the birth weight distribution, Table 1, shows that the

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weight ranges from 2½ lbs. to 14 lbs. The frequency increases as the weight increases up to the weight group 5½ to 6½ lbs. and then there is a sharp decline of frequency after weight group 6½ to 7½ lbs. 81% of the observations are concentrated in the weight range 4½ to 7½ lbs.

TABLE 1
Distribution of Birth Weight

Weight (lbs.)	Infant births	
	No.	%
2½—3½	38	4.2
3½—4½	47	5.2
4½—5½	174	19.3
5½—6½	317	35.3
6½—7½	239	26.7
7½—8½	66	7.3
8½—9½	15	1.7
9½ +	3	0.3
All births	899	100.0

Percentage weight distribution (Table 1) compares favourably with the findings of H. V. Tilak on his work at the Bombay hospitals on new-born infants.

2. *Influence of Maternal Age on Birth Weight.* An analysis of birth weight by maternal age at the time of confinement shows that the minimum age recorded is 15 years and

maximum 45 years. The cases have been classified into six groups of five-year interval. The maximum number of confinements have been recorded in the age group 20-24 years (Table 2) and the minimum in the group 40 years and above. Similar inferences have been made by Mukherjee and Biswas.

primipara is 15 years and the maximum is 32 years. The largest number of cases refer to the age group 20-24. The minimum average birth weight 5.38 lbs. is observed in the age group 20-24 and maximum 6.10 lbs. in group 25-29 years (Table 3). There is, however, no systematic rise in weight as the age advances.

TABLE 2
Distribution of Birth Weight by Maternal Age

Age (Years)	Birth weight in lbs.								Total	Average weight
	2½ - 3½	3½ - 4½	4½ - 5½	5½ - 6½	6½ - 7½	7½ - 8½	8½ - 9½	9½ +		
15 - 19	4	6	27	33	25	3	—	—	98	5.80
20 - 24	11	18	80	119	72	15	4	—	319	5.89
25 - 29	12	14	29	89	62	24	4	2	236	6.16
30 - 34	8	8	23	45	56	11	4	1	156	6.13
35 - 39	2	1	12	23	20	8	3	—	69	6.36
40 +	1	—	3	8	4	5	—	—	21	6.38
Total	38	47	174	317	239	66	15	3	899	6.05

TABLE 3
Distribution of Birth Weight by Maternal Age (Primipara only considered)

Maternal age	Weight in lbs.							Total	Average weight
	2½ - 3½	3½ - 4½	4½ - 5½	5½ - 6½	6½ - 7½	7½ - 8½	8½ - 9½		
15 - 19	2	5	19	29	19	3	—	77	5.87
20 - 24	2	8	39	44	19	9	1	122	5.83
25 - 29	1	2	1	11	3	2	1	21	6.10
30 - 34	—	—	3	2	2	—	—	7	5.86
All births	5	15	62	86	43	14	2	227	5.87

The average minimum weight of 5.80 lbs. is recorded in the age group 15-19 and maximum of 6.38 lbs. is recorded in the group 40 and above. The average weight shows a systematic increase with the maternal age.

(a) *Birth Weight in Relation to Maternal Age for Primiparae only.* The minimum age recorded for a

(b) *Birth Weight in Relation to Maternal Age for Second and Third Parity.* The minimum age observed is 15 years and the maximum is 42 years (Table 4). The highest frequency belongs to the age group 20-24 years.

There is a systematic increase in weight as age advances, the minimum weight 5.45 lbs. being in the

TABLE 4

Distribution of Birth Weight by Maternal Age
(2nd and 3rd parity only considered)

(years)	Weight in lbs.								Total	Average weight
	2½ - 3½	3½ - 4½	4½ - 5½	5½ - 6½	6½ - 7½	7½ - 8½	8½ - 9½	9½ +		
15-19	2	1	8	4	5	—	—	—	20	5.45
20-24	6	6	32	55	36	5	1	—	141	5.91
25-29	7	2	8	24	23	11	1	1	77	6.25
30+	—	—	3	13	8	2	1	—	27	6.44
Total	15	9	51	96	72	18	3	1	265	6.03

group 15-19 and the maximum 6.44 lbs. being in the group 30 and above.

The increase in weight with age for primipara, second and third para and all parity is clearly seen in the graph (Fig. 1). Except for the age group 15-19 years, weights in the multipara (second and third para) are higher than those in primipara. There is a systematic and smooth increase in weight for multipara, whereas the increase in weight for all parity is systematic but not smooth. In case of primipara the increase in weight is neither systematic nor smooth. The rate of increase is seen to be higher in multipara.

Note: (a) The point plotted against the age 30-34 years refers to the group 30 and over.

(b) The point plotted against the age 40 years refers to 40 and over.

3. *Influence of Parity on Birth Weight.* On analysis of birth weight in relation to parity (Table 5), it is seen that the average birth weight varies between 5.87 lbs. for the first parity, and 6.68 lbs. for the parity group 10 and over. Though there is no regular increase in average birth weight of newborns in higher parity yet from the figures it is clear that weight of infants in higher parity group (10 and over) is 0.81 lb. more than the mean weight in the primipara.

4. *Birth Weight in Relation to Sex of the Baby.* The maximum frequency for both sexes is seen in the weight group 5½-6½ lbs. as the weight increases the number of cases increases for both male and female up to 5½-6½ lbs. and then there is a decrease in frequencies with the increase in weight (Table 6).

Applying the students 't' test for finding out the significant difference between the two distributions and

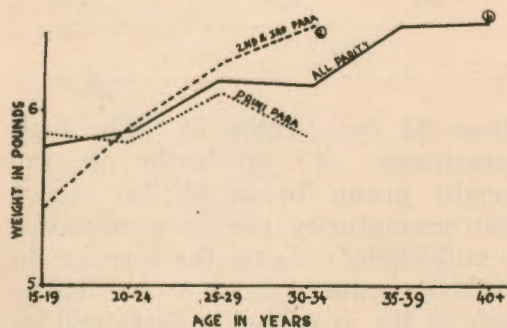


Fig. 1

Fig. 1. Distributions of weight in relation to age for primipara, second and third para and all parity.

TABLE 5
Distribution of Birth Weight by Parity

Order of parity	Weight in lbs.									Total No. of infants		Average birth weight
	2½-3½	3½-4½	4½-5½	5½-6½	6½-7½	7½-8½	8½-9½	9½+	No.	%		
1	5	15	62	86	43	14	2	—	227	25.2	5.87	
2	8	7	30	52	34	6	2	1	140	15.6	5.91	
3	7	2	21	44	38	12	1	—	125	14.0	6.15	
4	3	7	16	36	31	7	2	—	102	11.4	6.12	
5	2	7	17	32	27	8	3	1	97	10.8	6.20	
6	5	4	11	26	22	6	—	—	74	8.2	6.00	
7	5	2	8	17	17	3	3	—	55	6.0	6.09	
8	1	1	5	13	12	3	—	—	35	3.8	6.23	
9	—	2	3	6	8	1	1	1	22	2.4	6.45	
10+	2	—	1	5	7	6	1	—	22	2.4	6.68	
Total	38	47	174	317	239	66	15	3	899	100.0	6.05	

TABLE 6
Birth Weight by Sex of Newborn

Birth weight (lbs.)	Sex				Total No.
	Male		Female		
	No.	%	No.	%	
2½-3½	14	36.9	24	63.1	38
3½-4½	20	42.6	27	57.4	47
4½-5½	73	42.0	101	58.0	174
5½-6½	160	50.5	157	49.5	317
6½-7½	120	50.1	119	49.9	239
7½-8½	42	63.8	24	36.2	66
8½+	8	44.5	10	55.5	18
Total	437	48.7	462	51.3	899
Average wt.	6.17		5.93		

their averages it is found that $t=2.829$ which proves that newborn males are heavier, in general, than females.

5. *Relationship between Birth Weight and Live or Still-birth.* Ninety-two per cent of the cases are live births whereas only 8% are still-births. Still-births are largely seen in the weight groups 2½-4½ lbs. and

above 8½ lbs. (Table 7). The high percentage of still-births in the weight group below 4½ lbs. shows that prematurity per se predisposes to still-births. Again the increase in stillbirth rate (22.1%) in babies over 8½ lbs. is probably explained by a higher incidence of breech and difficult labours in this group. Therefore the ideal weight of a baby can be said to be 5½-7½ lbs.

TABLE 7
Distribution of Weight for Live and Still-born Babies

Birth weight (lbs.)	Condition at birth				Total No.
	Live		Still		
	No.	%	No.	%	
2½-3½	21	55.1	17	44.9	38
3½-4½	36	76.8	11	23.2	47
4½-5½	161	92.5	13	7.5	174
5½-6½	304	96.0	13	4.0	317
6½-7½	226	94.8	13	5.2	239
7½-8½	65	98.5	1	1.5	66
8½+	14	77.9	4	22.1	18
Total	827	92.0	72	8.0	899

6. *Distribution of Birth Weight for Normal and Abnormal Type of Labours.* Out of the total 899 cases, 788 (87.6%) are normal and the remaining 111 (12.4%) are abnormal. Abnormal deliveries are mostly seen in the weight groups 2½-4½ lbs. and above 8½ lbs. Incidence of stillbirths and abnormal deliveries are noticed in the same weight groups. This probably explains the fact that 33.3% of the abnormal deliveries have resulted in stillbirths (Table 8).

lence of stillbirths and abnormal labours in the weight group 2½-4½ lbs. and above 8½ lbs. On further analysis of this data, to study the relationship between stillbirths and type of labour, it is seen that in the weight groups 2½-3½ lbs. prematurity per se is responsible for stillbirths even though the labour is normal. In the weight group 3½-4½ lbs., breech accounts for 53.3% of stillbirths. All the three abnormal deliveries in the

TABLE 8
Distribution of Birth Weight by Type of Labour

Birth weight (lbs.)	Type of labour				Total No.
	Normal		Abnormal		
	No.	%	No.	%	
2½-3½	19	50.0	19	50.0	38
3½-4½	32	68.1	15	31.9	47
4½-5½	152	87.4	22	12.6	174
5½-6½	290	91.5	27	8.5	317
6½-7½	219	91.6	20	8.4	239
7½-8½	61	92.4	5	7.6	66
8½+	15	83.4	3	16.6	18
Total	788	87.6	111	12.4	899

7. *Labour in Relation to Still-birth by Weight.* Analysis has shown that there is a high preva-

lence of stillbirths in the weight group above 8½ lbs. have resulted in stillbirth, breech accounting for two and forceps for one.

TABLE 9
Type of Abnormal Deliveries for Live and Still-births in relation
to Birth Weight

Birth weight in lbs.	Abnormal deliveries splitted into different categories																				
	Breech		Forceps		Twins		Twins with breach		Caesarean		Face presentation		Craniotomy		Hand prolapse		Total abnorms		Normal deliveries		
	L	S	L	S	L	S	L	S	L	S	L	S	L	S	L	S	L	S	L	S	
2½-3½	3	4	—	—	7	—	—	3	1	—	—	—	—	—	—	—	—	13	6	8	11
3½-4½	4	7	—	—	2	—	1	1	—	—	—	—	—	—	—	—	—	7	8	29	3
4½-5½	10	3	—	—	3	—	1	—	1	—	—	—	—	—	—	—	—	16	6	145	7
5½-6½	8	4	4	2	1	—	1	—	4	—	1	—	—	—	—	—	—	19	8	285	5
6½-7½	5	4	4	5	1	—	—	—	1	—	1	—	—	—	—	—	—	13	7	213	6
7½-8½	1	1	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	4	1	61	—
8½+	—	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	14	1
Total	31	25	11	3	14	—	—	6	2	7	—	3	2	—	5	—	2	72	39	755	33

L: Livebirth

S: Stillbirth

In case of twins each labour gives rise to two births. Both births are considered separately for the purpose of study.

Discussion

It has been observed that the birth weight of the newborn infant increases with the increase in maternal age. The infants in the higher age groups are heavier than the infants in the younger age groups by 0.58 lbs. Similar inferences were drawn by Tampan and Sundaram (1956) showing that infants of higher maternal age groups are heavier by 0.43 lbs. only. They further noticed that the birth weight of infants born in age group 28 years and over, in primiparae, showed a tendency to be heavier than the younger age group. The later findings are not in agreement with those of the present study, as in primipara there is no systematic increase in birth weight with the increase in maternal age. This relationship, however, holds good in multiparae (second and third parity). When the average weights of the first para and second and third paras are compared in respect to age groups, one can find that the weight in the second and third parity are higher than the weights in the first para. This shows that with the increase in parity the weight increases irrespective of age. Mukherjee and Biswas had thought that with the advancing age of the mother, the effect of parity on birth weights seemed to be negligible when the analysis is restricted to the first three parities only. These conclusions are again not confirmed by the present series.

On studying the relationship of birth weight with parity, Karn and Penrose have found that for high parities (eight and over) the mean weight of infants was almost 1 lb. more than the mean of the first-born

children. Tampan and Sundaram (1956) found that the mean weights of infants with 276 days of gestation period in the higher parity groups (five and over) was 0.8 lb. more than the mean weight of children in primipara. From the present study it is noticed that 5.87 lbs. is the average weight for the first para which steadily increases up to the third para and then there is an irregular increase up to the parity ten and over, giving the weight 6.68 lbs. This confirms the findings of Karn and Penrose, that infants born in higher parity groups have a general tendency to be heavier.

It is a well-known fact that the average weight of the new-born males is higher than that of females. Tilak (1956) mentioned that the average weight of males at birth in his survey was 5 lbs. 14.9 ozs., the female infant was found on the average to be less by 5.1 ozs. Tampan and Sundaram (1956) found that the average weight of the male baby at birth was 6.54 lbs., thus showing the difference of 0.05 lb., which was not significant. Bhonsale (1956) noticed no difference in weight in male and female infants in six and seven pound groups. Mukherjee and Biswas (1959) found that the average weight at birth for males was 6.01 lbs. and for females 5.91 lbs., thus showing the difference of 0.1 lb. The present analysis shows similar results. The average birth weight for males is 6.17 lb. whereas for females it is 5.93 lbs. On the average, the male babies are heavier by 0.24 lb. at the time of birth. This is proved to be statistically significant.

It is found that the proportion of

live births to stillbirths is in the ratio 11.5:1. Stillbirths are prevalent in the weight groups $2\frac{1}{2}$ - $4\frac{1}{2}$ and above $8\frac{1}{2}$ lbs.

A further analysis has been carried out to find the relationship between birth weight and the type of labour. In 12.4% of the total cases the labour was abnormal. This high figure is due to the fact that the lower weight groups are loaded with breech deliveries due to high incidence of prematurity. The other significant reason is that all suspected abnormal confinements are referred from the different maternal and child health centres to hospital for treatment. With the increase in weight the proportions of abnormal labour decrease, but for the weight group above $8\frac{1}{2}$ lbs. High percentages of the abnormal labours therefore refer to the weight groups below $4\frac{1}{2}$ lbs. and $8\frac{1}{2}$ lbs. and over. Similar results found in stillbirths shows that 33.3% of stillbirths are the result of abnormal labours and that 57.6% of the abnormal labours are due to breech.

To find out the cause of stillbirths, a detailed analysis has been worked out in relation to type of labour. In the weight groups $2\frac{1}{2}$ - $3\frac{1}{2}$ lbs. stillbirths are mainly seen associated with normal labour whereas in the groups $3\frac{1}{2}$ - $4\frac{1}{2}$ lbs. and above $8\frac{1}{2}$ lbs. breech presents higher mortality than vertex presentation.

Summary

1. Birth weight distribution shows that 81.0% of the deliveries are concentrated in the weight range $4\frac{1}{2}$ - $7\frac{1}{2}$ lbs.

2. Birth weight increases with the increase in maternal age. Aver-

age birth weight 5.80 lbs. in the age group 15-19 increases to 6.38 lbs. in the age group 40 and above, increase in weight being 0.58 lb.

3. Increase in birth weight with maternal age is regular and smooth in case of multipara (2nd and 3rd parity) but fails to do the same in case of primipara.

4. With the increase in parity birth weight also increases. Increase in weight is systematic for the first three paras and then there is an irregular increase. Average birth weight 5.87 lbs. for the first para increased to 6.68 lbs. for the parity group ten and over. Average weight for all births is 6.05 lbs.

5. In general, male babies are heavier at birth than females. Average birth weight for males is 6.17 lbs. and females is 5.93 lbs.

6. Stillbirths are generally seen in the weight groups $2\frac{1}{2}$ - $4\frac{1}{2}$ lbs. and above $8\frac{1}{2}$ lbs. The causes for stillbirths are, however, totally different in the two groups, being prematurity in the former, breech and difficult labour in the latter.

7. Approximately 12.4% of the births are abnormal. These are most commonly seen to occur in the weight groups $2\frac{1}{2}$ - $4\frac{1}{2}$ lbs. and above $8\frac{1}{2}$ lbs.

8. Nearly 33.3% of the abnormal deliveries result in stillbirths.

9. In the weight group $2\frac{1}{2}$ - $3\frac{1}{2}$ lbs. prematurity per se predisposes to stillbirths whereas in the groups $3\frac{1}{2}$ - $4\frac{1}{2}$ lbs. and above $8\frac{1}{2}$ lbs. breech is the main cause of stillbirths.

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