

## A Secular Trend of Birth Weight in a Select urban Maternity Home, Bengaluru, Karnataka, India

### Authors:

**Dr. Renuka Prithviraj, Dr. Shweta D Hiremath, Dr Maheshwaran R, Dr. Lavanya R**

*Professor, Head of the Department, Department of Community Medicine Sapthagiri Institute of Medical Sciences and Research Centre, Banaglore, India*

*Assistant Professor, Department of community medicine The Oxford Medical College and research Centre, Bangalore, India*

*Professor, Community Medicine Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore, India*

*Statistician Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore, India*

### Corresponding Author:

Dr. Shweta D Hiremath

#401, 4<sup>th</sup> floor, Teaching staff quarters, The Oxford Medical College Hospital & Research Centre, Yadavanahalli, Attibele hobli, jigala, Bangalore Pincode:562107

Article Received: 10-April-2023, Revised: 01-May-2023, Accepted: 18-May-2023

### **ABSTRACT:**

**Background:** Birth weight is a direct estimate of the maturity of new born and also an important indicator of maternal and child health. Birth weight being an important output indicator for evaluation of the RCH programme, it was decided to undertake the present study. **Aims & Objectives:** 1) To estimate the mean birth weight among babies delivered in an urban family welfare centre. 2) To determine the various socio-demographic factors associated with birth weight among the study population. **Methodology:** A retrospective study using secondary data in an urban family welfare centre in Bangalore urban district was conducted. Study group comprised of 2136 deliveries that were recorded in the parturition register between June 2015- June 2020. Babies with congenital anomalies and multiple pregnancies were excluded from the study. The socio demographic details and factors affecting birth weight were collected. Descriptive and inferential statistics was used for analysis. **Results:** The estimated mean birthweight in this study was  $2.96 \pm 0.48$  kgs (male :  $2.99 \pm 0.49$  kgs , female :  $2.92 \pm 0.47$ ) with increase of 150 gms through six years period. Also gender wise significant increase was noted with 160gms increase in males and 140gms increase in females. Birth weight was significantly high among term newborns and those belonging to APL family. A significant improvement in birth weight was observed with increase in maternal haemoglobin. **Conclusions:** The mean birthweight was  $2.96 \pm 0.48$  kgs. birth weight has remained stagnant during the six year period in spite of small increase of 150 gms.

**Keywords:** Birth weight, Bangalore Urban , Term newborns, haemoglobin.

### **INTRODUCTION:**

Present scenario shows an increase in trend of mean birth weight throughout the world. Birth weight not only is an important indicator of child's health and a direct estimate of the maturity of new-born but also reflects the health of mother. In India, the average birth weight is believed to be 2.7-3 kg.(1)Literature estimates this as 3 kgs(2) and another at 2.7-2.9 kgs(3).With non- availability of national data for direct estimates of mean birth weight, indirect estimates can be derived through National health Family Survey.In National health Family Survey- 4 (2015-16), data on birthweight collected based on mother's report/ written record showed that babies born with more than 2.5 kgs was 81.8% and 86.2 % mothers perceived their babies as large at birth. These figures were 82.8 % and 90% respectively for Karnataka(4). With immense progress made by Reproductive and child health programme,

Maternal Child Tracking System and supplementary nutritional programmes, increase in the mean birth weight should be an expected outcome. With limited research available on the current mean birth weight in our state and birth weight being an important output indicator for evaluation of the RCH programme, it was decided to undertake the present study. Also, such studies are needed to understand the secular trend of growth in population Hence, this study was planned with the objective to estimate the mean birth weight among babies delivered in select Urban family welfare center, Bengaluru and to determine socio-demographic factors associated with it.

### **METHODOLOGY:**

**Study design and setting:** A retrospective study was conducted using secondary data, in a maternity hospital attached to Mallasandraurban family welfare

centre in Bangalore North. This maternity home caters to the economically backward section of society catering to a slum and lower middle class population of 41625. It is staffed by one Medical Officer and 2 Nursing Attendants who are working there for a period of more than five years. This hospital provides 24/7 normal deliveries facilities.

**Questionnaire Design:** A questionnaire was designed for the purpose, considering the variables recorded in parturition register. The study group comprised of 2136 deliveries that were recorded in the parturition register between June 2015- June 2020. Birth weight was recorded in Kilograms.

**Data collection:** The data with respect to birth weight, gender of the baby, maternal age, religion, education, socio-economic status, parity, gestational age and maternal haemoglobin as recorded in the parturition register, were collected. The same baby weighing machine was used during the study period and one of the two staff were in charge of recording the weight, thereby reducing observer bias. It was also standardized to rule out instrument error.

**Inclusion criteria:** All normal deliveries conducted during June 2015- June 2020.

**Exclusion criteria:** Babies with congenital anomalies and Multiple pregnancies were excluded from the study.

**Outcome variable:** change in trend of mean birth weight

**Explanatory variable:** Maternal age, religion, education, socio economic status, parity, gestational age, haemoglobin level.

Ethical clearance was sought from the Institutional Ethical Committee before commencing the study.

**Data management and statistical analysis:** Data was entered in excel, cleaned, compiled and was analysed using SPSS version 20.0.

The results are presented as frequency, mean & standard deviation. Independent “ t “ test between birth weight, socio-economic status, sex of the baby, obstetric score & parity, one way ANOVA between birth weight, age of the mother, religion, education & haemoglobin was used. Regression equation was used to interpret the trend.

**RESULTS:**

This study was carried out in an urban maternity hospital catering to economically backward population. Over the period of six years, a total of 2136 mothers and their new-borns were included as study subjects.

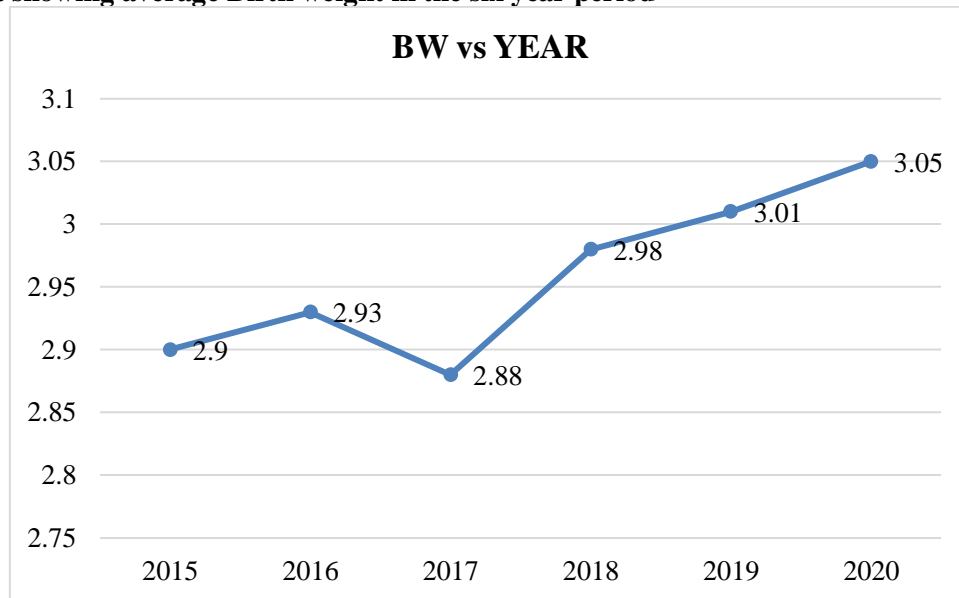
**Trend of birth weight:**

The estimated mean birth weight was found to be 2.96 ± 0.48 kgs with increase of 150 gms through six years period (Table1, Fig 1).

**Table 1: Distribution of birth weight in the six year period**

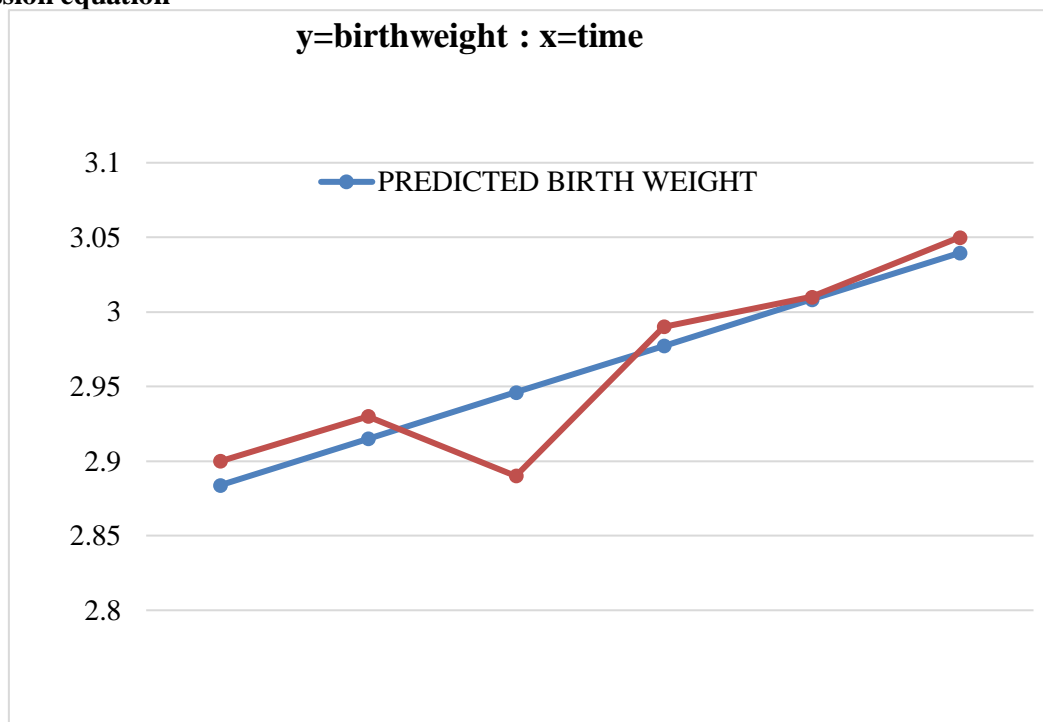
Year	Mean birth weight (both sexes)	Mean birth weight (male)	Mean birth weight (female)	No. of deliveries	p-value
2015	2.90 ± 0.44	2.92 ± 0.44	2.88 ± 0.44	390	0.001
2016	2.93 ± 0.44	2.98 ± 0.46	2.88 ± 0.43	382	
2017	2.88 ± 0.48	2.90 ± 0.50	2.87 ± 0.47	222	
2018	2.98 ± 0.45	2.97 ± 0.49	3.00 ± 0.41	325	
2019	3.01 ± 0.50	3.07 ± 0.50	2.95 ± 0.51	411	
2020	3.05 ± 0.52	3.08 ± 0.52	3.02 ± 0.52	406	
Overall	2.96 ± 0.48	2.99 ± 0.49	2.92 ± 0.47	2136	

**Fig 1: Line chart showing average Birth weight in the six year period**



**\*BW: Birthweight**

**Fig 2: Regression equation**



With the Reproductive and child health care programme intensively focussing on effective antenatal care and improvement of birth weight, the expectation is that mean birth weight will increase over the years. The trend of birth weight was studied using weighted regression analysis as numbers of births vary each year. With “year” on X scale and “average Birth weight” on Y scale, linear regression was used as shown in **Figure 2**. The analysis is as follows:

**Table 2: Bivariate Regression model for trend of Birth weight Coefficients**

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	R	R Square
	B	Std. Error	Beta				
1 (Constant)	-42.070	11.738	.083	-3.584	.000	.083 <sup>a</sup>	.0068
YEAR	.022	.006		3.836	.000		

**a. Dependent Variable: BW**

Model	Sum of squares	Df	Mean square	F	P value
Regression	3.445	1	3.445	14.719	.0001
Residual	499.470	2134	.234		
Total	502.915	2135			

**a. Dependent variable: BW**

**b. Predictors (constant); year**

In this study, value of R<sup>2</sup>(squared multiple correlation) was poor(Table 2).In the six year duration(2015-2020), only 0.7% variance of birth weight was observed yearly.And F statistic was also low indicating low variance.Hence, it is concluded that birth weight has remained stagnant during the six year period in spite of a small increase of 150 gms.

**Determinants of birth weight:**

**Sex:**

Mean birth weight of male and female babies was 2.99 ±0.49 kgs and 2.92±0.47 kgs respectively (Table 1). Females were lighter by 73 g and difference was significant (P = 0.0001). A gender wise significant increase (P value:0.003) using independent T test also was noted with 160 grams increase in males and 140 grams increase in females respectively during study period.

**Gestational age:**

As term deliveries have an important role in determining average birth weight, our study showed majority (98.6%) of the babies to be full term with their mean birth weight 2.97±0.47 kgs and only 1.4% of our study sample was pre-term with mean birth

weight of 2.00±0.59kgs. As known, full term babies were significantly heavier by 970g (Table 3) than pre-term babies (p = 0.0001)

**Parity:**

Mean birth weight differed also by obstetric characteristics. It increased with increase in parity. Babies born to multi para were significantly heavier by 170 g (p = 0.001) than those born to primi para (Table 3).

**Haemoglobin level:**

A significant improvement with increase in haemoglobin also was observed. Mean birth weight of babies born to mothers with Hb< 7gm% was 2.44±0.61kgs and for those with >10gm% Hb, it was 3.00±0.47kgs.

**Socio economic status:**

Mean birth weight of babies who belong to BPL was 2.81±0.48 and of those belonging to APL was 2.98±0.48kgs. Hence, babies belonging to BPL class were lighter by 171gms than those belonging to APL class and the difference was found to be statistically significant. There was no significant influence of maternal age, education and religion on birth weight.

**Table 3: Determinants of birth weight in the study**

Determinants	Frequency	Mean birth weight	P
<b>Maternal Age</b>			
<20	167	2.81	0.13
20-35	1946	2.96	
>35	23	2.91	
<b>Religion</b>			

Hindu	1899	2.95	0.614
Muslim	207	2.99	
Others	30	2.96	
<b>Education</b>			
Illiterate	311	2.92	0.145
Primary	1302	2.96	
Up to 10 <sup>th</sup>	396	2.99	
Pre university/ Diploma	117	2.88	
Graduate and above	10	2.99	
<b>Socio-economic status</b>			
APL	799	2.983	0.003
BPL	1337	2.812	
<b>Parity</b>			
Primi para	820	2.818	0.001
Multi para	1316	2.988	
<b>Gestational age</b>			
Term	2106	2.970	0.0001
Pre-term	30	2.000	
<b>Hb%</b>			
<7gm%	50	2.441	0.003
7-10gm%	927	2.930	
>10gm%	1159	3.000	

### **DISCUSSION:**

In the rarity of systematic studies using standardized methods, secondary data from hospitals can be used to monitor the birth weight trends in India. But it would be difficult to use such studies for comparison due to the issue of standardization of weighing scales and method used in recording birth weight(5). The present study was carried out at a maternity hospital, which caters to the needs of urban poor. The average birthweight of 2136 babies was estimated over a six year period and was related to various maternal and new born conditions.

### **Trend of birth weight :**

**Table 4: Review of mean Birth weight in other studies**

Author	Area and year	Sample size	duration of study (in years)	Mean birth weight (in gms)	Gender and increase in mean birth weight
Ashtekar et al(5)	Rural 1989- 2007	2586	19	2710	No difference
Bangal VB et al(6)	Rural 2008- 2017	45,120	10	2669	Male by 176 grams and female 151grams
Krishnan DK et al(1)	Coastal 2012- 2014	3882	2	3070	-
Tayade SA	Rural	43,114	10	2572	147 gram in male and 114 grams in

et al(7)	2007-2020				female.
Rajeswari et al(8)	Urban 2000-2013	19,223	14	2930	130 gram in male and 110 grams in female.
Current study	Urban 2015-2020	2136	6	2960	160 grams in males and 140 grams in females

The mean birth weight in our study from Bengaluru was found to be  $2.96 \pm 0.48$  kgs. Another study in 2017 by Christopher on 2789 singleton live births in Bengaluru found a mean birth weight of  $2.87 \pm 0.49$  kg(9). In 1994, Prasad et al's study in Karnataka found it to be  $2.82 \pm 0.42$  kg(10). National Family Health Survey 3 data from 2005 – 2006 analysed by Kader *et al*, in a study population of 20,946 showed the Mean Birth weight as  $2844 \pm 683$  grams(11). On examining the trend in our study, birth weight has remained stagnant during the study period. Same was observed by Ashtekaret al(5) and Krishnan DK et al(1). On the contrary, Tayade SA et al<sup>7</sup>, Bangal VB et al<sup>6</sup> and Rajeswari et al(8) (Table 4) showed a significant gradual increase in mean birth weight. A large scale study from South India, dealing with nearly 20,000 deliveries, covering 15 years by [Kumar et al\(12\)](#), to bring about reference standards for birth weight, found the mean ( $\pm$  SD) birthweight for the year 1996 as  $2846 (\pm 562)$  g as compared to year 2010 (15 years later) which was  $2907 (\pm 571)$  g, there was only a difference of 61 grams in the mean birthweights over one and half decades.

#### **Mean birth weight and gender of the baby:**

Male babies were found to be 73 gms heavier than female babies. A study done by Kumar et al (2013) found male babies of first born mothers to be 45 grams heavier than female babies(12). The same was 116 grams for later born babies. Same was observed by Prasad et al(10), Bangal VB et al(6), Tayade SA et al(7) and Rajeswari et al(8) (Table 4).

#### **Mean birth weight and parity, Gestational age:**

In the present study, an increase in mean birth weight with an increase in parity was observed. An significant increase of 170 gms from primipara mothers to multipara mothers was seen (Table 3). In Krishnan DK et al's study in coastal Karnataka, an increase of 160gms from primi mothers to grand multipara

mothers was observed(1). Prasad et al (1994) also made similar observations(10). In line with observations made by Kumar et al(12) and Prasad et al(10) with respect to birth weight of full term babies and pre term babies, present study also showed that full term babies were significantly heavier by 970g than pre-term babies.

#### **Mean birth weight with respect to haemoglobin concentration of mother:**

In this study, association between maternal haemoglobin concentration and mean birth weight was found to be statistically significant. Children born to mothers whose haemoglobin concentration was  $>10\text{gm}\%$  were significantly heavier by 559gms than those with maternal  $\text{Hb} < 7\text{gm}\%$ . Similar findings were observed by Tayade SA et al(7). Also, there was no significant association between mean birth weight and maternal age, education and religion. This might be due to the fact that, the study centre was catering to urban poor with dominating age group being  $< 35\text{yrs}$  and religion hindu and very few mothers were educated beyond tenth standard. Similar observation was made by Tayade SA et al(7), Krishnan DK et al(1), Srikrishna(13) and Joshi(14). This is in contrast to the findings of Kadam et al(15) (children born to elderly mothers were significantly heavier by 200 g) and Mathai et al(16) who found that that maternal age and education was significantly associated with birth weight.

#### **CONCLUSION:**

There is varied opinion by different studies over the increase in trend of birth weight. The studies that have been positive about the trend have derived that the increase is only gradual. In this scenario, multicentric long term studies can give a correct inference. On the other hand, over the years, perception about care of girl child, care during pregnancy is improving. There is better utilization of quality MCH care which is readily

accessible to the beneficiaries. The government's mother and child tracking system and various social security schemes also ensures adequate Ante-natal and Post-natal care besides encouraging institutional deliveries. These factors bear a direct or indirect effect on birth weight.

**Acknowledgement:**

We would like to thank the Medical officer and nursing staff of Mallasandra Maternity home, Bengaluru.

**REFERENCES:**

1. Krishnan KD, Avabratha KS, D'Souza AJ. Estimation of average birth weight in term newborns: a hospital-based study in coastal Karnataka. *Int J ContempPediatr* 2014; 1:156-9.
2. Ghai O, Gupta P, Paul V. Ghai essential pediatrics. 8<sup>th</sup>ed. New Dehli: Mehta Publishers; 2001: 19
3. Park K. Park's textbook of PREVENTIVE AND SOCIAL MEDICINE. 24<sup>th</sup> ed. Jabalpur: M/s BanarsidasBhanot Publishers; 2017: 578
4. International Institute for Population Sciences. National Family Health Survey, India. 2015-16. NFHS-4, Vol. I. Mumbai: IIPS; 2017: 252
5. Ashtekar SV, Kulkarni MB, Sadavarte VS, Ashtekar RS. Analysis of birth weights of a rural hospital. *Indian J Community Med* 2010; 35: 252-5
6. Bangal VB et al. Changing pattern of birth weight over a decade in rural India. *Int J ReprodContraceptObstet Gynecol.* 2017 Oct; 6(10): 4625-4630
7. Surekha A. Tayade, Neha Gangane, Jaya Kore, Noopur Singh, Shalaka Harne. Newborn birth weight: a trend towards positive paradigm shift in rural central India. *Int J ReprodContraceptObstet Gynecol.* 2018 Mar; 7(3): 1024-1028
8. Dr. R. Rajeswari, Dr. Binayakdebburman, Dr. Jasmine S Sundar, Dr. K. Ramya. Trends in birth weight and the prevalence of low birth weight in a tertiary care hospital, Chennai. *IOSR Journal of Dental and Medical Sciences.* Volume 14, Issue 8 Ver. IV (Aug. 2015), PP 07-13
9. Christopher GL (2018) The Effect of Biological Factors on Birth Weight and Gestation in South Indian New-Borns. *J PediatrNeurol Med* 3: 130. doi: 10.4172/2472-100X.100013
10. Prasad KN, Rao RS, Sujatha A. Birth weight pattern in Karnataka. *Indian Pediatr.* 1994; 31(7): 836-9.
11. Kader M, Perera NK. Socio-economic and nutritional determinants of low birth weight in India. *North Am J Med Sci* 2014; 6: 302-8
12. Kumar VS, Jeyaseelan L, Sebastian T, Regi A, Mathew J, Jose R. New birth weight reference standards customised to birth order and sex of babies from South India. *BMC Pregnancy Childbirth.* 2013; 13: 38.

13. Srikrishna SR, Stephen C. Birth weights in a Bangalore hospital: is the city women in the phase of a nutrition transition? *Health PopulPerspect Issues*. 2003;26 (2):74-86.
14. Joshi SM, Likhar SK, Athavale AV, Shukla US. Factors affecting birth weight: a study in a secondary level hospital in gas affected area of Bhopal. *Natl J Community Med*. 2013;4(4):570-3.
15. Kadam YR, Dhoble RV, Gore AD. A study of birth weight of full term neonates and its' determinants. *Med J DY PatilUniv*2014; 7:20-4.
16. Mathai M, Jacob S, Karthikeyan NG. Birthweight standards for South Indian babies. *Indian Pediatr*. 1996;33 (3):203-9.

**How to Cite:**

Dr. Renuka Prithviraj, Dr. Shweta D Hiremath, Dr. Maheshwaran R, Dr. Lavanya R. (2023). A Secular Trend of Birth Weight in a Select urban Maternity Home, Bengaluru, Karnataka, India. *International Journal of Medical Science in Clinical Research and Review*, 6(03), Page: 564–571. Retrieved from <https://ijmscrr.in/index.php/ijmscrr/article/view/542>  
<http://doi.org/10.5281/zenodo.7947151>

© Dr. Renuka Prithviraj, Dr. Shweta D Hiremath, Dr. Maheshwaran R, Dr. Lavanya R. (2023). Originally Published in the Journal of International Journal of Medical Science in Clinical Research and Review (<https://ijmscrr.in>), 18.May.2023. This is an open-access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>)