



## Body Mass Index of pregnant women as an epidemiological determinant of Birth weight of a new born child - A Longitudinal study in a tertiary care hospital

## KEYWORDS

Body Mass Index, Primigravida, Birth weight, newborn.

**Dr. Nandanwar Deepika N**

Resident, Dept of Community medicine, Seth G.S. Medical college and KEM Hospital, Parel, Mumbai-400012, India.

**Dr. Shinde Ratendra R**

Prof and Head, Dept of Community medicine, Seth G.S. Medical college and KEM Hospital, Parel, Mumbai-400012, India.

**Dr. Sadawarte Mandar K**

Resident, Dept of Community medicine, Seth G.S. Medical College and KEM Hospital, Parel, Mumbai-400012, India.

**ABSTRACT**

*The longitudinal study of 1 year 6 months assessed the socio demographic profile of 100 women in ante-natal clinic and identified epidemiological factors associated with birth weight of the newborn. The mother's BMI was measured in a predetermined protocol during the course of pregnancy till delivery and correlation of birth weight of the newborn with mother's BMI was studied. This tool of BMI was used to predict birth weight in 60 women. Positive Correlation between BMI and Birth weight of the newborn was found in the study group and birth weight of newborns could be predicted using mother's BMI.*

**Introduction:**

In any community mother and child are always considered as one unit- be it biologically, socially or culturally. Nutrient intake and weight gain during pregnancy are the two main modifiable factors influencing maternal and infant outcomes. <sup>1</sup>

BMI of mother is a simple and convenient tool to estimate the birth weight. This is expected to evolve as an indigenous epidemiological tool which can be replicated even in rural areas because of the ease of calculation and can help in improving the pregnancy outcome.

The present study was planned to assess the correlation of BMI with birth weight of the child and to predict the weight of a newborn if mother's BMI is known.

**Material and methods:**

A longitudinal study of one year six months was conducted on 100 Primi gravida pregnant women in the Ante-natal OPD and Post natal ward of a tertiary care hospital and teaching institute after obtaining ethical clearance. High risk and Multi gravida women were excluded. Their BMI was calculated at three ANC visits once in each trimester by using the formula, weight/height in metres<sup>2</sup> and birth weight of the infant was recorded from the post natal ward. Correlation between BMI and birth weight was computed. Data was collected using a structured questionnaire after taking an informed written consent. Data was entered in Microsoft-Excel 2007 Software and analyzed using SPSS Software version 16.0. Chi square test was used to estimate the association between socio-demographic parameters and neonatal birth weight. Correlation coefficient was computed for finding association between BMI of the women and birth weight of the babies.

**Results:**

Majority of the study subjects belonged to the age group of 21-25 years. Maximum women were Hindu. 52% women were educated upto secondary level and so was the case

with most of the husbands with 60% of them being educated upto secondary level. Majority belonged to Nuclear families. The average family size was 3.73. (Table 1)

The average total family income per month was Rs.10823.5. The average per capita income of the family was Rs. 3750.51. Majority of the respondents belonged to upper lower socio-economic class as per modified Kuppuswamy classification. (Table 2)

More than half women were in the age group of 18 to 22 years at the time of marriage. The age difference between majority of the respondents and their husbands was one to five years. (Table 3)

Majority of women consumed a mixed diet. Average calorie intake was 1855.4 Kcal and average protein intake was 68.02 grams. (Table 4)

Maximum women had no history of hereditary obesity and 15% women had history of addiction. All the women participated in the study had received Iron & Folic Acid tablets and Tetanus Toxoid injections. (Table 5)

The Pearson's co relation coefficient of BMI with Birth weight was found to be 0.700, 0.712 and 0.69 in 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> trimester respectively. Mean birth weight of the babies of the study subjects was 2.55 kg and that of comparable group was 2.64. (Table 6 and 7)

The epidemiological factors that were found to be significantly associated with the birth weight of the newborn were Mother's age at marriage, calorie intake, protein intake and history of addiction in women. (Table 8)

The percentage of predictability was found to be 86.25%. (Table 9)

**Discussion:**

The findings of this study corroborated with the studies by

Joshi S et al <sup>2</sup> & Shrivastava S and Bobhate P <sup>3</sup> in terms of sample size, age group and socio demographic parameters.

Study by Shah U P et al <sup>4</sup> and Agarwal G et al <sup>5</sup> also revealed the same findings as of this study pertaining to maternal occupation and addiction respectively.

#### Conclusion:

It was concluded from the study that age at marriage, diet of the pregnant women and addictions have significant effect on the birth weight of the newborn baby. Significant positive correlation was found between BMI of mother and birth weight of the babies.

#### Limitations:

This study needs to be replicated in various settings for the general application of the study findings in all the settings.

Time and area constraint may be a limitation. Pregnant women registered in only during a specified time period were selected for the study purpose.

All women (eg. High risk Pregnancy) were not included in the study. This may present as a limitation in generalizing the results of this study to the whole population.

#### Recommendations:

- 1) There is a need to improve the nutritional health of the woman with low pre pregnancy BMI in order to confirm that they do not enter pregnancy in a nutritionally disadvantaged state. Proper diet and nutrition counseling to the pregnant women should be given.
- 2) Targeted interventions may be required to improve maternal and child health. Mother's occupation as laborer should be included as an enlistment in high risk pregnancy.
- 3) Age factor in pregnancy significantly influences birth weight of the child and hence health awareness for marriage after 18 years of age should continue.
- 4) Female literacy is a very important aspect which needs to be focused upon more. Better female literacy leads to better ANC visits and better antenatal care and compliance. Also good parenting skills can be learnt which in turn leads to good birth weight of the progeny and their better overall care.
- 5) Counseling to pregnant women should cover all the aspects of antenatal care viz. proper diet and nutrition, proper rest and exercise, IFA tablets and TT injections, danger signs in pregnancy etc. this counseling should also be extended to her husband and female relatives especially mother in law. This will help in decreasing resistance to follow various healthy habits during pregnancy and avoid traditional but harmful practices.
- 6) History of tobacco or any other addiction should be included as an enlistment in high risk pregnancy and should be discouraged.
- 7) References to significance of BMI should be a part of orientation training of the grass root level workers like ASHAs, ANMs etc.

**Table 1: Socio demographic data: (n=100)**

Age	<=20	11
	21-25	55
	26-30	30
	>30	4
Religion	Hindu	69
	Muslim	14
	Buddhist	8
	Christian	6
	Others	3
Education of Women	Illiterate	7
	Primary	12
	Secondary	52
	Higher secondary	23
	Graduate and above	6
Education of Husband	Illiterate	2
	Primary	10
	Secondary	60
	Higher secondary	22
	Graduate and above	6
Occupation of Women	Housewives	84
	Unskilled	13
	Skilled	1
	Semi professional	2
	Professional	0
Occupation of Husband	Unemployed	0
	Unskilled	64
	Skilled	23
	Semi professional	13
	Professional	0
Type of family	Nuclear	42
	Extended nuclear	19
	Joint	34
	3 generation	5
Family size	2-4	68
	5-7	27
	8-10	5
	>10	0

**Table 2: Socio economic data: (n=100)**

Income of Women	Nil	84
	<=10000	15
	11000-20000	1
	21000-30000	0
Income of Husband	Nil	0
	<=10000	80
	11000-20000	17
	21000-30000	3
Total family income	Nil	0
	<=10000	65
	11000-20000	31
	21000-30000	4
	>30000	0
Per capita income	<3000	41
	3001-6000	46
	6001-9000	12
	>9000	1
Socioeconomic class	Upper	0
	Upper middle	6
	Lower middle	37
	Upper lower	57
	Lower	0
Colour of ration card	White	2
	Orange	88
	Yellow	6
	None	4

Table 3: Marital Information: (n=100)

Age at the time of marriage	<18	7	
	18-22	54	
	23-26	33	
	>26	6	
Number of years	Yrs of marriage	Yrs staying with husband	Age difference between husband and wife
<1	50	50	4
1-3	39	41	34
4-5	11	9	30
>5	0	0	32

Table 4: Dietary intake.

	Calorie intake	Protein intake
Average (n=100)	1855.4 Kcal	68.02 grams
Average deficit (n=88)	512.32 Kcal	11.86 grams
Average excess (n=12)	307.08 Kcal	3.83 grams

Table 5: Epidemiological factors present or absent: (n=100)

Factors	YES	NO	TOTAL
Aadhar Card	72	28	100
Ration Card	96	4	100
Daily exercise	29	71	100
Hereditary obesity	4	96	100
History of addictions	15	85	100
History of major disease	13	87	100
History of infertility	5	95	100
History of surgery on uterus	2	98	100
Use of contraceptives	54	46	100
IFA and TT injection	100	0	100

Table 9: Comparison of expected and actual birth weight within comparable group.(N=60)

BMI	RANGE OF BIRTH WEIGHT					
	LESS THAN 2.5 KG		2.5 TO 2.9 KG		MORE THAN 2.9 KG	
	EXPECTED	ACTUAL	EXPECTED	ACTUAL	EXPECTED	ACTUAL
<18 (N=26)	26	20	0	6	0	0
18-23 (N=21)	3	0	18	21	0	0
>23 (N=13)	0	0	9	8	4	5

Table 6: Correlation between Mother's BMI and Birth weight of newborn in each trimester.

Body Mass Index (BMI)	Pearson's coefficient (r)	Coefficient of determination (R <sup>2</sup> )
1 <sup>st</sup> Trimester	0.700	0.4905
2 <sup>nd</sup> Trimester	0.712	0.5078
3 <sup>rd</sup> Trimester	0.69	0.4825

Table 7: Distribution of the birth weights of the newborns in study and comparable group.

BIRTH WEIGHT CATEGORY	NUMBER OF BABIES IN STUDY GROUP (n=100)	NUMBER OF BABIES IN COMPARABLE GROUP (n=60)
LESS THAN 2.5 KG	43(43%)	29(48.33%)
2.5 TO 2.9 KG	52(52%)	18(30%)
MORE THAN 2.9 KG	5(5%)	13(21.67%)
TOTAL	100(100%)	60(100%)

Table 8: Significance of epidemiological factors in relation to birth weight of the newborn.

Factor	Chi square value	P value
Age	0.379	0.8274
Religion	1.387	0.4999
Education of women	0.6393	0.7004
Occupation of women	1.073	0.4504
PCI of family	1.925	0.3820
Age at marriage	5.71	0.01687
Calorie deficit	10.29	0.001347
Protein deficit	10.29	0.001347
History of Addiction	4.033	0.04463

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