

**THE STUDY OF ANEMIA IN GESTATIONAL DIABETES MELLITUS**Srinivasa V<sup>1</sup>, Nagaraja B. S<sup>2</sup>, G. Chandra Mohan<sup>3</sup>, Akila V<sup>4</sup>, Prakash Kikker Gowdaiah<sup>5</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT: AIMS AND OBJECTIVE:** To investigate possible association between Anemia and Gestational Diabetes Mellitus (GDM). **DESIGN, SETTING & PARTICIPANTS:** A cross sectional study comprising of 100 GDM patients attending as outpatients or In-patients at Vani Vilas hospital and Bowring & Lady Curzon hospital, BMC & RI, Bangalore. **MAIN MEASUREMENTS:** GDM patients either newly diagnosed or on follow up were selected and complete blood counts including the peripheral smear, blood sugar levels and HbA1c were done. **RESULTS:** Anemia was diagnosed in 6 patients (6%) who are considerably less compared to Non-GDM pregnancy (40-50%). Out of which only 1 patient's peripheral smear showed Microcytic hypochromic blood picture whereas rest showed Normocytic Normochromic picture. **CONCLUSION:** Our study suggests that incidence of Anemia especially Microcytic Hypochromic Anemia is considerably lower in GDM. These finding suggests that routine supplementation of Iron irrespective of Hemoglobin (Hb) levels should be reconsidered in risk group women.

**KEYWORDS:** Anemia, Gestational Diabetes Mellitus, Microcytic hypochromic Anemia, Serum Iron, Ferritin.

**INTRODUCTION:** GDM is a state of Glucose intolerance diagnosed during pregnancy and affects 1-14% pregnancy in different population. The incidence has been increasing in past 20 years.<sup>1,2</sup> GDM increases both short and long term complications in both mother and child. GDM increases risk of developing Type2 Diabetes in later life of both mother and child. High iron load and disorders of iron metabolism have been associated with an increased risk of diabetes Eg: Hemochromatosis patients develop diabetes in 30-60%.<sup>3,4</sup> Iron binding medication in such patients are shown to prevent diabetes.<sup>5</sup>

High Hb levels in pregnancy has been reported to be individual risk factor for GDM and low Hb levels and Anemia have shown to result in lowering the risk of GDM. Most such studies are from outside Indian country. Hence our study aims at investigating the possible association between Anemia and GDM in South Indian Women.

Aims and Objective:

- To investigate possible association between Anemia and Gestational Diabetes Mellitus (GDM).

**MATERIALS AND METHODS:****Study Design:**

- A total of 130 patients were screened for study out of which 100 were eligible for study. Demographic data, past obstetric history, detailed clinical examination including height, weight and BMI were taken. Blood sugars, HbA1c, complete blood counts including peripheral smear were estimated.

**Place of study:**

- The data for this study was collected from 100 GDM patients from out-patient and In-patient of Vani Vilas hospital and Bowring & Lady Curzon hospital, BMC & RI, Bangalore.

**Time period:**

- November 2012 to July 2013

**Inclusion criteria:**

- Either newly detected GDM patients or on follow up
- Between age group of 18-35years.

**Exclusion criteria:**

- Age>35years
- Renal impairment
- Thyroid dysfunction
- Overt diabetes either type 1 or 2.
- Statistical methods: Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean  $\pm$  SD (Min-Max) and results on categorical measurements are presented in number (%). Significance is assessed at 5 % level of significance.
- Students t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.
- Statistical software: The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, Med Calc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

**RESULTS:** A total of 100 GDM patients were investigated. The mean age of the patient was 26.09 $\pm$ 3.4years. The overall prevalence of Anemia was 7.0%. The mean HbA1c was 7.80 $\pm$ 0.63. Mean haemoglobin was 12.01 $\pm$ 1.29 g/dl and it was positively associated (r=0.75) with impaired glucose metabolism. The mean blood glucose at 0hrs and 2hrs after was 158.73  $\pm$  35.97 and 274.40  $\pm$  67.04 mg/dl respectively. Haemoglobin level was highly correlating and statistically significant with prevalence of GDM (P<0.05).

Our study found that the incidence of anemia in GDM patients was considerably lower than the incidence in normal pregnancy. Those patients who had anemia, their peripheral smear examination showed majority to be Normocytic Normochromic Anemia. Other observations in our study revealed that younger age was associated with Anemia; BMI was not significantly associated with GDM.

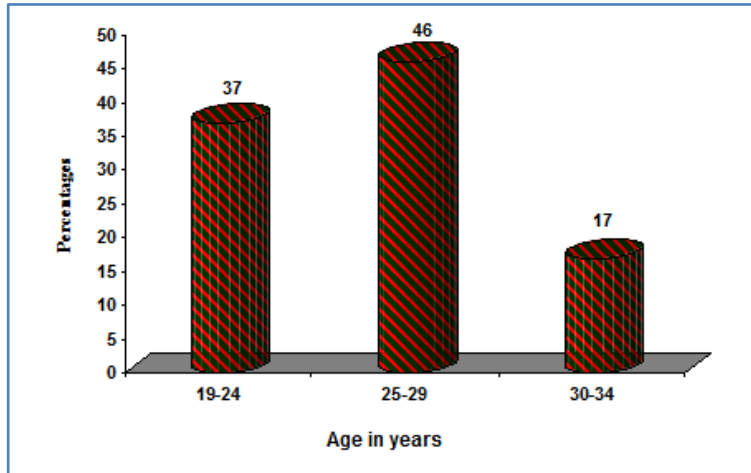
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### Statistical Analysis:

Age in years	No. of patients	%
19-24	37	37.0
25-29	46	46.0
30-34	17	17.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

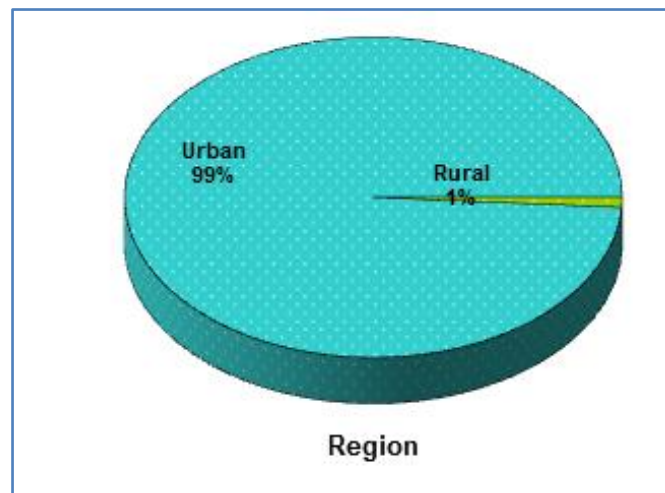
**Table 1: Age distribution of patients studied**

Mean  $\pm$  SD: 26.09 $\pm$ 3.38



Region	No. of patients	%
Rural	1	1.0
Urban	99	99.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

**Table 2: Region distribution of patients studied**

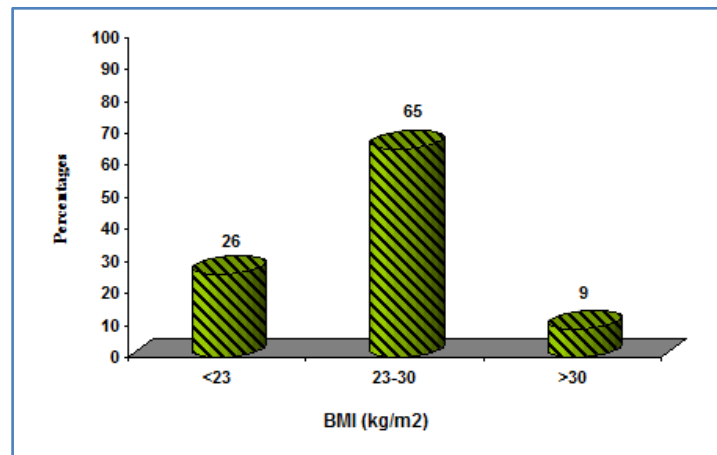


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BMI (kg/m <sup>2</sup> )	No. of patients	%
<23	26	26.0
23-30	65	65.0
>30	9	9.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

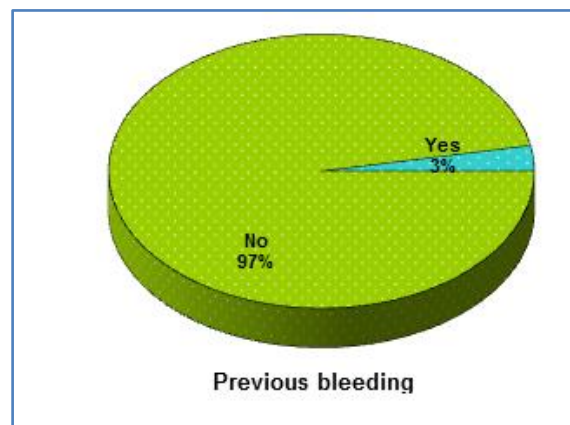
**Table 3: BMI (kg/m<sup>2</sup>) distribution of patients studied**

Mean  $\pm$  SD: 26.23 $\pm$ 3.77



Previous bleeding	No. of patients	%
No	97	97.0
Yes	3	3.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

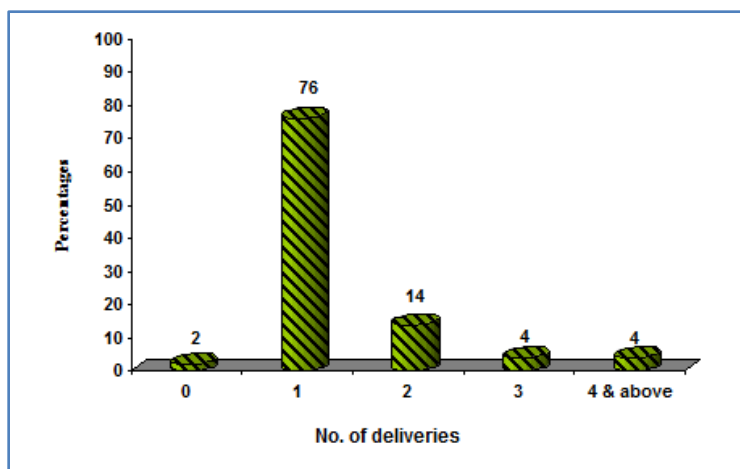
**Table 4: Previous bleeding of patients studied**



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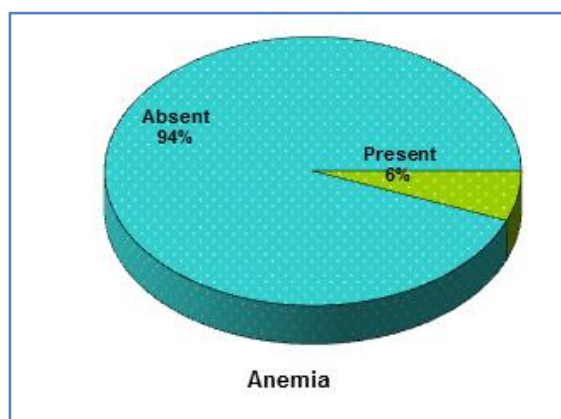
No. of deliveries	No. of patients	%
0	2	2.0
1	76	76.0
2	14	14.0
3	4	4.0
4 & above	4	4.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

**Table 5: No. of deliveries**



Anemia	No. of patients	%
Absent	94	94.0
Present	6	6.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

**Table 6: Incidence of anemia in patients studied**

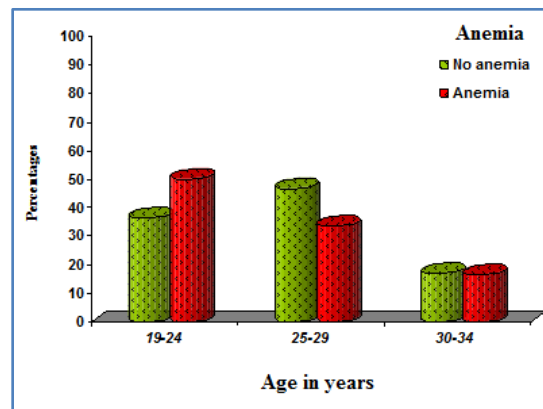


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Age in years	Anemia		Total
	No anemia	Anemia	
19-24	34(36.2%)	3(50%)	37(37%)
25-29	44(46.8%)	2(33.3%)	46(46%)
30-34	16(17%)	1(16.7%)	17(17%)
<b>Total</b>	<b>94(100%)</b>	<b>6(100%)</b>	<b>100(100%)</b>

**Table 7: Age distribution according to incidence of Anemia in patients studied**

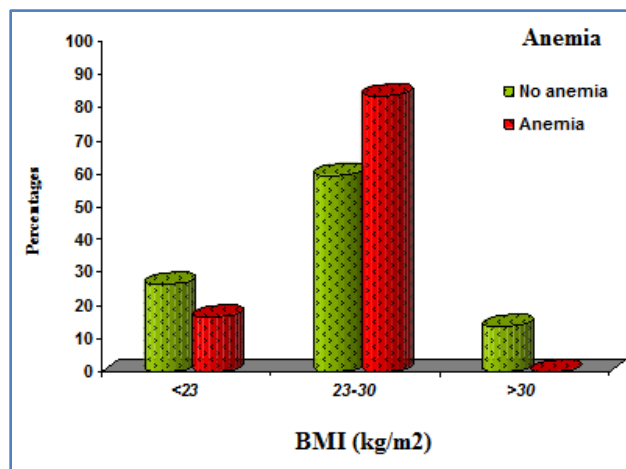
Lower age is positively associated with incidence of anemia with  $p=0.117$



BMI (kg/m <sup>2</sup> )	Anemia		Total
	No anemia	Anemia	
<23	25(26.6%)	1(16.7%)	26(26%)
23-30	56(59.6%)	5(83.3%)	61(61%)
>30	13(13.8%)	0(0%)	13(13%)
<b>Total</b>	<b>94(100%)</b>	<b>6(100%)</b>	<b>100(100%)</b>

**Table 8: BMI (kg/m<sup>2</sup>) with incidence of anemia**

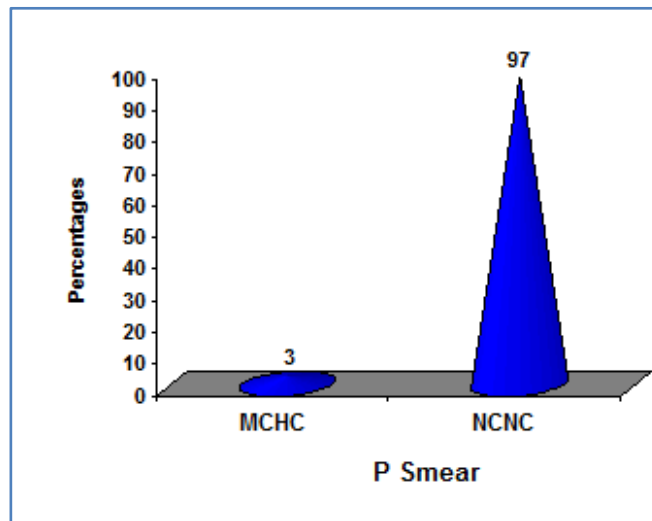
BMI is not statistically associated with incidence of anemia with  $p=0.710$



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P Smear	No. of patients	%
MCHC	3	3.0
NCNC	97	97.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

**Table 9: P Smear findings of patients studied**



P Smear	Anemia		Total
	No anemia	Anemia	
MCHC	0(0%)	3(50%)	3(3%)
NCNC	94(100%)	3(50%)	97(97%)
<b>Total</b>	<b>94(100%)</b>	<b>6(100%)</b>	<b>100(100%)</b>

**Table 10: P. Smear findings with incidence of anemia**

	Anemia		Total	P value
	No anemia	Anemia		
Age in years	26.09±3.37	26.17±3.87	26.09±3.38	0.955
BMI (kg/m <sup>2</sup> )	26.29±3.86	25.31±1.76	26.23±3.77	0.540
Pulse rate	80.28±10.32	80.33±13.35	80.28±10.45	0.990
Blood pressure	118.82±8.28	120.10±5.20	118.90±8.11	0.710
Hb	12.21±0.99	8.93±1.50	12.01±1.28	<0.001**
FBS	159.85±35.95	141.17±34.52	158.73±35.97	0.219
PPBS	283.81±59.44	238.00±49.65	281.06±59.69	0.068+
HbA1c	7.42±0.79	7.17±0.82	7.41±0.79	0.450

**Table 11: Baseline variables according to incidence of anemia in patients studied**

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GDM	Anemia		Total
	No anemia	Anemia	
No	94(94.00%)	0	94(94.0%)
Yes	0	6(100.0%)	8(8.0%)
<b>Total</b>	<b>94(100.0%)</b>	<b>6(100.0%)</b>	<b>100(100.0%)</b>

**Table 12: Correlation of Gestational DM with incidence of anemia**

GDM is significantly associated with incidence increased Hb with  $P < 0.001^{**}$

**DISCUSSION:** In this study we investigated the possible relation between Anemia and GDM. To our knowledge there are no studies from South India in this regard. We found that the incidence of anemia specifically Microcytic Hypochromic Anemia was considerably lower in GDM women compared to Non GDM pregnancy.

In a somewhat similar study Annika Helinet al<sup>6</sup> discovered that women with high dietary iron intake and high Hb had increased risk of GDM. But the study didn't include Indian women. Similarly Quiet al<sup>7</sup> demonstrated an association between high Heme Iron intake during pregnancy and the risk of GDM.

Iron is a highly reactive component with a possibility to participate in harmful reactions.<sup>8</sup> Iron excreted from human body is with very limited mechanism and thus intake of iron is highly regulated according to body needs.<sup>9</sup>

Iron could interfere in Glucose metabolism by following possible mechanism.

- Iron decreases insulin secretion and metabolism in liver which leads to peripheral hyperinsulinemia.<sup>10</sup>
- Iron overload results in oxidative stress in pancreatic  $\beta$ -cells that leads to destruction of Islet cells and thus decreases insulin secretion.<sup>11</sup>

**CONCLUSION:** Our study suggests that incidence of anemia especially Microcytic Hypochromic Anaemia is considerably lower in GDM. These finding suggests that routine supplementation of iron irrespective of Hemoglobin (Hb) levels should be reconsidered in risk group women and iron supplements to be given only to women who has anemia due to Iron deficiency anemia, though studies on a larger group is warranted.

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### AUTHORS:

1. Srinivasa V.
2. Nagaraja B. S.
3. G. Chandra Mohan
4. Akila V.
5. Prakash Kikker Gowdaiah

### PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of General Medicine, Bangalore Medical College and Research Institute, Bangalore.
2. Professor, Department of General Medicine, Bangalore Medical College and Research Institute, Bangalore.
3. Post Graduate, Department of General Medicine, Bangalore Medical College and Research Institute, Bangalore.
4. Post Graduate, Department of General Medicine, Bangalore Medical College and Research Institute, Bangalore.

5. Associate Professor, Department of General Medicine, Bangalore Medical College and Research Institute, Bangalore.

### NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. G. Chandra Mohan,  
Room No. 202, 2<sup>nd</sup> Floor,  
BMCRI Mens PG Hostel,  
Hospital Road, Shivajinagar,  
Bangalore-560001.  
Email: drgchandramohan@gmail.com

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