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Maternal Anemia and BMI as Determinants of Pregnancy Outcomes: A Hospital-Based Study

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ABSTRACT

Background: Malnutrition is a serious underlying cause of child and maternal deaths around the world. The objective of this study evaluates maternal anemia and body mass index as determinants of pregnancy outcomes**.** Undernourishment during pregnancy can occurs Intra Uterine Growth Retardation. Contributing to about 80,0000 new-borns, 40,0000 infant deaths and 20% under 2 years children have stunted, 20% of maternal deaths during labor and early postpartum.

Methods: This study Hospital-based cross-sectional study. The study comprised laboring women admitted for delivery in selected tertiary care hospital in South India from 10th November 2021 to 20th January 2022. Structured interview schedule for demographic information, patient's case sheet for information about the 'Body Mass Index as a determinants of pregnancy outcomes' and anthropometric measurement for body mass index (weight and height). All registered deliveries in the study period have been included, comprising of 101 sample size Bivariate logistic regressions were used to determine the factors associated with outcome variables. A significant level of 5% was used to decide the significance of statistical tests.

Results: Body Mass Index in the 1st antenatal visit of the women who came for delivery in tertiary care hospital, underweight 36.6%, normal body mass index 52.5%, and overweight 10.9%. During 1st antenatal visit 58.4% had anemia, while 53.5% had mild anemia during the last antenatal visit. Respectively 39.6% of antenatal women had normal Hb% during 1st antenatal care visit, whereas 46.5% had normal Hb%, during their last antenatal visit. The mode of delivery; spontaneous vaginal delivery 45.5%, vacuum delivery 3.0%, emergency caesarean section delivery 50.5%. Preterm delivery was statistically significant among whose first antenatal care visit was after 11th weeks of gestation. Whereas, emergency caesarean section delivery was statistically significant among underweight. Increasing maternal weight body mass index was associated with maternal and neonatal health outcomes. Which was risk of pregnancy induced hypertension, preeclampsia, eclampsia, gestational diabetes mellitus and caesarean section delivery.

Conclusions: Every 2nd women was anemic, every 3rd pregnant women was underweight (BMI >18.5), every 2nd baby was born with caesarean section delivery. Preterm delivery was statically significant of weeks of gestation during first antenatal care visit with more than 11th weeks of gestation. Whereas, emergency cesarean section was significant with low body mass index.

Keywords: Anemia; body mass index; caesearn section delivery; low birth weight; preterm delivery

INTRODUCTION

Globally 1.62 billion women are suffering from anemia.[1] According to WHO, 1993 to 2005 data, 32 million (38%) pregnant women are anemic, of whom 750,000 are severely anemic (hemoglobin level <7.0/dl).[2] The majority of anemic pregnant women, in low-income and middle-income countries, are 43% which is the highest prevalence found in Southern Asia 52%, Central African and West African countries 56%.[3,4] Anemia is a major consequence for women's health as well as socio-economic development which results in the loss of billions of dollars annually. [1,5,6] The prevalence of anemia in pregnant women in developed countries are14%, in developing countries 51%, and in India, it varies from 65% to 75%. [7,8]

Complications of maternal obesity (BMI>25 kg/m^2) including gestational hypertension, preeclampsia, macrosomia, early induction of labor and need for

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caesarean section deliveries and currently apply upmost but also concede increasingly in middle-income countries, including India.[9]

While, in the countryside of India, undernutrition (BMI<18.5 kg/m^2) is associated with low birth weight (LBW< 2.5 kg) and preterm deliveries.

METHODS

The purpose of the study has been already explained to women before the data collection, and written informed consent was obtained from every subject. For socio-demographic, socio-economic condition structured interview schedule techniques were used. For the maternal and newborn pregnancy outcomes information patient case sheet was used. For BMI every subject had taken weight and height and for previous (first antenatal clinic visit) weight and height patient's case sheet had used. The total number of samples were 101. Date was collected from 10th November 2021 to 20th January 2022. Ethical clearance was obtained from the ethical review committee of KLE Academy of Higher Education and Research (KAHER), to conduct the study.

The collected data was entered in MS Excel-2016 and exported in SPSS- version 20 for analysis. Data has been checked for consistency and completeness by exploratory data analysis before running the statistical analysis. Univariate and bi-variate were used to see the distribution of the study subjects by outcome variables (low birth weight, preterm delivery, and mode of delivery). Bivariate logistic regressions were used to determine the factors associated with outcome variables. A significant level i.e; 5%, was used to decide the significance of statistical tests.

Data quality was ensured in collection, coding, entry, and analysis. Structured Interview Schedule and patient case sheet, each case information was checked for its consistency, provision of full information and apposite documents.

RESULTS

Table 1 shows that, the preterm delivery was 33.3% and 14.3% among women of age group <25 years respectively. The preterm delivery was 37.5% and 26.1% in women who were vegetarian and mixed diet respectively. The preterm delivery was 44.4%in women who were vegetarian (consume egg). Respectively, the preterm delivery was 44.4%, 27.2% among women who visited the total number of ANC visit ≤ 4 times and >5 times respectively (Table 1).

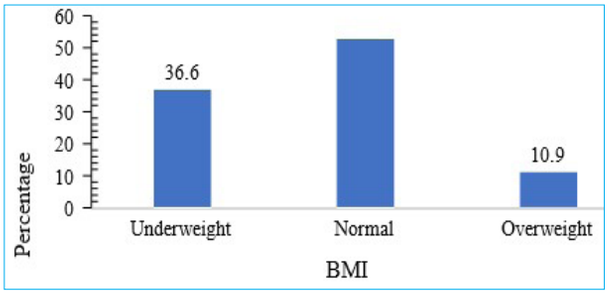

Figure 1. Body Mass Index (BMI) Level (n=101).

Figure 1. shows that, findings of the study of Body Mass Index (BMI) in the first antenatal visit of the women, underweight 36.6%, normal BMI 52.5% and overweight 10.9% (Figure 1).

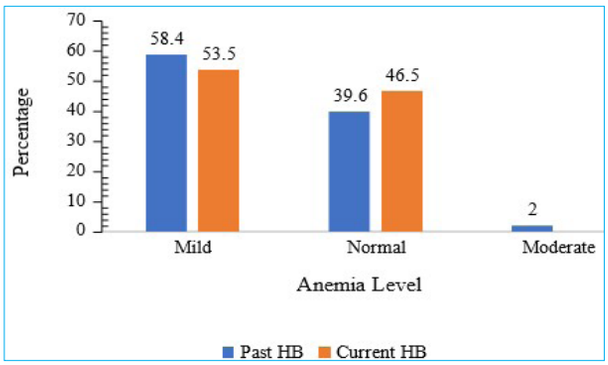

Figure 2. HB Level (n=101).

Figure 2. shows that, the percentage of mild anemia was 58.4% and 53.5% in 1st antenatal visit and last antenatal visit respectively. Likewise, normal Hb level was 39.6% and 46.5% during 1st and last antenatal visit respectively. Moderate anemia was 2.0% during 1st antenatal visit. (Figure 2).

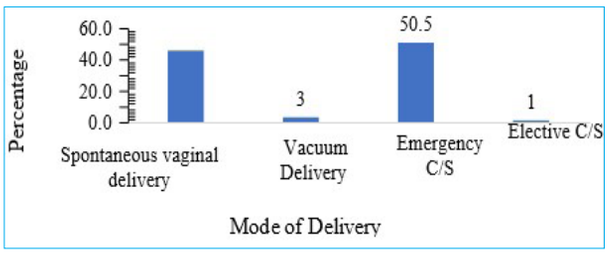

Figure 3. Mode of delivery (n=101)

Figure 3. shows that, the mode of delivery; spontaneous vaginal delivery was 45.5%, vacuum delivery was 3.0%, emergency caesarean section (C/S) 50.5% and elective cesarean section (C/S) 1.0% (Figure 3).

Table 1. Shows that, socio-demographic and socio-economic information about the women who were participated in this study (Table 1).

Table 1. Distribution of outcome preterm delivery n=101.

Background Characteristics		Preterm delivery				
		No		Yes		N
		n1	%	n2	%	
Age	< 25 Years	34	66.7	17	33.3	51
	25-29 Years	26	72.2	10	27.8	36
	30+ Years	12	85.7	2	14.3	14
Women Education	Secondary	31	68.9	14	31.1	45
	PUC	29	74.4	10	25.6	39
	Graduation and above	12	70.6	5	29.4	17
Occupation of Woman	Home maker	46	74.2	16	25.8	62
	Govt. Service	1	50.0	1	50.0	2
	Pvt. Service	5	71.4	2	28.6	7
	Business	4	66.7	2	33.3	6
	Others	16	66.7	8	33.3	24
Dietary pattern	Pure vegetarian	16	66.7	8	33.3	24
	Vegetarian (consume egg)	5	62.5	3	37.5	8
	Vegetarian and non- vegetarian mixed	51	73.9	18	26.1	69
Dietary habit	once times a day	0	0.0	0	0.0	0
	Twice a day	0	0.0	0	0.0	0
	Thrice a day	70	70.7	29	29.3	99
	Four or More than 4 times a day	2	100.0	0	0.0	2
Monthly family income	<20000	16	69.6	7	30.4	23
	20000-40000	27	64.3	15	35.7	42
	40001+	29	80.6	7	19.4	36
Total ANC Visit	≥4	5	55.6	4	44.4	9
	5+	67	72.8	25	27.2	92
First ANC Visit	< 6 Week	19	59.4	13	40.6	32
Time week	6-10	23	74.2	8	25.8	31
	11+	30	78.9	8	21.1	38
Utilization of health facility	≥5	27	71.1	11	28.9	38
	6-10	36	70.6	15	29.4	51
	11+	9	75.0	3	25.0	12
Past Reported Hb	Severe	0	0.0	0	0.0	0
	Moderate	1	50.0	1	50.0	2
	Mild	45	76.3	14	23.7	59
	Normal	26	65.0	14	35.0	40
Current report of Hb	Severe	0	0.0	0	0.0	0
	Moderate	0	0.0	0	0.0	0
	Mild	37	68.5	17	31.5	54
	Normal	35	74.5	12	25.5	47
BMI	Underweight	26	70.3	11	29.7	37
	Normal	36	67.9	17	32.1	53
	Overweight	10	90.9	1	9.1	11

Table 2. Distribution of outcome low birth weight in KG n=101.

Background Characteristics		Low birth weight in Kg				
		No		Yes		n
		n1	%	n2	%	
Age	< 25 Years	35	68.6	16	31.4	51
	25-29 Years	27	75.0	9	25.0	36
	30+ Years	12	85.7	2	14.3	14
Women Education	Secondary	30	66.7	15	33.3	45
	PUC	31	79.5	8	20.5	39
	Graduation and above	13	76.5	4	23.5	17
Occupation of Woman	Home maker	43	69.4	19	30.6	62
	Govt. Service	1	50.0	1	50.0	2
	Pvt. Service	6	85.7	1	14.3	7
Dietary pattern	Business	6	100.0	0	0.0	6
	Others	18	75.0	6	25.0	24
	Pure vegetarian	16	66.7	8	33.3	24
	Vegetarian (consume age)	5	62.5	3	37.5	8
	Vegetarian and non- vegetarian mixed	53	76.8	16	23.2	69
Dietary habit	once times a day	0	0.0	0	0.0	0
	Twice a day	0	0.0	0	0.0	0
	Thrice a day	72	72.7	27	27.3	99
	≥ 4 times a day	2	100.0	0	0.0	2
Monthly family income	<20000	17	73.9	6	26.1	23
	20000-40000	30	71.4	12	28.6	42
	40001+	27	75.0	9	25.0	36
Total ANC Visit	≤ 4	7	77.8	2	22.2	9
	5+	67	72.8	25	27.2	92
First ANC Visit Time Week	< 6 Week	22	68.8	10	31.3	32
	6-10	22	71.0	9	29.0	31
	11+	30	78.9	8	21.1	38
Utilization of health facility	≤ 5	29	76.3	9	23.7	38
	6-10	37	72.5	14	27.5	51
	11+	8	66.7	4	33.3	12
Past reported Hb%	Severe	0	0.0	0	0.0	0
	Moderate	2	100.0	0	0.0	2
	Mild	42	71.2	17	28.8	59
	Normal	30	75.0	10	25.0	40
Current Reported Hb %	Severe	0	0.0	0	0.0	0
	Moderate	0	0.0	0	0.0	0
	Mild	41	75.9	13	24.1	54
	Normal	33	70.2	14	29.8	47
BMI	Underweight	27	73.0	10	27.0	37
	Normal	36	67.9	17	32.1	53
	Overweight	11	100.0	0	0.0	11

Table 2 shows, that, the percentage of low birth weight babies were 31.4% and 14.3% among women of age group <25 years and >30 years respectively. The percentage of low birth weight was 37.5% and 23.2% in women who consume vegetarian and mixed diet respectively. (Table 2).

The percentage of low birth weight babies were 29.8%, 24.1% in women who had Hb % normal and who were mild anemic respectively in current Hb% normal. The percentage of low weight babies were 32.1%, 27.0% in women who had normal BMI and underweight (BMI>18.5) respectively (Table 2).

Table 3 shows that, the percentage of spontaneous vaginal delivery was 47.1% and 64.3% among women of age group <25 years and >30 years respectively. The percentage of caesarean section delivery was 53% and 28.6% among women of age group <25 years and > 30 years respectively. The percentage of spontaneous vaginal delivery was 58.3% and 59.5% among women whose family monthly income was Rs. 4000 or more than 40001 and Rs 20000- 40001 in Indian currency respectively (Table 3).

Table 4; shows that, preterm delivery was 5.82 times higher in the pregnant women of age group <25 years than >30 years. Low birth weight was 3.56 times higher in women <25 years of age group, while emergency cesarean section was 4.93 times higher than the women >30 years of age group. Likewise, emergency cesarean section was 2.99 times higher in women <25 years of age group. (Table 4).

Table 5; shows that, emergency cesarean section delivery was higher in PUC level of education women than secondary, graduate and above graduate level of education women. Preterm delivery was 10.21 times higher in women who had government service holder than women who had home maker, private service holder, business and other occupation women. Emergency caesarean section was 5 times higher in women who had occupation of business than women who were home maker. Emergency C/S delivery was statistically significant among underweight (BMI> 18.5) women, whereas preterm delivery was statistically significant among women who visit ANC for the 1st time after 11th weeks of gestation (Table 5).

Table 6; shows that, preterm delivery was 2.24 times higher in rural women than in urban women. Low birth weight was 1.53 times higher in rural women than in urban women. Emergency C/S delivery was 3.01 times higher in semi-urban women than in urban women. Preterm delivery, low birth weight and emergency C/S delivery were higher in women who had problem of preeclampsia in primi para women than multi para. While preterm delivery was 7.45 times higher in women who had problem of eclampsia with primi para women. Emergency C/S delivery was 3.14 times higher in women who had no history of gestational diabetes mellitus than women who had gestational diabetes mellitus. Low birth weight was 1.45 times higher in women who had one time abortion history than in women who had no abortion history, emergency caesarean section delivery was higher in women who had history of one time abortion than women who had no history of abortion. Low birth weight was 7.69 times higher in women who were in 4th gravida than women who were in 1st gravida, similarly emergency caesarean section was 14.17 times higher in women who were 4th gravida than women who were 1st gravida (Table 6).

Table 3.Distribution of outcomes (Mode of delivery) (spontaneous vaginal delivery, vacuum delivery and emergency Caesarean Section C/S) delivery) n-101.

Background Characteristics		Mode of delivery						
		Spontaneous vaginal Delivery		Instrumental delivery (Vacuum)		Emergency C/S		n
		n1	%	n2	%	n3	%	
Age	< 25 Years	24	47.1	0	0	27	53	51
	25-29 Years	13	36.1	2	5.6	21	58.3	36
	30+ Years	9	64.3	1	7.1	4	28.6	14
Women Education	Secondary	19	42.2	1	2.2	25	55.5	45
	PUC	17	43.6	2	5.1	20	51.3	39
	Graduation and above	10	58.8	0	0	7	41.2	17
Occupation of Woman	Home maker	32	51.6	1	1.6	29	46.8	62
	Govt. Service	1	50	0	0	1	50	2
	Pvt. Service	3	42.9	1	14.3	3	42.9	7
	Business	2	33.3	0	0	4	66.7	6
	Others	8	33.3	1	4.2	15	62.5	24

Dietary pattern	Pure vegetarian	13	54.2	0	0	11	45.9	24
	Vegetarian (consume age)	4	50	1	12.5	3	37.5	8
	Vegetarian and non- vegetarian mixed	29	42	2	2.9	38	55.1	69
Dietary habit	once times a day	0	0	0	0	0	0	0
	Twice a day	0	0	0	0	0	0	0
	Thrice a day	44	44.4	3	3	52	52.5	99
	Four or More than 4 times a day	2	100	0	0	0	0	2
Monthly family income	<20000	11	47.8	0	0	12	52.2	23
	20000-40000	14	33.3	3	7.1	25	59.5	42
	40001+	21	58.3	0	0	15	41.7	36
Total ANC Visit	≤4	3	33.3	1	11.1	5	55.6	9
	5+	43	46.7	2	2.2	47	51.1	92
First ANC Visit Time Week	< 6 Week	15	46.9	0	0	17	53.1	32
	6-10	11	35.5	2	6.5	18	58.1	31
	11+	20	52.6	1	2.6	17	44.7	38
Utilization of health facility	≤5	15	39.5	3	7.9	20	52.6	38
	6-10	22	43.1	0	0	29	56.9	51
	11+	9	75	0	0	3	25	12
Past reported Hb%	Severe	0	0	0	0	0	0	0
	Moderate	1	50	0	0	1	50	2
	Mild	28	47.5	0	0	31	52.5	59
	Normal	17	42.5	3	7.5	20	50	40
Current reported Hb%	Severe	0	0	0	0	0	0	0
	Moderate	0	0	0	0	0	0	0
	Mild	30	55.6	0	0	24	44.4	54
	Normal	16	34	3	6.4	28	59.5	47
BMI	Underweight	20	54.1	1	2.7	16	43.2	37
	Normal	19	35.8	1	1.9	33	62.3	53
	Overweight	7	63.6	1	9.1	3	27.3	11

Table 4. Distribution of outcomes (Mode of delivery) (spontaneous vaginal delivery, vacuum delivery and emergency Caesarean Section (C/S) delivery) (n=101).

Background Characteristics		Preterm delivery	Low birth weight	Spontaneous vaginal delivery	Emergency C/S	n
Residence	Urban	21.9	21.9	53.1	46.9	32
	Semi urban	26.3	26.3	26.3	73.7	19
	Rural	34	30	54	46	50
Parity	Primi Para	31.1	31.1	48.9	51.1	45
	Low parity	24	20	50	50	50
	Multi Para	50	50	33.3	66.7	6
Gravida	G1	33.3	33.3	50	50	42
	G2	23.3	23.3	53.3	46.7	30
	G3	19	9.5	47.6	52.4	21
	G4	66.7	66.7	16.7	83.3	6
	G5	0	0	0	100	1
	G6	0	0	100	0	1

Preeclampsia	Primi	37.2	34.9	48.8	51.2	43
	Yes	50	0	0	100	2
	No	21.4	21.4	50	50	56
Eclampsia	Primi	37.2	34.9	48.8	51.2	43
	Yes	0	0	0	0	0
	No	22.4	20.7	48.3	51.7	58
Abortion	Abortion 0	29.5	27.3	48.9	51.1	88
	Abortion 1	27.3	27.3	45.5	54.5	11
	Abortion 2	0	0	50	50	2
	Abortion 3	0	0	0	0	0
GDM	Yes	37.5	37.5	62.5	37.5	8
	No	28	25.8	47.3	52.7	93
Pregnancy induce Hypertension	Yes	37.5	25	50	50	16
	No	27.1	27.1	48.2	51.8	85

Table 5. Multiple logistic registration output for socio-demographic, maternal anemia and BMI factors associated with pregnancy outcomes conclusions, Karnataka, 2022 (n=101).

Background Characteristics	OR (95% C.I.)		
	Pre-term delivery	Low Birth Weight	Emergency C/S
Age Groups			
30+ Years	1.00	1.00	1.00
< 25 Years	5.82 (0.68, 49.63)	3.56 (0.51, 24.84)	2.99 (0.62, 14.47)
25-29 Years	3 (0.36, 24.8)	1.86 (0.27, 12.95)	4.93 (0.96, 25.4)
Women Education			
Secondary	1.00	1.00	1.00
PUC	0.66 (0.19, 2.22)	0.32 (0.09, 1.12)	1.08 (0.36, 3.28)
Graduation and above	1.03 (0.18, 5.84)	0.39 (0.06, 2.4)	0.55 (0.12, 2.58)
Occupation of women			
Home maker	1.00	1.00	1.00
Govt. Service	10.21 (0.27, 381.52)		3.02 (0.11, 84.24)
Pvt. Service	2.93 (0.27, 31.86)	2.1 (0.15, 29.29)	1.55 (0.18, 13.44)
Business	3.36 (0.3, 38.16)		5 (0.53, 47.42)
Others	0.61 (0.15, 2.43)	0.41 (0.1, 1.66)	2.45 (0.63, 9.56)
Dietary pattern			
Pure vegetarian	1.00	1.00	1.00
Vegetarian (consume egg)	1.93 (0.27, 13.93)	2.25 (0.3, 16.79)	0.38 (0.05, 2.94)
Vegetarian and non-vegetarian mixed	0.76 (0.23, 2.53)	0.64 (0.19, 2.18)	1.28 (0.4, 4.13)
Monthly family income			
<20000	1.00	1.00	1.00
20000-40000	1.41 (0.34, 5.79)	1.02 (0.23, 4.47)	1.01 (0.27, 3.72)
40001+	0.42 (0.07, 2.5)	0.9 (0.16, 4.95)	0.58 (0.13, 2.54)
Total ANC visit during your Pregnancy			
≤4	1.00	1.00	1.00
5+	0.4 (0.07, 2.28)	1.38 (0.2, 9.61)	0.99 (0.18, 5.52)
First ANC Visit Time in week			
< 6 Week	1.00	1.00	1.00
6-10.	0.29 (0.07, 1.24)	0.87 (0.18, 4.17)	1.03 (0.27, 3.96)

11+		0.2 (0.05, 0.79)	0.65 (0.15, 2.83)	0.49 (0.14, 1.7)
Utilization of health facility in year				
≤5		1.00	1.00	1.00
6-10.		1.18 (0.39, 3.56)	1.63 (0.51, 5.23)	1.3 (0.46, 3.64)
11+		0.61 (0.08, 4.73)	3.11 (0.37, 26.28)	0.38 (0.06, 2.56)
Current reported Hb				
No		1.00	1.00	1.00
Yes		1.65 (0.55, 4.93)	0.67 (0.22, 2.05)	0.46 (0.17, 1.25)
BMI		1.00	1.00	1.00
Normal		1.00	1.00	1.00
Underweight		0.82 (0.26, 2.63)	0.65 (0.2, 2.1)	0.32 (0.11, 0.97)
Overweight		0.13 (0.01, 1.77)		0.21 (0.03, 1.24)
Received iron calcium vitamins tablet	Yes	1.00	1.00	1.00
	No	0.07 (0, 1.39)	0.3 (0.02, 5.66)	-

Table 6. Multiple logistic registration output for socio-demographic, maternal anemia and BMI factors associated with pregnancy outcomes conclusions, Karnataka, 2022 (n=101).

Background Characteristics	OR (95% C.I.)		
	Pre-term delivery	Low Birth Weight	Emergency C/S
Place of Residence			
Urban	1.00	1.00	1.00
Semi-urban	1.4 (0.33, 5.87)	1.32 (0.27, 6.47)	3.01 (0.73, 12.45)
Rural	2.24 (0.73, 6.9)	1.53 (0.49, 4.78)	1.09 (0.41, 2.92)
Eclampsia			
Primi	1.00	1.00	1.00
Yes	0.36 (0.13, 0.97)	0.31 (0.02, 5.94)	0.42 (0.02, 7.38)
No	-	-	-
Preeclampsia			
Primi	1.00	1.00	1.00
Yes	7.45 (0.36, 154.07)	-	-
No			
GDM			
Yes	1.00	1.00	1.00
No	0.43 (0.09, 2.11)	0.76 (0.13, 4.28)	3.14 (0.52, 19)
Pregnancy induce Hypertension			
Yes	1.00	1.00	1.00
No	0.51 (0.15, 1.78)	1.01 (0.24, 4.24)	1.33 (0.38, 4.59)
Abortion History			
0	1.00	1.00	1.00
1	0.79 (0.16, 3.78)	1.45 (0.21, 10.13)	0.75 (0.14, 4.17)
2	-	-	-
Gravida			
1	1.00	1.00	1.00
2	-	1.68 (0.08, 37.76)	2.34 (0.12, 46.03)
3	-	0.57 (0.02, 13.47)	1.76 (0.09, 33.29)
4	-	7.69 (0.28, 209.96)	14.17 (0.3, 675.66)
5	-	-	-
6	-	-	-

DISCUSSION

Maternal anemia is an indicator of health and poor nutrition. Two major indicators of maternal nutrition are body mass index (BMI) and anemia, both of which can affect health of a mother and her fetus. In rural India, undernutrition (BMI <18.5 kg/m^2) associated with low birth weight (LBW <2.5 kg) and preterm deliveries (<37 weeks of gestation). Pawalia A et al.[10] However in low and middle income country 56% of pregnant women were suffering from anemia Black RE et al.[11] Therefore this study aimed to evaluate the anemia and BMI as determinants of pregnancy outcomes in South, India.

The study shows that, BMI during first antenatal visit of the women was 36.6% underweight, 58.4% Mild anemia, while during last antenatal visit 53.5% Mild anemia. While, Hb% >7 was 2.0% moderate anemia during first antenatal visit. Similarly, anemia 90% low BMI (18.5<) 35%, and 0.2% severe anemia. Majority of the women suffered from mild anemia than moderate and severe anemia. The risk of caesarean section delivery were significantly higher in non-anemic women than anemic women. While, this study women with anemia were significantly higher risk for C/S delivery, didn't supported the Patel A et al and Kumar A et al.[12,13] Age of the pregnant women and gravida were independently associated with maternal anemia, low birth weight, and preterm delivery, while preterm delivery was significant among women who visited first ANC visit after 11th weeks of gestation, which was supported, Agarwal KN et al.[14] Kumari S et al study maternal anemia was a strongly statistically significant risk for preterm birth than non-anemic women. Whereas, weakly statically significant risk for low birth weight. While, preterm delivery and low birth weight were positive association between each other.[15] Participants were 32% from rural area, whereas in similar study 20% participant were from rural area, Ethiopia CS. Statistical 2004/2005.[16] Mild anemic women were 54.5% during first antenatal visit, which was supported, Bagi- Ansari N et al.[17] Supplementation of iron sulfate, folic acid, calcium and vitamins during current pregnancy did not significantly reduced the incidence of anemia which was supported the Brion MJ et al, Thirukkanesh S et al, Zhang Q et al, Aikawa R et al and Khan DA et al.[18-22] Nutritional status, education, occupation, dietary pattern, and socio-economic status of the women were associated factors of anemia and body mass index which were risk of preterm delivery, low birth weight and emergency caesarean section which was supported, Bodnar LM et al.[23]

Maternal weight was associated with maternal and neonatal health outcomes. Maternal obesity may increase risk of pregnancy induced hypertension, preeclampsia, eclampsia, GDM and cesarean section delivery. Preeclampsia, eclampsia, and gestational diabetes mellitus were risk of low birth weight, preterm delivery and cesarean section delivery. Preterm delivery and low birth weight were high risks of neonatal deaths, while C/S delivery was the risk of maternal mortality, which was supported, James AH et al, Doherty DA et al, and Callaway LK et al.[24-26]

CONCLUSIONS

The combination of anemia and body mass index (BMI) in pregnancy increased the risk of low birth weight, preterm birth, and neonatal mortality. These adverse birth outcomes raise major concerns because national programs to address iron deficiency anemia have not reduced the rates of anemia among rural pregnant women in Karnataka. Meanwhile, seeking simultaneously short-term strategies such as spouse counseling, community awareness program in reproductive health. Reduce or minimize delay in the decision to seek care, delay in identifying, reaching health facilities and delay in receipt of adequate and appropriate treatment to better healthcare service and management of the provision of safe delivery for the segment of pregnant women who are both anemic and underweight could be helpful in reducing neonatal and maternal mortality and morbidity. Such actions are could be helpful in reducing neonatal and maternal mortality and imperative to break the intergenerational cycle of poor growth in the new-born and also for improving child health survival.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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