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Maternal and foetal outcome of gestational diabetes mellitus in a rural block of Assam, India

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ABSTRACT

Aim: India is known as a diabetic capital of the world and it has been well recognized that women especially pregnant and lactating women form one of the most vulnerable segments of the population from nutritional point of view.

Objectives: To assess the incidence of gestational diabetes mellitus and measure the maternal and foetal outcome of gestational diabetes mellitus.

Methods: A cohort study was conducted in an area served by rural block primary health centre, where all consented pregnant women in first trimester registered between June and August 2011 were followed up in second and third trimester to measure incidence of gestational diabetes mellitus along with maternal and foetal outcome measurement during delivery and postnatal period.

Results: The incidence of GDM amongst the study population was 3% (28, $n = 930$). The impaired glucose tolerance was documented amongst 216 (23.2%, $n = 930$) ladies. Prevalence of underweight was 21.4% (202), while 5.7% (54) were overweight and 0.2% (2) was obese in first trimester. Anaemia prevalence was 72% (670) ($Hb < 110$ g/l). Serum albumin level was lower in 32.9%. LSCS rate was found significantly higher amongst GDM subjects compared to non-GDM subjects ($RR = 4.58$; 95% CI, 2.18–9.59, $p = 0.000$). Mean birth weight of neonate was 2.802 ± 0.479 . Birth weight was found significantly higher amongst GDM group compared to non-GDM group ($\chi^2 = 166.8$, $p = 0.000$). Neonatal death was more common amongst GDM group compared to non-GDM group ($\chi^2 = 6.776$, $p = 0.034$).

Conclusion: There is increased caesarean section rate, admission to an NICU among women who had gestational diabetes mellitus during pregnancy.

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1. Introduction

While under nutrition continues to be major problem as in the earlier decades, the current decade has witnessed the progressive rise of over nutrition in women during reproductive age especially among the affluent segments of population both in urban and in rural areas. It has become imperative to assess the nutritional status of pregnant women and give them appropriate advice and care. Maternal under nutrition is associated with low birth weight and all its attendant adverse consequences.¹ On the other hand, as the number of diabetic people is increasing worldwide the prevalence of gestational diabetes mellitus is also increasing especially in less prosperous countries.² In India, during the last two decades there is marked increase in incidence of gestational diabetes mellitus i.e. 2% in 1980, 7% in 1990 and 16.55% in 2000.³ Indians have an eleven fold higher risk of developing diabetes mellitus during pregnancy.⁴ This rise is due to sedentary life style, diet changes, continued immigration from high-risk population and a virtual epidemic of childhood and adolescent obesity.⁵ Study conducted by Ingrid Ostlund et al in two countries of Stockholm and Orebro in Sweden from 1997 to 2001 found that impaired glucose tolerance is independently and significantly associated with an increased incidence of caesarean section and prematurity as well as markedly increased proportion of large for date or macrosomia and admission to an NICU for two days or longer.⁶ An increase in pancreatic beta cell mass and insulin secretion in the foetus occurs by the 16th week of gestation, in response to maternal hyperglycemia.^{7,8} Blood sugar testing as a routine test is not practiced in antenatal checkup done in most of the PHCs and sub centres of Assam; though, it was well known that early detection of gestational diabetes and adequate care has potential to avert preventable morbidities. Keeping this background in mind and paucity of published data from north eastern region, prompted us to conduct the study to assess the incidence of gestational diabetes mellitus and measure the maternal and foetal outcome of gestational diabetes mellitus.

2. Methodology

2.1. Design

A cohort study was conducted where a follow-up of all enrolled pregnant ladies was done in each trimester with outcome measurement immediately after delivery and six weeks postpartum.

2.2. Ethical statement

The study protocol was approved by the Institutional Ethics Committee of Assam Medical College, and necessary permissions were obtained in addition from the Joint Director of Health Services.

A written informed consent was sought from all eligible participants, and those consenting were included in the study. If a participant could not read or write, verbal information was provided, and consent was recorded as a thumb impression in the presence of two impartial witnesses. The surveys were

preceded by meetings with community leaders to ensure community-wide participation.

2.3. Setting

A rural block of Dibrugarh District of Assam was selected randomly from six rural blocks; which is situated about 30 km away from Dibrugarh town. It covers a population of 1,73,908. Most of the people residing in this area are agricultural worker.

2.4. Participants

All antenatal women coming during Jun to Aug 2011 to all sub centres, tea garden hospitals, village health and nutrition days celebrated in outreach areas, primary health centres, state dispensaries and community health centres of Khowang block of Assam giving consent were enrolled in the study.

Taking prevalence of gestational diabetes mellitus as 7% with anticipated relative risk of two and allocation of 1:3 with 95% confidence interval and 20% relative precision the required sample size for exposed group is 212 and for control group is 636.³

2.5. Study procedure

Information about socio demographic, behavioural and dietary habit was collected using predesigned, pretested schedule. Food frequency questionnaire and 24 h recall method was used for dietary survey. Physical measurement includes anthropometry and general physical examination. Body mass index (BMI) was calculated. Reproductive tract infection was diagnosed using syndromic approach. Laboratory investigation was done for blood sugar, serum creatinine, serum albumin, serum urea, serum uric acid, urine for sugar, albumin, pus cell, epithelial cell, RBC, calcium oxalate and haemoglobin. Blood sugar testing was done using glucose-oxidase – peroxide method and haemoglobin estimation was done using cyanmethaemoglobin method and haemoglobin level less than 110 g/l is categorized as anaemia.⁹ The term gestational diabetes; is defined as diabetes with onset or first detected during the pregnancy; which includes women with pre-existing (clinically undetected) type 1 or type 2 diabetes and the majority can expect to be restored to normal glucose tolerance immediately after pregnancy.¹⁰ In pregnant ladies 75 g glucose was given without regard to the last meal. A venous blood sample was collected at 2 h for estimating plasma glucose.¹¹ Blood sugar estimation was done in first, second, third trimester, and postnatal so that all GDM cases were detected and post pregnancy status is taken as proxy to know pre pregnancy blood sugar level.

WHO criteria for diagnosis of GDM (with 75 g OGTT) are used as a single test procedure to diagnose gestational diabetes mellitus in the community was used with the following cut off points.

Plasma Glucose	Type of hyperglycemia
2h > 200 mg/dl	Diabetes
2h > 140 mg/dl & <199 mg/dl	Gestational diabetes mellitus
2h > 120 mg/dl & <139 mg/dl	Gestational glucose intolerance
2h < 120 mg/dl	Normal

Definition of pregnancy induced hypertension, pre-eclampsia, eclampsia, cephalo-pelvic-disproportion, post-partum haemorrhage (PPH), pre labour rupture of membrane (PROM)¹² prolonged labour and Apgar score is used following standard textbook guideline.

2.6. Statistical analysis

Socio-demographic variables and past medical history presented in frequency distribution. Chi square distribution is done to compare the maternal and foetal outcome of gestational diabetic mothers with non-diabetic mothers. Relative Risk and 95% CI of RR is calculated to compare the risk of developing GDM. Repeated Measure ANOVA, also known as within-subjects ANOVA is used to test the equality of means of the anthropometric and Laboratory results.

3. Results

A total of 946 subject contacted during enrolment procedure of which 930 had given consent to participate. The response rate was 98.3%. Loss to follow up in second trimester was 72 (7.7%) and that in third trimester was 81 (8.7%). The maternal and foetal outcome measure could be completed amongst 777 (83.5%) study subjects. Therefore overall refusal rate till the end of study was 153 (16.5%).

Majority of the study population 909 (97.7%) were Hindu by religion. According to caste category 360 (38.7%) were other backward class (OBC), 355 (38.2%) were tea tribe; while 143 (15.4%) were scheduled tribe (ST), 55 (5.9%) General and 17 (1.8%) were scheduled caste (SC). Mean age was 22.56 ± 4.532 . Adolescent pregnancy was prevalent in 206 (22.2%), while 4 (0.4%) were having elderly pregnancy. Literacy status of the study participant was 704 (75.7%) of which majority studied up to high school level 319 (34.3%).

Amongst the spouses of pregnant ladies, literacy status was better compared to pregnant ladies i.e., 761 (81.8%) and majority studied up to high school level 324 (34.8%). Most of the pregnant women enrolled in the study was house maker 842 (90.5%), while 74 (8.0%) were working as manual labourer and 14 (1.5%) were self-employed in some business activities. Amongst spouses 332 (35.7%) were farmer by occupation, 301 (32.4%) were businessman, 293 (31.5%) were wage earner, while only 4 (0.4%) were employed in some organization as skilled worker [Table 1].

Anaemia prevalence was 72% (670) (Hb < 110 g/l), amongst studied participant during first trimester. Serum albumin level was normal in 624 (67%), while it was lower in 32.9% cases. Urinary albumin was present in 183 (19.74%) pregnant lady in first trimester and 353 (38.07%) had pus cell in urine. According to body mass index (BMI), 202 (21.4%) were underweight, while 54 (5.7%) were overweight and 2 (0.2%) were obese. Prevalence of hypertension was found as 3.2% (30) amongst pregnant ladies in first trimester of their pregnancy. Stool examination was done in 11.7% (111) of pregnant women for presence of soil transmitted helminthic ova and amongst the 111 participants 83.8% (93) had helminthic ova in their stool. The symptoms of reproductive tract infection were found in 31 ladies (3.3%). The

incidence of GDM amongst the study population was 3% (28, n = 930). The impaired glucose tolerance was documented amongst 216 (23.2%, n = 930) ladies. Analysis done by using repeated measures ANOVA indicates that the anaemia status worsens as pregnancy advances ($F = 123.117$, $p < 0.05$).

Family history of diabetes mellitus was found to be significantly associated with occurrence of gestational diabetes (RR 16.02, 95% CI 7.22–35.55, $p = 0.000$). Intake of beetle nut with tobacco was found in 241 (31%) of the study population though the risk difference was not significant (RR 1.44,

Table 1 – Baseline socio–demographic profile of study participant.

Variables		Number	Percentage
Religion	Hindu	909	97.7%
	Islam	21	2.3%
Caste Category	Scheduled caste	17	1.8%
	Scheduled tribe	143	15.4%
	Other backward caste	360	38.7%
	Tea tribe	355	38.2%
Age Group	General	55	5.9%
	<19 years	206	22.2%
	19–35 years	720	77.4%
	>35 years	4	0.4%
Literacy Status	Illiterate	226	24.3%
	Primary school	72	7.7%
	Middle school	155	16.7%
	High school	319	34.3%
Literacy status spouses	Secondary school	129	13.9%
	Graduate/above	29	3.1%
	Illiterate	169	18.2%
	Primary school	85	9.1%
Occupation of study participants	Middle school	161	17.3%
	High school	324	34.8%
	Secondary school	150	16.1%
	Graduate/above	41	4.4%
Occupation of spouses of study participant	House maker	842	90.5%
	Manual labour	74	8%
	Self-employed	14	1.5%
	Farmer	332	35.7%
Laboratory Findings	Businessman	301	32.4%
	Wage earner	293	31.5%
	Skilled worker	4	0.4%
Blood sugar	Normal	686	73.7%
	Impaired glucose tolerance	216	23.2%
	Gestational diabetes mellitus	28	3.01%
Haemoglobin	Anaemic	670	72%
	Non-anaemic	260	28
Serum albumin level	Normal	624	67.1%
	Lower	306	32.9%
Urinary albumin	Present	183	19.7%
	Absent	747	80.3%
Pus cell in urine	Present	353	37.96%
	Absent	577	62.04%
Reproductive tract infection	Present	31	3.3%
	Absent	899	96.7%
Ova in stool (n = 111)	Present	93	83.8%
	Absent	18	16.2%

Table 2 – Family history and behavioural risk factor distribution amongst non GDM and GDM group of study cohort.

Variables		Non GDM (n = 749)	GDM (n = 28)	RR (95% CI)	p value
Family history of Diabetes mellitus	No	745 (99.5%)	24 (85.7%)	1	0.000
	Yes	4 (0.5%)	4 (14.3%)	16.02 (7.22–35.55)	
Chewing of beetle nut	No	519 (69.3%)	17 (60.7%)	1	0.335
	Yes	230 (30.7%)	11 (39.3%)	1.44 (0.68–3.03)	
Tobacco chewers	No	426 (56.9%)	24 (85.7%)	1	0.002
	Yes	323 (43.1%)	4 (14.3%)	0.23 (0.08–0.65)	
Alcohol consumers	No	181 (24.2%)	14 (50%)	1	0.001
	Yes	568 (75.8%)	14 (50%)	0.34 (0.16–0.69)	
Financial stress	None or little	702 (93.7%)	25 (89.3%)	1	0.329
	Moderate	46 (6.2%)	3 (10.7%)	1.78 (0.56–5.69)	
	Severe	1 (0.1%)	0	–	

95% CI: 0.68–3.03; $p = 0.335$). Tobacco chewing was found higher amongst non GDM group (RR = 0.23, 95% CI: 0.08–0.65, $p = 0.002$). Alcohol consumption was also found higher amongst non-GDM group (RR 0.34, 95% CI: 0.16–0.69; $p = 0.001$). Comparison of financial stress amongst non GDM and GDM was not found significantly different (RR 1.78, 95% CI: 0.56–5.69; $p = 0.329$) [Table 2].

The habit of taking dairy products was found to be significantly associated with GDM in all frequencies i.e., monthly (RR: 0.32, 95% CI: 0.11–0.95, $p = 0.032$), weekly (RR: 0.25, 95% CI: 0.08–0.78, $p = 0.011$) and daily (RR: 0.26, 95% CI: 0.09–0.71, $p = 0.006 < 0.05$). Significant association was seen between daily user of sugar/sweeteners and GDM (95% CI: 1.07–57.33, $p = 0.013 < 0.05$). Daily user of sugar/sweeteners was 7.8 times more associated with GDM than never/<1 per month users. There was significant association between GDM with weekly, daily users of Desserts/sweet snacks with RR: 3.37, 95% CI: 1.28–8.85, $p = 0.009 < 0.05$ and RR: 5.20, 95% CI: 1.92–14.10, $p < 0.05$ respectively. Daily users of pickled vegetables were also significantly associated with GDM (RR: 5.20, 95% CI: 1.74–15.56, $p = 0.002$).

3.1. Maternal outcome

LSCS rate was found significantly higher amongst GDM subjects compared to non-GDM subjects (RR = 5.05; 95% CI, 2.41–10.58, $p = 0.000$). A total of 164 (22%) LSCS done in non-GDM group and 17 (60.7%) LSCS was done in GDM group. Elective cesarean section was done in 82 ladies from non-GDM group and 12 from GDM group (70.6% vs 50%); while emergency LSCS was done also in 82 ladies from non-GDM group and 5 from GDM group (50% vs 29.4%). Commonest

reasons for elective LSCS was history of previous cesarean section [16 (19.5%) vs 2 (16.7%)] amongst non GDM vs GDM group, clients choice [10 (12.2%) vs 3 (25.0%)], breach presentation in 12 (14.6%) amongst non GDM group and none amongst GDM group, cephalopelvic disproportion [10 (12.2%) vs 4 (33.3%)], pregnancy induced hypertension [15 (18.3%) vs 2 (16.7%)], postdated with oligohydramnios was found in 9 (11.0%) cases amongst non-GDM group while none amongst GDM group, placenta previa [6 (7.3%) vs 1 (8.3%)], intrauterine growth retardation found in 3 (3.7%) amongst non GDM group and none amongst GDM group, transverse lie was documented amongst only one cases from non GDM group (1.2%). Reasons for emergency LSCS was prolonged labour 22 (26.8%) amongst non-GDM group, foetal distress [15 (18.3%) vs 3 (60.0%)], failed induction [20 (24.4%) vs 1 (20.0%)], antepartum haemorrhage [9 (11.0%) vs 0%], breach delivery [5 (6.1%) vs 1 (20.0%)] and transverse lie with hand prolapse in 1 (1.2%) from non GDM group, premature rupture of membrane and loss of foetal movement (PROM) [9 (11.0%) vs 0%] and face presentation [1 (1.2%) vs 0%]. Abnormal presentation was also found significantly higher amongst GDM group compared to non-GDM group; breach presentation (RR = 7.09, 95% CI: 3.19–15.76, $p = 0.000$) and transverse lie (RR = 13.63, 95% CI: 5.28–35.20, $p = 0.000$). Pregnancy induced hypertension was more common amongst GDM group compared to non-GDM group (RR = 2.82, 95% CI: 1.37–5.84, $p = 0.003$) [Table 3].

3.2. Foetal outcome

Foetal loss was found in 7 cases (0.9%, $n = 772$); out of which two had intrauterine death, six borne as still birth while

Table 3 – Comparison of maternal outcome of non - GDM and GDM subjects using relative risk, 95% CI, p value.

	Maternal outcomes (n = 772)	Non GDM (n = 744)	GDM (n = 28)	RR (95% CI)	p value
Type of delivery	Normal vaginal (536, 69.4%)	525 (70.6%)	11 (39.3%)	1	0.000
	Assisted forceps (55, 7.1%)	55 (7.4%)	0	–	
	LSCS (181, 23.4%)	164 (22%)	17 (60.7%)	4.58 (2.18–9.59)	
Presentation	Vertex (709, 91.8%)	693 (93.1%)	16 (57.1%)	1	0.000
	Breech (50, 6.5%)	42 (5.6%)	8 (28.6%)	7.09 (3.19–15.76)	
	Transverse lie (13, 1.7%)	9 (1.2%)	4 (14.3%)	13.63 (5.28–35.20)	
Pregnancy induced hypertension	Normal (548, 71%)	535 (71.9%)	13 (46.4%)	1	0.003
	Gestational hypertension (224, 29%)	209 (28.1%)	15 (53.6%)	2.82 (1.37–5.84)	

Table 4 – Comparison of Foetal outcome of GDM & non-GDM mothers using chi-square test.

Foetal outcome		Non-GDM (n = 744)	GDM (n = 28)	χ^2	p value
Foetal Outcome	Live birth (765, 99.1%, n = 772)	737 (99.1%)	28 (100%)	0.266	0.876
	Intrauterine death (2, 0.3%, n = 772)	2 (0.3%)	0		
	Still birth (5, 0.6%, n = 772)	5 (0.7%)	0		

neonatal loss was found in 14 cases (1.8%) out of which 11 died during early neonatal period, while 3 died in late neonatal period ($\chi^2 = 6.776$, $p = 0.034$). Mean birth weight of neonate was 2.802 ± 0.479 . Birth weight was found significantly higher amongst GDM group compared to non-GDM group ($\chi^2 = 149.27$, $p = 0.000$). Prevalence of macrosomia was 14 (1.8%), which was higher amongst GDM group (32.1% vs 0.7%). Premature delivery was found in 77 (10.1%) cases. Gender ratio was favourable for girl child (375:390). 11 (1.4%) babies got treated at intensive care unit of which 8 were from non GDM group and 3 from GDM group ($\chi^2 = 17.647$, $p = 0.000$). Neonatal resuscitation was done more for babies of GDM mothers compared to non-GDM (17.9% vs 9.6%). Neonatal hypoglycaemia was detected in 2 (7.1%, n = 28) babies from GDM group. Neonatal Jaundice was detected in 23 (3.1%, n = 734) babies out of which 21 (3%, n = 706) from non GDM group and 2 (7.1%) from GDM group. Congenital malformation was not found in any baby. The mean Apgar score in 1 min was 8.15 ± 0.994 and in 5 min it was found as 9.27 ± 0.756 .

Neonatal death was more common amongst GDM group compared to non-GDM group ($\chi^2 = 6.776$, $p = 0.034$). Causes of neonatal deaths were Asphyxia (5 vs 1), septicemia (4 vs 1) and prematurity (2 vs 0). Birth weight of babies from GDM group was higher compared to non GDM group, which was significant ($\chi^2 = 149.273$, $p = 0.000$). Neonate requiring intensive care was also found higher amongst GDM group compared to non-GDM group ($\chi^2 = 17.647$, $p = 0.000$) [Tables 4 and 5].

4. Discussion

The response rate for the study was good. Anaemia was rampant with prevalence of 72% amongst study participant, which was reported as 76% amongst college going students from the same district.¹³ This indicates anaemia is common across women of different age groups. Adolescent pregnancy was prevalent in 206 (22.2%), while 4 (0.4%) were having elderly pregnancy. According to district level household survey report (DLHS-3), 35.5% pregnant women got married before 18 years in Assam.¹⁴

WHO suggest screening of all pregnant women at 24–28 weeks for diabetes.¹⁵ Few studies suggest the screening to diagnose GDM in the first trimester itself as early detection and care, results in a better foetal outcome.¹⁶ A community based study conducted in urban, rural and semi-urban areas in Tamil Nadu found a prevalence of gestational diabetes as 17.8% in² urban, 13.8% in semi-urban area and 9.9% in rural areas. Out of 28 GDM 10.7% were detected in first trimester while remaining 89.3% detected in subsequent visits. A cross sectional study done in Tamil Nadu has detected 72% diabetes detection in first visit and the remaining 28% in subsequent visit. A significant increase ($p < 0.0001$) in the prevalence of GDM was observed with family history of diabetes, increased maternal age and BMI.² In our study the prevalence of diabetes was less compared to other study reports, which may be because of low mean age of study participant (22.56 ± 4.532). The prevalence of GDM in India

Table 5 – Comparison of Foetal outcome of GDM & non-GDM mothers using chi-square test.

Variables (n = 765)		Non-GDM (n = 737)	GDM (n = 28)	χ^2	p value
Neonatal Outcome	Alive (751, 98.2%, n = 765)	725 (98.4%)	26 (92.9%)	6.776	0.034
	Early neonatal death (11, 1.4%, n = 765)	9 (1.2%)	2 (7.1%)		
	Late Neonatal death (3, 0.4%, n = 765)	3 (0.4%)	0		
Weight (kg)	<2.5 (142, 18.6%, n = 765)	140 (19.0%)	2 (7.1%)	149.273	0.000
	2.500–3.999 (609, 79.6%, n = 765)	592 (80.3%)	17 (60.7%)		
	>4.000 (14, 1.8%, n = 765)	5 (0.7%)	9 (32.1%)		
Maturity	Premature (77, 10.1%, n = 765)	73 (9.9%)	4 (14.3%)	0.572	0.450
	Normal (688, 89.9%, n = 765)	664 (90.1%)	24 (85.7%)		
Baby care in NICU >2 days	Yes (11, 1.4%, n = 765)	8 (1.1%)	3 (10.7%)	17.647	0.000
	No (754, 98.6%, n = 765)	729 (98.9%)	25 (89.3%)		
Documented medical condition up to one month of life	Neonatal hypoglycemia (2, 0.3%, n = 734)	No 706 (100%, n = 706) Yes 0	26 (92.9%) 2 (7.1%)	50.56	0.000
	Neonatal Jaundice (23, 3.1%, n = 734)	No 685 (97%, n = 706) Yes 21 (3%, n = 706)	26 (92.9%) 2 (7.1%)	1.54	0.214
Apgar score in 1 min	Normal (≥ 7) (342, 44.7%, n = 765)	314 (42.6%)	28 (100%)	0.623	0.430
	Decrease Apgar score (< 6) (7, 0.9%, n = 765)	7 (0.9%)	0		
Apgar score in 5 min	Normal (≥ 7) (347, 45.4%, n = 765)	319 (43.3%)	28 (100%)	0.175	0.675
	Decrease Apgar score (< 6) (2, 0.3%, n = 765)	2 (0.3%)	0		

varied from 3.8 to 21% in different parts of the country, depending on the geographical locations and diagnostic methods used. GDM has been found to be more prevalent in urban^{17,18} areas than in rural areas. For a given population and ethnicity, the prevalence of GDM corresponds to the prevalence of Impaired Glucose Tolerance [IGT, in non-pregnant adult] within that given population.¹⁹ For diagnosing GDM, a single test following 75 g oral intake of glucose 2 h before as recommended by WHO was found feasible in rural resource poor community setting as the response rate was high. There is a need to have selective (high risk population) or universal screening of pregnant women for GDM. The advantage of single test is that the women need not be fasting. As per as National Rural Health Mission guideline for village health and nutrition day celebration in India in each village in a monthly basis providing all services available to pregnant women and other beneficiaries can be utilized as platform for screening haemoglobin and blood sugar to plan early intervention amongst pregnant ladies.

Women diagnosed to have GDM are at increased risk of future diabetes predominantly type 2 DM as are their children.²⁰ Thus GDM offers an important opportunity for the development, testing and implementation of clinical strategies for diabetes prevention. Timely action taken now in screening all pregnant women for glucose intolerance, achieving euglycemia in them and ensuring adequate nutrition may prevent in all probability, the vicious cycle of transmitting glucose intolerance from one generation to another. Pre-conceptional OGTT can also be considered to undertake as different health promotional activities.

The studied population has dual burden of disease as evidenced by high prevalence of under-nutrition and anaemia and emergence of impaired glucose tolerance comparatively at a lower age bracket; indicating the need for quality nutritional counselling for all pregnant women and improvement of nutritional status during pre-pregnancy state. Targeting the adolescent group from nutrition intervention may prove fruitful. To avoid adverse pregnancy outcome of gestational diabetes establishment of diabetes screening at the peripheral level is also essential along with improved delivery and newborn care facilities at all primary health centres. Though iron folic acid supplementation programme is on-going anaemia status is worsening as pregnancy advances as evidenced by repeated measures ANOVA test, which indirectly may indicate the need for improving the quality and compliance of IFA tablets.

According to administrative data the pregnancy registration in the studied population during the period of study was 93% indicating better accessibility of services in the area and better representation and generalizability of our study findings.

5. Conclusions

There is increased maternal and foetal morbidity in terms of caesarean section rate, admission to NICU among women who had GDM during pregnancy. To determine whether there is an effect of treatment, a randomized study is needed. On the other hand higher prevalence of anaemia and under

nutrition amongst people living in rural areas of Assam also needs urgent attention.

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Conflicts of interest

All authors have none to declare.

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Observations on community associated methicillin resistant *Staphylococcus aureus* carriage

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ABSTRACT

Background & Objectives: Community associated methicillin resistant *Staphylococcus aureus* (CA-MRSA) infections are becoming increasingly important. Present study was conducted to know CA-MRSA prevalence in apparently healthy individuals, colonization sites and antibiotic susceptibility pattern.

Methods: It was a prospective, hospital based study in which 200 healthy individuals (accompanying the patients attending outdoor services at a tertiary care center) with no history of recent hospitalization/surgery, and antibiotic intake were randomly enrolled as study subjects. A total of 600 samples one each from nose, throat and axilla, were collected. 100 admitted patients were enrolled as controls to look for acquisition of hospital acquired MRSA (HA-MRSA).

Results: A total of 204 *S. aureus* isolates were recovered from 116 subjects in the study group; maximum yield was from throat, followed by anterior nares. Of these, 41.2% (84/204) were MRSA as detected by oxacillin MIC by agar dilution method. Over all CA-MRSA colonization at one or more body sites was found in 23.5% (47/200) of study subjects. The antibiotic susceptibility testing showed 25% of CAMRSA to be resistant to clindamycin.

Interpretation and conclusions: A considerably high proportion of the population (23.5%) in study group was colonized with CA-MRSA and throat was the commonest site for both *S. aureus* and MRSA carriage.

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