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Association among Cases of Pregnancy Weight Gain, Gestational Diabetes Mellitus and Neonatal Delivery Outcomes at Mama Lucy Kibaki Hospital, Nairobi City

Gabriel Muswali[1], Rosebella Onyango[1], Bernard Guyah[2], Walter Otieno[3]

[1]Department of Public Health, School of Public Health and Community Development, Maseno University, Kisumu, Kenya
[2]Department of Biomedical Sciences & Technology, School of Public Health and Community Development, Maseno University, Kisumu, Kenya
[3]School of Medicine, Maseno University, Kisumu, Kenya
Email: gmuswali@gmail.com

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Abstract

Background: Gestational Weight Gain and Gestational Diabetes Mellitus are interrelated and are also closely associated with adverse neonatal deliveries namely macrosomia and preterm births. However, available literature does not shed light on comparison between the magnitude of adverse newborn outcomes associated with GDM and GWG together on one hand and GWG only on the other hand in women of various BMI in Kenya. Consequently, this study investigated the association among the cases of GWG, GDM and neonatal outcomes in women of various BMI attending antennal care and eventually delivering at Mama Lucy Kibaki Hospital in Nairobi, Kenya. **Method:** This panel longitudinal study was undertaken from January to July, 2019 and it involved prospective tracking of gestational weight gain, gestational diabetes mellitus and the associated neonatal deliveries (macrosomia and preterm births) in 337 pregnant women of various BMIs. The women in their fifth gestational month were recruited into the project at Mama Lucy Kibaki Hospital during the antenatal visit and followed up to the delivery stage. During the follow up and delivery stage, data on gestational weight gain and details of the delivery were collected. Two sets of data were collected; one set of women with excessive GWG, GDM and associated neonatal deliveries and another set (of women) with neonatal outcomes but without excessive GWG and GDM. The data were analyzed through bivariate logistic regression which involved determining crude and adjusted odds of neonatal births (macrosomia and preterm) births occurring in the presence and absence of excessive GWG and GDM in women of various BMIs. **Results:** There was no association among cases of excessive GWG in women of underweight (AOR =

3.326; 95% CI: 0.519 - 21.318; p = 0.205) and normal weight (AOR = 0.470; 95% CI: 0.150 - 1.467; p = 0.194) BMI on one and neonatal deliveries on the other hand. However, there was significant relationship among cases of excessive GWG in women with overweight (AOR = 0.192; 95% CI: 0.074 - 0.500; p = 0.001) and obese BMI (AOR = 0.501; 95% CI: 0.267 - 0.939; p = 0.031) on one hand and neonatal deliveries on the other hand. Excessive GWG and GDM are good predictors of adverse neonatal outcomes in overweight and obese women and not in women of underweight and normal BMI.

Subject Areas

Women's Health

Keywords

Excessive GWG, GDM, Neonatal Deliveries, Macrosomia and Preterm Births

1. Introduction

1.1. Background Information

Gestational Weight Gain and Gestational Diabetes Mellitus are interrelated and are also associated with adverse neonatal deliveries namely macrosomia and preterm births. In this relationship, the GWG is assessed either singly or in the presence of GDM. A few studies have investigated independent effect of gestational weight gain leading to obesity and maternal hyperglycemia and pregnancy outcome. Investigation of gestational weight gain and the risk of gestational diabetes mellitus, found that excess gestational weight gain complicates a large number of pregnancies and is highly correlated with maternal overweight and obesity as well as the development of GDM [1] [2] [3]. Further, it was established that patients with the GWG below 5 kg (mean, 3.7 kg) had lower rates of the LGA, preterm birth, and perinatal morbidity compared with those with an average GWG of 12 kg, after adjusting for pre-pregnancy BMI [4]. Independent effect of GDM on neonatal deliveries is also recognized. The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study of 2008 remains the most acknowledged one in establishing the link between hyperglycemia and adverse neonatal and maternal deliveries. Another study establishes that offspring born to GDM mothers with pre-pregnancy over-weight/obesity or excessive GWG is associated with increased risks of large for gestational age and macrosomia at birth [5]. Despite Kenya having increasing cases of obesity and GDM, there are no studies that have been conducted in the country to interrogate newborn outcomes that are associated with GDM together with GWG on one hand and GWG on the other hand.

1.2. Study Objective

The study investigated the association among the cases of GWG, GDM and as-

sociated neonatal outcomes in women of various BMI at Mama Lucy Kibaki Hospital in Nairobi Kenya.

1.3. Rationale

Establishing strong positive association among the cases of GWG, GDM and neonatal outcomes in women of various BMI will provide evidence for healthcare workers to use GWG and GDM at antenatal care stage as indictors of adverse pregnancy and delivery outcomes. Hence, the health care workers will mobilize specialized medical expertise and other resources to manage the resultant conditions in time.

2. Methodology

2.1. Study Design

This was a prospective panel longitudinal study undertaken from January to July 2019 at Mama Lucy Kibaki Hospital; a level five hospital in Nairobi city, Kenya. During the study, the gestational weight gain, gestational diabetes mellitus and their attendant neonatal deliveries (macrosomia and preterm births) in 337 expectant women of various BMI were tracked. The women were recruited in the fifth gestational month (second trimester) during their antenatal care visits and followed till delivery time.

2.2. Inclusion and Exclusion Criteria

The study included nulliparous, primiparous and multiparous women with singleton pregnancies. However, expectant women with pre-existing diabetes mellitus (type 1 or type 2) and chronic illnesses or medication that could influence glucose metabolism were excluded from the study.

2.3. Sample Size Determination and Sampling Methods

The study sample size was determined using the Fisher's formula; $nf = n/(1 + n/N)$ applied to a population of less than 10,000. The antenatal care records at Mama Lucy Kibaki Hospital showed that there were 156 pregnant women with risk factors for GDM in a population of 4488 women served per year. Hence, (n) and (N) were equivalent to 156 and 4488 respectively. After adjustment of the sample size to cater for drop-out cases, the final sample size of expectant women was 337, taking into account women without risk factors as a comparison group. Since the 337 women could not be found in one antenatal clinic attendance, systematic sampling method was employed on a rolling basis until the determined sample size (of 337) was finally reached.

2.4. Data Collection Tools

Questionnaire and document content review guide (see annex) were used to collect data. The questionnaire was used to collect data during the recruitment and follow-up stages while the document content analysis guide was used to extract

data from the delivery records at the delivery stage. The tools were developed by the researcher and reviewed by the research supervising professors at the Schools of Public Health and Medicine at Maseno University, Kenya to maximize content and construct validity. Maximizing content validity entailed addressing sampling validity. In sampling validity, the researcher ensured that the instrument adequately sampled the content population of the property measured. This was achieved through analysis of the content population on GWG, GDM, delivery outcomes to determine if the instruments adequately sampled pertinent issues on the subject content. Similarly, in construct validity, the researcher and his supervisors interrogated the extent to which the research tools predicted meaningful traits in the variables under investigation.

In enhancing reliability, pretest was carried out. A test-retest method was used to enhance the reliability of the results. This method involved a research instrument being administered to the same group of respondents at two different times and the correlation between the two sets of scores computed. This was done during the pretest of the research tools on 30 study participants at Mama Lucy Kibaki Hospital. Cronbach Apha coefficient was used to assess the acceptable level of internal consistency. The Apha value of not less than 0.7 was acceptable for the internal consistency of the items. The test-retest method was reinforced by other methods; the split-half method which involved splitting the research items into two; even numbered and odd-numbered items. The two sets were scored separately and then correlated to obtain an estimate of reliability during the pretest process. Based on the pretest, some question items were fine-tuned while others were dropped due to the challenge of feasibility.

2.5. Data Collection

Data collection took place at three stages namely recruitment; follow-up and delivery stages. At the recruitment stage which took place at antenatal care unit, data were collected using a questionnaire. The data collected included study participants' last BMI before pregnancy. During the follow-up stage data were collected using weighing machine and document review and interview guide. The data collected included GWG and the results of the GDM test. During the delivery stage, the delivery details were documented. These included sex and weight of the newborn, and whether it was term or preterm delivery. The researcher followed the participants until the 8th month. From that point, the researcher took the details of the delivery dates for purposes of follow-up at the maternity unit. He also took the name of the participant and recorded it against the participants' research identity code. This was to enable the researcher to trace the name of the participant in the delivery book and extract data on their respective delivery details.

2.6. Data Analysis

The study generated two sets of data; one set of women with excessive GWG

in the presence of GDM and the associated delivery outcomes. Another set of women with delivery outcomes associated with absence of excessive GWG and GDM.

Descriptive data analysis involved summarizing data into frequencies and percentages of cases of Gestational weight Gain and Gestational Diabetes Mellitus and associated newborn outcomes (normal and adverse outcomes). Inferential analysis involved employing binary (bivariate) logistic regression to compare the delivery outcomes from women with excessive GWG and GDM with delivery outcomes from the women without the two conditions (excessive GWG and GDM) under various BMIs. This involved determining crude odds and adjusted odds that adverse neonatal (macrosomia and preterm) births occurred given the presence of excessive pregnancy weight gain and gestational diabetes mellitus compared to the odds of the adverse neonatal births occurring in the absence of excessive pregnancy weight gain and gestational diabetes mellitus at p value of 0.05.

3. Results

3.1. Socio-Demographic Profile of Study Participants

The socio-demographic characteristics of the study participants were; Ethnicity, Education, Age, Parity and Height. There were 118(35%) study participants of Kikuyu ethnic extraction and 43 (12.8%) of Luhya ethnicity. Participants of Luo tribe were 60 (17.8%) while those of Kamba ethnicity were 64 (19%). Participants from other ethnic groups in Kenya were 52 (15.4%).

There were 49 (14.5%) participants who had either not attended school or had primary school level of education. There were 177 (52.5%) participants with secondary level of education while those with middle college and university levels of education were 81 (24.0%) and 30 (8.9%) respectively.

There were 144 (42.7%) study participants aged 18-24 years while those falling within the age range of 25-34 were 158 (46.9%). The participants falling within the age range of 35-49 years were 34 (10.1%).

Most of the study participants (161; 47.8%) were nulliparous (had not given birth before) while those who had given birth once (primiparous), were 108 (32%). The study participants who had delivered twice and thrice were 46 (13.6%) and 18 (5.3%) respectively. There were 4(1.2%) study participants who had delivered four times and above.

- The study participants were of various height categories. A paltry 3 (0.9%) were of 130-149cm height category while majority, 262 (77.7%), were of 150-169 cm height range. The third category of height range of 170-189 cm had 72 (21.4%) study participants (Table 1).

3.2. Gestational Weight Gain and Neonatal Delivery Outcomes

The study established that participants who gained underweight BMI's excess GWG had 2 (22.2%) adverse deliveries namely macrosomia and preterm births

Table 1. Socio-demographic characteristics of study participants.

	Socio-demographic Characteristic	n (%)
i.	**Ethnicity**	
-	Kikuyu	118 (35)
-	Luhya	43 (12.8)
-	Luo	60 (17.8)
-	Kamba	64 (19)
-	Others	52 (15.4)
ii.	**Education**	
-	Not been to school and primary school level	49 (14.5)
-	Secondary school level	177 (52.5)
-	Middle Level College	81 (24.0)
-	University	30 (8.9)
iii.	**Age**	
-	18 - 24	144 (42.7)
-	25 - 34	158 (46.9)
-	35 - 49	34 (10.1)
iv.	**Parity**	
-	Zero; Nulliparous	161 (47.8)
-	One: Primiparous	108 (32)
-	Two: Multiparous	46 (13.6)
-	Three: Multiparous	18 (5.3)
-	Four and above: Grandpara	4 (1.2)
v.	**Height**	
-	130 - 149 cm	3 (0.9)
-	150 - 169 cm	262 (77.7)
-	170 - 189 cm	72 (21.4)

compared to 7 (77.8%) normal births. The relationship among underweight BMI's excessive GWG and macrosomia and preterm births was not significant (AOR = 3.326; 95% CI: 0.519 - 21.318; p = 0.205).

The study women who gained normal weight BMI's excessive GWG had 14 (66.7%) macrosomia and preterm births compared to 7 (33.3%) normal deliveries. The association between excessive GWG for normal weight BMI and macrosomia and preterm deliveries was not significant (AOR = 0.470; 95% CI: 0.150 - 1.467; p = 0.194).

The study participant who gained overweight BMI's excess GWG registered 16 (69.6%) macrosomia and preterm births compared to 7 (30.4%) normal deli-

veries. The bivariate analysis established that excessive GWG for overweight BMI was significantly related to macrosomia and preterm births (AOR = 0.192; 95% CI: 0.074 - 0.500; p = 0.001).

Among the study women who gained obese BMI's excessive GWG, there were 42 (47.7%) macrosomia and preterm births as well as 46 (52.3%) normal deliveries. The relationship between obese BMI's excessive GWG and macrosomia and preterm births was significant (AOR = 0.501; 95% CI: 0.267 - 0.939; p = 0.031).

In the presence of GDM, there were 45 (70.3%) macrosomia and preterm births as well as 19 (29.7%) normal deliveries by the study participants. Gestational Diabetes Mellitus was found to be independently associated with macrosomia and preterm births (AOR = 0.147; 95% CI: 0.078 - 0.280; p = 0.0001) (Table 2).

- Cases were adverse neonatal deliveries while controls were normal deliveries.

3.3. Gestational Weight Gain Co-Occurring with GDM and Neonatal Delivery Outcomes

The study participants who gained excessive GWG for underweight BMI and

Table 2. Association between cases of gestational weight gain and neonatal deliveries.

Predictor Variable	Cases n (%)	Cont. n (%)	COR (95% CI)	p-value	AOR (95% CI)	p-value
Gestational Weight Gain by Pre-pregnancy BMI						
Underweight Excess GWG	2 (22.2)	7 (77.8)	1.513 (0.309 - 7.413)	0.609	3.326 (0.519 - 21.318)	0.205
Underweight Not Excess GWG	99 (30.2)	229 (69.8)	Ref.			
Normal weight's Excess GWG	14 (66.7)	7 (33.3)	0.190 (0.074 - 0.486)	0.001	0.470 (0.150 - 1.467)	0.194
Normal weight's Not Excess GWG	87 (27.5)	229 (72.5)	Ref.			
Overweight's Excess GWG	16 (69.6)	7 (30.4)	0.162 (0.065 - 0.408)	0.0001	0.192 (0.074 - 0.500)	0.001
Overweight's Not Excess GWG	85 (79.4)	22 (20.6)	Ref.			
Obese Excess GWG	42 (47.7)	46 (52.3)	0.340 (0.204 - 0.566)	0.0001	0.501 (0.267 - 0.939)	0.031
Obese Not Excess GWG	59 (23.7)	190 (76.3)	Ref.			
Gestational Diabetes Mellitus (GDM)						
GDM Present	45 (70.3)	19 (29.7)	0.109 (0.059 - 0.201)	0.0001	0.147 (0.078 - 0.280)	0.0001
GDM Absent	56 (20.5)	217 (79.5)	Ref.			

also developed GDM, had 4 (50%) macrosomia and preterm births and equal number of normal deliveries. The concurrent presentation of underweight BMI excessive GWG and GDM was not significantly associated with macrosomia and preterm births in study women (AOR = 1.149; 95% CI: 0.205 - 6.450; p = 0.874). Among the study women with co-occurrence of normal weight BMI's excessive GWG and GDM, there were more macrosomia and preterm births (9; 90.0%) than normal delivery (1; 10.0%). The bivariate regression analysis established significant relationship between co-occurrence of normal weight BMI's excessive GWG and GDM on one hand and macrosomia and preterm births on the other hand (AOR = 0.050; 95% CI: 0.006 - 0.412; p = 0.005).

The study women with excessive GWG for overweight BMI co-occurring with GDM had 11 (84.6%) macrosomia and preterm births as well as 2 (15.4%) normal births. There was significant relationship between the excessive GWG for overweight BMI co-occurring with GDM on one hand and delivery outcomes namely macrosomia and preterm births on the other hand (AOR = 0.093; 95% CI: 0.019 - 0.445; p = 0.003). The study women with excessive GWG for obese BMI and GDM at the same time had 23 (85.2%) macrosomia and preterm deliveries. Similarly, the study women had 4 (14.8%) normal births. Bivariate analysis established significant relationship between excessive GWG for obese BMI co-occurring with GDM on one hand and adverse deliveries namely macrosomia and preterm births on the other hand (AOR = 0.065; 95% CI: 0.022 - 0.199; p = 0.0001) (**Table 3**).

- Cases were adverse neonatal deliveries while controls were normal deliveries.

4. Discussions

The present study established that excessive pregnancy weight gain by women of pre-pregnancy overweight and obese BMIs was positively associated with macrosomia and preterm deliveries. (AOR = 0.192; 95% CI: 0.074 - 0.500; p = 0.001) for overweight BMI and (AOR = 0.501; 95% CI: 0.267 - 0.939; p = 0.031) for obese BMI. Similarly, the study found that GDM was independently associated with macrosomia and preterm births by study participants (AOR = 0.147; 95% CI: 0.078 - 0.280; p = 0.0001). Further, the co-occurrence of excessive GWG and GDM in pre-pregnancy overweight and obese BMI were also positively associated with the neonatal outcomes (AOR = 0.093; 95% CI: 0.019 - 0.445; p = 0.003) for overweight BMI and (AOR = 0.065; 95% CI: 0.022 - 0.199; p = 0.0001 for obese BMI) respectively.

The association among excessive GWG, GDM and macrosomia may be partly explained by the linkage of baseline maternal BMI and GWG with changes in the hormonal milieu, including insulin resistance by the expectant women. This leads to increased availability of sugar that is, in turn, taken up by the fetus, leading to overgrowth/macrosomia condition. On the other hand GDM is associated with pre-eclampsia which is the driving factor for preterm births.

Table 3. Association among cases of gestational weight gain co-occurring with gestational diabetes mellitus and neonatal delivery outcomes.

Predictor Variable GWG co-occurring with GDM	Cases n (%)	Cont. n (%)	COR (95% CI)	p-value	AOR (95% CI)	p-value
Underweight Excess GWG + GDM Present	4 (50)	4 (50)	0.418 (0.102 - 1.706)	0.224	1.149 (0.205 - 6.450)	0.874
Underweight Excess GWG + GDM Absent	97 (29.5)	232 (70.5)	Ref.			
Normal weight Excess GWG + GDM Present	9 (90)	1 (10)	0.043 (0.005 - 0.348)	0.003	0.050 (0.006 - 0.412)	0.005
Normal weight Excess GWG + GDM Absent	92 (28.1)	235 (71.9)	Ref.			
Overweight Excess GWG + GDM Present	11 (84.6)	2 (15.4)	0.070 (0.015 - 0.322)	0.001	0.093 (0.019 - 0.445)	0.003
Overweight Excess GWG + GDM Absent	90 (27.8)	234 (72.2)	Ref.			
Obese Excess GWG + GDM Present	23 (85.2)	4 (14.8)	0.058 (0.020 - 0.174)	0.0001	0.065 (0.022 - 0.199)	0.0001
Obese Excess GWG + GDM Absent	78 (25.2)	232 (74.8)	Ref.			

The association among excessive GWG, GDM and macrosomia in the current study is confirmed by various previous studies. High GWG is linearly correlated with macrosomia and excessive birth weight [6] [7] [8]. One cohort study reported that if a mother's body mass index increased by 25% or more during pregnancy, 86.2% of the babies had macrosomia; thus, a high GWG was demonstrated to result in macrosomia [9].

Another study reports that risk factors for macrosomia include maternal obesity or overweight, diabetes or gestational diabetes mellitus, excessive weight gain during pregnancy, post-term pregnancy, and male sex [10]. Similarly, it has been shown that maternal weight gain above 16 kg during pregnancy is a risk factor for macrosomia delivery (OR 10.2, 95% CI 4.5 - 22.9) [11]. This has already been observed by some authors as reported in [12] [13] [14].

Further, maternal complications may be positively associated with macrosomia birth outcome as demonstrated in some studies [15] [16]. Most studies show that gestational diabetes mellitus and maternal weight gain during pregnancy are strong predictors of macrosomia [10] [16]-[24]. The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study of 2008 also agrees to the findings of the present study. HAPO establishes a link between hyperglycemia and a number of delivery outcomes including macrosomia and preterm births.

With respect to preterm births, there is concurrence and contrast between the present study and the previous ones on the association of excessive GWG (underweight, normal weight, overweight, obesity), GDM and the said births. Glo-

bally, around 10% - 11% of all births, or about15 million births per year, are estimated to be preterm [25] [26].

In the present study, excessive GWG is reported to be associated with preterm births. However, this contrasts the previous studies which indicate that preterm births are associated with low GWG irrespective of pre-pregnancy BMIs and that increasing GWG reduces the risks of preterm births. The following are the studies with contrasting evidence.

Low weight gain is known to be associated with preterm birth [27] [28] and with infant death during the first year after birth [29] [30]. Two large meta-analyses focusing on less severe adverse birth outcomes show elevated rates of Large-for-Gestational-Age and macrosomia in women with excess weight gain in all pre-pregnancy BMI categories, and elevated rates of Small-for-Gestational-Age in women with low weight gain [31] [32]. Further, an increased risk of preterm birth in association with low BMI has been described in the UK and elsewhere as an independent factor alongside social deprivation and smoking [33].

A study in Gaza Strip, Israel, established a higher total weight gain among cases than controls, meaning that adequate/normal weight gain during pregnancy decreases the risk of having a preterm birth regardless of the pre-pregnancy body mass index (BMI) [34]. This position is supported by a study which shows that the risk of preterm delivery is reduced by an adequate rate of weight gain during pregnancy even if the mother was underweight before pregnancy [35].

In women with low GWG, the increased risk of preterm birth could be associated with spontaneous labor or premature rupture of uterine membranes. Hence, preterm birth occurs both in cases of excessive GWG as is the case in the current study and in low GWG as has been elucidated in a number of previous studies. What is different in these two cases is the mechanism responsible for the resultant preterm births.

The current study concurs with some previous ones on the association between GDM and preterm births. GDM has been identified as a predisposing factor for preterm birth [36]. The association between diabetes and preterm births is further confirmed by other studies [31] [32]. Moreover, the HAPO study confirms association between hyperglycemia (GDM) and preterm births [37].

5. Study Limitations

Some of the study participants dropped out of the study particularly in the eighth gestational month due to fatigue. However, this did not adversely affect the study because the sample size had taken care of possible drop-outs. Further, during data collection, nurses at Mama Lucy Kibaki Hospital went on strike on two occasions, leading to suspension of the exercise. Eventually, the data collection process took longer than planned.

6. Conclusion

Excessive GWG and GDM are good predictors of neonatal outcomes namely macrosomia and preterm births owing to the association among them. Owing to the said association, health workers should intensify monitoring of the pregnancies and deliveries of women who gain excessive GWG and/or develop GDM and counsel them to minimize exposure to the said risks.

Conflicts of Interest

The authors declare no conflicts of interest.

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Appendix: Data Collection Tools

A: Baseline Demographic Data for Expectant Women

The following demographic data will be collected from every member of a cohort of women recruited at the beginning of the study.

1) Respondent Identification Information

a) Cohort identification number:_____

b) Project Personal Identification Number of the expectant woman:_____

2) Identification Information for Research Assistant

a) Name of research assistant:_____

b) Date of data collection:_____

3) Demographic and Bio-Profiles of Respondent

No.	Research Item	Tick/circle one digit that represents the correct response			
1.	**Age bracket (in completed years)**	**1** 18 - 22	**2** 23 - 27	**3** 28 - 32	**4** 33 - 37
2.	**Parity**	**1** Nulliparous	**2** Primiparous	**3** Multiparous	
3.	**Ethnicity**	*Indicate here*: _____			
4.	**Formal educational level reached**	**1** None-Primary	**2** Secondary	**3** College	**4** University
5.	**Pre-pregnancy BMI**	**1** Underweight	**2** Normal	**3** Overweight	**4** Obese
6.	**Trimester at the first ANC visit**	**1** First	**2** second	**3** Third	
7.	**Weight (in Kgs) at first ANC visit**	*Indicate here*: _____			

B: Data collection during GDM screening:

1) Screening pregnant women for GDM and associated management of the condition

No.	Research Question/Item	Tick/circle the digit that represents the correct response/Complete space provided				
1	Are you aware of a condition known as GDM?	**1** **Yes**			**2** **No**	
2	Gestational week at which GDM screening was done	**1** **28th week**	**2** **29th week**	**3** **30th week**	**4** **31st week**	**5** **32nd week**
3	Results of screening for GDM					

a) Follow-up on gestational/pregnancy weight gain per month: document content analysis guide

No.	Research Item	Tick/circle the digit that represents the correct response				
1	**Pregnancy weight gain (in Kgs) per month**	**1**	**2**	**3**	**4**	**5**
		0 - 2 kgs	3 - 5 kgs	6 - 8 kgs	9 - 11 kgs	Above 11 kgs

b) D: Delivery process and delivery outcomes document content analysis guide

No.	Research Item/Question	Tick/circle the digit that represents the correct response	
1	Nature of delivery	**1**	**2**
		Normal	Cesarean section
2	Sex of the newborn	**1**	**2**
		Male	Female
3	Macrosomia (*Newborn over 4000 g*)	**1**	**2**
		Yes	No
4	Neonate born alive	**1**	**2**
		Yes	No
5	Normal Neonate/newborn	1	2
		Yes	No
6	Neonate was still-born	**1**	**2**
		Yes	No
7	Neonate was pre-term	**1**	**2**
		Yes	No
10	Neonate mal-presentation during delivery	**1**	**2**
		Yes	No