East African Journal of Health and Science, Volume 6, Issue 1, 2023
Article DOI: https://doi.org/10.37284/eajhs.6.1.1092

East African Journal of Health and Science
eajhs.eanso.org
Volume 6 Issue 1, 2023
Print ISSN: 2707-3912 | Online ISSN: 2707-3920
Title DOI: https://doi.org/10.37284/2707-3920

EAST AFRICAN NATURE & SCIENCE ORGANIZATION

Original Article

Association among Cases of Women with first degree Family History of Diabetes Mellitus, Previous Macrosomia and Preterm Births, and Pregnancy Weight Gain at Mama Lucy Kibaki Hospital, Nairobi City

Gabriel Muswali[1*], *Rosebella Onyango*[1], *Bernard Guyah*[1] *& Walter Otieno*[1]

[1] Maseno University, P. O. Box 3275-40100, Kisumu, Kenya.
*Author for correspondence email: gmuswali@gmail.com

Article DOI: https://doi.org/10.37284/eajhs.6.1.1092

Date Published:

14 February 2023

Keywords:

Family History of Diabetes Mellitus, History of Macrosomia Births, History of Preterm Births, Gestational Weight Gain.

ABSTRACT

Background: Weight gain during pregnancy is of great concern for most women and obstetricians because of its possible consequences. This concern exists because gestational weight gain that exceeds what is recommended by the Institute of Medicine is associated with many maternal and fetal complications. While excessive gestational weight gain (GWG) is associated with modifiable risk factors for Gestational Diabetes Mellitus (GDM) notably, obesity and overweight conditions, there is a paucity of information on the association of cases of excessive GWG with non-modifiable risk factors (NMRF) for GDM namely history of diabetes mellitus in the first-degree family members as well as previous macrosomia and preterm deliveries. **Method**: The study prospectively monitored GWG in 337 women with a history of diabetes mellitus in first-degree family members as well as previous macrosomia and preterm deliveries. Data collected was analysed through bivariate regression to determine the odds of excessive GWG in the presence and absence of each of the three non-modifiable risk factors. **Results**: The non-modifiable risk factors of women of all BMIs were not found to be significantly associated with excessive GWG. For instance, a family history of DM in obese women was not associated with excessive GWG (P = 0.254; AOR = 0.715; 95%CI: 0.401-1.272). History of macrosomia in obese women was also not statistically significant (P = 0.973; AOR = 1.015; 95% CI: 0.429-2.402). Similarly, history of preterm births in obese women was not significantly associated with excessive GWG (P = 0.778; AOR = 0.902; 95%CI: 0.441-1.847). **Conclusion**: History of macrosomia and preterm births as well as family history of Diabetes mellitus cannot serve as predictors for excessive GWG because there is no association among them and excessive GWG by women of all BMIs.

Article DOI: https://doi.org/10.37284/eajhs.6.1.1092

APA CITATION

Muswali, G., Onyango, R., Guyah, B. & Otieno, W. (2023). Association among Cases of Women with first degree Family History of Diabetes Mellitus, Previous Macrosomia and Preterm Births, and Pregnancy Weight Gain at Mama Lucy Kibaki Hospital, Nairobi City *East African Journal of Health and Science, 6*(1), 1-8. https://doi.org/10.37284/eajhs.6.1.1092.

CHICAGO CITATION

Muswali, Gabriel, Rosebella Onyango, Bernard Guyah and Walter Otieno. 2023. "Association among Cases of Women with first degree Family History of Diabetes Mellitus, Previous Macrosomia and Preterm Births, and Pregnancy Weight Gain at Mama Lucy Kibaki Hospital, Nairobi City". *East African Journal of Health and Science* 6 (1), 1-8. https://doi.org/10.37284/eajhs.6.1.1092.

HARVARD CITATION

Muswali, G., Onyango, R., Guyah, B. & Otieno, W. (2023) "Association among Cases of Women with first degree Family History of Diabetes Mellitus, Previous Macrosomia and Preterm Births, and Pregnancy Weight Gain at Mama Lucy Kibaki Hospital, Nairobi City", *East African Journal of Health and Science*, 6(1), pp. 1-8. doi: 10.37284/eajhs.6.1.1092.

IEEE CITATION

G. Muswali, R. Onyango, B. Guyah & W. Otieno, "Association among Cases of Women with first degree Family History of Diabetes Mellitus, Previous Macrosomia and Preterm Births, and Pregnancy Weight Gain at Mama Lucy Kibaki Hospital, Nairobi City", *EAJHS*, vol. 6, no. 1, pp. 1-8, Feb. 2023.

MLA CITATION

Muswali, Gabriel, Rosebella Onyango, Bernard Guyah & Walter Otieno. "Association among Cases of Women with first degree Family History of Diabetes Mellitus, Previous Macrosomia and Preterm Births, and Pregnancy Weight Gain at Mama Lucy Kibaki Hospital, Nairobi City". *East African Journal of Health and Science*, Vol. 6, no. 1, Feb. 2023, pp. 1-8, doi:10.37284/eajhs.6.1.1092.

INTRODUCTION

Weight gain in pregnancy is of great concern for most women and obstetricians because of its possible consequences. This concern exists because gestational weight gain that exceeds what is recommended by the Institute of Medicine (IOM, 2009) is associated with many complications, both maternal and foetal (Andreto *et al.*, 2006; Costa *et al.*, 2006). The recommended total weight gain ranges for various pre-pregnancy Body Mass Index (BMI) are as follows; Underweight (12.5kg-18.0kg); Normal weight (11.5kg-16.0kg); Overweight (7.0kg-11.5kg); Obese (5.0kg-9.0kg).

One of the risk factors of excessive Gestational Weight Gain (GWG) is Gestational Diabetes Mellitus (GDM). Both GDM and excessive GWG share modifiable risk factors which include obesity, diabetes mellitus (type 1 and 2), physical activity and smoking. Studies have been able to establish link between modifiable risk factors for GDM and excessive GWG. For instance, it has been shown that healthy nulliparous women with excessive GWG are more likely to be obese or overweight before pregnancy compared to women with normal BMI (Restall et al., 2014). Other modifiable risk factors for GDM independently associated with excessive GWG in the study by Restall et al., (2014) were increasing maternal birth weight, cessation of smoking by 14–16 weeks, increased nightly sleep duration, high seafood diet and decreasing exercise by 14–16 weeks.

Besides the modifiable risk factors, there are common with non-modifiable risk factors (NMRF) for GDM, among them, history of diabetes mellitus in the first-degree family members as well as previous macrosomia and preterm deliveries. From the literature reviewed, these risk factors are interrelated and their pool keeps growing from new cases of obesity, diabetes mellitus, macrosomia and preterm deliveries.

The relationship between NMRF for GDM and GWG has similarly been investigated although not as extensively as in the case of modifiable risk factors. The studies largely focused on the association of GWG with age and parity as NMRF of interest. However, there is scanty published

Article DOI: https://doi.org/10.37284/eajhs.6.1.1092

information on the association among the GWG and the three NMRF namely; history of diabetes mellitus in the first-degree family members as well as previous macrosomia and preterm deliveries particularly in Kenyan women. This study is therefore to investigate cases of excessive GWG associated with cases of family history of diabetes mellitus and history of macrosomia and preterm births in women who deliver at Mama Lucy Kibaki Hospital. The study is guided by the hypothesis that pregnant women of all BMIs with family history of Diabetes Mellitus and history of macrosomia and preterm births are more likely to gain excessive gestational weight than their counterparts without these three risk factors.

METHODOLOGY

Study Design

This was a prospective panel study that investigated cases of excessive GWG as well as GWG within and less than IOM recommended ranges in women of various BMIs with and without one or more of the three Non-Modifiable Risk factors namely; Family history of diabetes mellitus and history of macrosomia and preterm births at Mama Lucy Kibaki Hospital. The study worked with a sample size of 337 women of singleton pregnancy, nulliparous, primiparous, and multiparous status. Women with pre-existing diabetes mellitus (type 1 or type 2) and with chronic illnesses or on medication that could influence glucose metabolism were excluded from the study.

Data Collection Tools

Document content review guide was used to extract relevant information from the Antenatal clinic (ANC), medical and delivery records of study participants. The information extracted included; sex of the neonate, type of delivery (caesarean, vaginal and mal-presentation), whether neonate was macrosomia or not, preterm or term births. Further, Questionnaire was used to collect quantitative data from the study participants on socio-demographic profile and personal information which included ethnic tribes, education levels, parity, age and pre-pregnancy BMI, and date of the next antenatal care visits. Weighing machine was used to weigh the expectant women during the ANC visit so as to determine the gestational weight gain.

Data Collection

Data collection took place at three stages namely recruitment stage; follow-up stage, and delivery stage. At recruitment stage, questionnaire was used to collect data on study participants' last BMI before pregnancy, their parity, age, whether or not the participant had NMRF and the specific one(s) as well as the date of the next ANC visit.

A weighing machine was used to collect data on GWG during the follow-up stage. Document review and interview guides were also used to collect data at this stage. During delivery stage data collected included; results of the GDM test, the last GWG and delivery details. The researcher followed the participants from the 5^{th} gestational month to the 8^{th} month. In the 8^{th} gestational month, 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 research identity code. This was to enable the researcher to trace the name of the participant in the delivery book and extract data on delivery details.

Data Analysis

Descriptive analysis involved classifying cases of weight gain into two according to IoM's criteria; that is; (i) weight gain within recommended IoM ranges together with weight gain below recommended IoM ranges; and (ii) weight gain in excess of recommended IoM range for various pre-pregnancy BMIs. The frequency of cases with various levels of weight gain at different pre-pregnancy BMIs was presented against associated non-modifiable risk factors. The inferential analysis involved determining crude and adjusted odds that excessive gestational weight gain occurred given

Article DOI: https://doi.org/10.37284/eajhs.6.1.1092

the presence of the three non-modifiable risk factors compared to the odds of the excessive gestational weight gain occurring in the absence of the said risk factor in a population.

RESULTS

History of Macrosomia Births

Cases of history of macrosomia births were not found to be significantly related with excessive GWG by women of all pre-pregnancy BMIs viz underweight, normal weight, overweight and obese BMI (*P* = 0.348; AOR = 0.200; 95%CI: 0.041-0.984; *P* = 0.575; AOR = 0.699; 95%CI: 0.200-2.444; *P* = 0.143; AOR = 0.436; 95% CI:0.144-1.325; *P* = 0.973; AOR = 1.015; 95% CI: 0.429-2.402 respectively). The study women of underweight BMI and with history of macrosomia births had 3(10.0) cases of excessive GWG compared to 27(90.0) cases with GWG that was within or less than IOM recommended ranges. Further, normal weight BMI women with the risk factor (history of macrosomia births) had 4(13.3%) cases of excessive GWG and 26(86.7%) cases of GWG within or less than IOM recommended ranges. There were 6(20%) cases of excessive GWG and 24(80%) incidents of GWG within or less than IOM recommended ranges for overweight BMI. Additionally, there were 10(33%) cases of excessive GWG and 20(67%) incidents of GWG within or less than IOM recommended ranges for obese BMI. Although the history of macrosomia births was not significantly associated with excessive GWG by all BMIs, it was found to be positively related with adverse neonatal and maternal delivery outcomes (*P* = 0.0001; AOR = 0.142; 95%CI: 0.062-0.327) and (*P* = 0.003; AOR = 0.226; 95%CI: 0.085-0.598) respectively. Similarly, family history of diabetes mellitus was found to associated with neonatal and maternal outcomes (*P* = 0.002; AOR = 0.416; 95%CI: 0.237-0.733) and (*P* = 0.032; AOR = 0.591; 95%CI: 0.333-1.0448) respectively (see table 1).

History of Preterm Births

The risk factor of previous unexplained/history of preterm births was not significantly associated with excessive GWG by pre-pregnancy BMIs viz normal weight, overweight and obese (*P* = 0.835; AOR = 0.874; 95%CI: 0.245-3.119; *P* = 0.979; AOR = 0.983; 95% CI:0.274-3.520; *P* = 0.778; AOR = 0.902; 95%CI: 0.441-1.847 respectively). The normal weight and overweight BMI women with the risk factor registered 3(7%) cases of excessive GWG and 40(93%) cases of GWG within and less than IOM recommended ranges. The obese BMI study participants registered 12(27.9%) cases of excessive GWG and 31(72.1%) incidents of GWG within and less than IOM recommended ranges (see table 4.3). The risk factor of previous unexplained/history of preterm births was not positively associated with adverse neonatal and maternal deliveries outcomes under investigation (*P* = 0.065; AOR = 0.527; 95% CI: 0.267-1.040) and (*P* = 0.666; AOR = 0.234; 95%CI: 0.341-1.301) respectively

Family History of Diabetes Mellitus

Family history of diabetes mellitus in the first degree family members of the study participants was not significantly associated with excess GWG for all BMIs; that is underweight, normal weight, overweight and obese BMIs (*P* = 0.482; AOR = 2.130; 95%CI:0.258-17.549; *P* = 0.848; AOR = 1.117; 95%CI 0.362-3.446; *P* = 0.688; AOR = 1.259; 95% CI:0.409-3.880, *P* = 0.254; AOR = 0.715; 95%CI: 0.401-1.272 respectively). The pre-pregnancy underweight study participants with history of diabetes mellitus in the first-degree family members registered 1(1.4%) case of excessive GWG compared to 69(98.6%) cases of weight gain that was within or lower than IOM recommended ranges. The women of pre-pregnancy normal weight and overweight BMI with family history of diabetes Mellitus had 4(5.7%) cases of excessive GWG compared to 66(94.3%) cases of weight gain that was within or lower than IOM

Article DOI: https://doi.org/10.37284/eajhs.6.1.1092

recommended ranges. However, women of obese BMI with family history of diabetes mellitus had more cases of excessive GWG than other BMIs; 22(31.4) and 48(68.6%) cases of GWG within or less than IOM recommended ranges. Although history of diabetes mellitus in the first-degree members of study participants was not significantly associated with excessive GWG by all pre-pregnancy BMIs, it was positively related with neonatal and maternal delivery outcomes (*P* = 0.002; AOR = 0.416; 95%CI:0.237-0.733) and (*P* = 0.032; AOR = 0.591; 95%CI: 0.333-1.0448) respectively (see *Table 1*).

Article DOI: https://doi.org/10.37284/eajhs.6.1.1092

Table 1: Association between Non-Modifiable Risk Factors and Excess Gestational Weight Gain

BMIs with Non-Modified Risk factors		Cases n(%)	Control n(%)	COR 95%(CI)	P-value	AOR95%(CI)	P-Value
History of Macrosomia							
Underweight	Present	3(10.0)	27(90.0)	0.179 (0.042- 0.758)	0.019	0.200 (0.041-0.984)	0.348
	Absent	6(2.0)	301(98.0)	Ref			
Normal weight	Present	4(13.3)	26(86.7)	0.381 (0.119-1.216)	0.103	0.699 (0.200-2.444)	0.575
	Absent	17(5.5)	290(94.5)	Ref			
Overweight	Present	6(20)	24(80)	0.234 (0.085-0.650)	0.005	0.436 (0.144-1.325)	0.143
	Absent	17(5.5)	290(94.5)	Ref			
Obese	Present	10(33)	20(67)	0.681 (0306-1.518)	0.348	1.015 (0.429-2.402)	0.973
	Absent	78(25.4)	229(74.6)	Ref			
History of Preterm Births							
Underweight	Present	0(0)	43(100)	-	-	-	-
	Absent	9(3.1)	285(96.9)	Ref			
Normal weight	Present	3(7)	40(93)	0.870 (0.245-3.085)	0.829	0.874 (0.245-3.119)	0.835
	Absent	18(6.1)	276(93.9)	Ref			
Overweight	Present	3(7)	40(93)	0.973 (0.277-3.424)	0.966	0.983 (0.274-3.520)	0.979
	Absent	20(6.8)	274(93.2)	Ref			
Obese	Present	12(27.9)	31(72.1)	0.901 (0.440-1.842)	0.774	0.902 (0.441-1.847)	0.778
	Absent	76(25.9)	218(74.1)	Ref			
Family History of Diabetes Mellitus							
Underweight	Present	1(1.4)	69(98.6)	2.131 (0.262-17.330)	0.479	2.130 (0.258-17.549)	0.482
	Absent	8(3)	259(97)	Ref			
Normal weight	Present	4(5.7)	66(94.3)	1.122 (0.365-3.447)	0.841	1.117 (0.362-3.446)	0.848
	Absent	17(6.4)	250(93.6)				
Overweight	Present	4(5.7)	66(94.3)	1.264 (0.416-3.843)	0.680	1.259 (0.409-3.880)	0.688
	Absent	19(17.1)	248(92.9)	Ref			
Obese	Present	22(31.4)	48(68.6)	0.716 (0.403-1.275)	0.257	0.715 (0.401-1.272)	0.254
	Absent	66(24.7)	201(75.3)	Ref			

NB/ Cases are women with Excessive Gestational Weight Gain: Controls are women with recommended and less than recommended Gestational Weight Gain.

Article DOI: https://doi.org/10.37284/eajhs.6.1.1092

DISCUSSIONS

The NMRF for GDM namely history of macrosomia, history of preterm births and family history of diabetes mellitus in the present study were found not to have significant relationship with cases of excessive GWG by all pre-pregnancy BMIs namely; underweight, normal weight, overweight and obese (See table 1). The finding could be attributed to the fact that there may be no physiological and/or genetic link among history of preterm birth, previous macrosomia births, family history of Diabetes Mellitus and the development of factors responsible for excessive GWG namely uterus and its contents (foetus, amniotic fluid, and placenta), breasts, blood, and interstitial fluid, increase in cellular water and deposition of new fat and proteins.

There is paucity of studies investigating the direct relationship between excessive GWG and each of the three NMRF namely; family history of diabetes mellitus as well as history of macrosomia and preterm births. However, some previous studies have instead assessed relationship among excessive GWG and different NMRF namely age and parity. The studies established results that contrast the current findings. According to Restall *et al*, (2014), women aged less than 25 years and 25–29 years are almost twice as likely while 60% of women aged 30–34 years, are more likely to gain above IOM guidelines compared to women aged 35 years or more. This is a clear demonstration of link between age and excessive GWG. Other studies on the relationship between age and excessive GWG reveal a similar trend. The studies establish that young mothers are at greater risk of exceeding GWG guidelines (Olafsdottir, *et al.,* 2006; Rodrigues *et al.,* 2010; Stuebe *et al.,* 2009) while older women tend to gain less weight during pregnancy (Abrams, *et al*., 1995; Rodrigues *et al.,* 2010; Stuebe *et al.,* 2009). Restall *et al*, (2014) attributes the unusual case of advanced maternal age being a protective factor against adverse outcome to poor anabolic response to pregnancy or alternatively older women being more disciplined regarding lifestyle choices. Similarly, a study by Wang *et al.,* (2019), investigating association among pre-pregnancy BMI, rates of GWG and delivery outcomes in women in Wuhan, China, established that excessive GWG is associated with multiparty (P = 0.001), another non-modifiable risk factor. This finding too diverges from that of the current study. The contrast between the findings of the present study and those of the previous ones may be attributed to the fact that maternal age as a non-modifiable risk factor may have direct influence on lifestyle choices that, in turn, have bearing on gestational weight gain. Moreover, maternal age and multi-parity may also have direct physiological or genetic influence on the development of factors responsible for excessive GWG.

CONCLUSIONS

History of macrosomia, history of preterm births and family history of Diabetes mellitus cannot serve as predictors for excessive GWG because there is no association between them and the excessive GWG by women of all BMIs. Therefore, these non-modifiable risk factors should not be used to predict the excessive GWG.

REFERENCES

Abrams, B., Carmichael, S., & Selvin, S. (1995). Factors associated with the pattern of maternal weight gain during pregnancy. *Obstetrics and Gynecology*, 86(2), 170–176.

Andreto, L. M., Souza, A.I., Figueiroa, J.N., &Cabral-Filho, J.E. (2006). Factors associated with excessive gestational weight gain among patients in prenatal care at a public hospital in Recife, Pernambuco, Brazil Republic. *Public Health*, *22*(11), 2401

Costa, B.M.F., Maldi, P.C., Gil, M.F., & Paulinelli, R.R. (2006). Determinant factors of excessive weight gain in eutrophic pregnant women. *Femina*, *34*(12), 823-828

Article DOI: https://doi.org/10.37284/eajhs.6.1.1092

Institute of Medicine and National Research Council Committee (2009). To Re-examine IOM pregnancy weight guidelines, editor. *Weight gain during pregnancy: Reexamining the Guidelines*. Washington, DC: National Academies Press.

Olafsdottir, A. S., Skuladottir, G.V., Thorsdottir, L., Hauksson, A., & Steingrimsdottir,L.(2006). Maternal diet in early and late pregnancy in relation to weight gain. *International Journal of Obesity*, 30(3), 492–499.

Restall, A., Rennae, S.T.; Louise, C.K., John, M. D., Thompson, L. P., Deralie, F.L. McCowan, M. E., & Gustaaf, A.D.(2014). Risk Factors for Excessive Gestational Weight Gain in a Healthy, Nulliparous Cohort. *Journal of Obesity*.

Rodrigues, P. L., De Oliveira, L. C., Brito, A. D. S., & Kac, G.(2010). Determinant factors of insufficient and excessive gestational weight gain and maternal-child adverse outcomes. *Nutrition*, 26(6), 617–623.

Stuebe, A. M., Oken, E., & Gillman, M. W. (2009). Associations of diet and physical activity during pregnancy with risk for excessive gestational weight gain. *American Journal of Obstetrics and Gynecology*, 201(1), 58.e1–58.e8.

Wang, X., Zhang, X., Zhou, M., Juan,J., & Wang, X.(2019).Association of Pre-pregnancy body mass index, rate of gestational weight gain with pregnancy outcomes in Chinese urban women. *Nutrition and Metabolism*.16, 54

