European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 07, Issue 03, 2020

Effect Of Pre Pregnancy Body Mass Index Status In Pregnancy With Obesity Cases

Wardhana ManggalaPasca[1],Zulhijayanti, Noor Assyifa[2]
Cahyani, MeiliaDwi[3],
Rahmatyah, Rizqy[4]

[1]*Maternal Fetal Medicine Division, Obstetrics & Gynecology Department, Faculty Medicine of Airlangga University – Soetomo Academic Medical Center Hospital;*
[2]*Resident of Obstetrics &Gynecology Department, Faculty of Medicine, Airlangga University – Dr.Soetomo General Hospital, Surabaya;*
[3,4]*Faculty of Medicine, UniversitasAirlangga – Dr.Soetomo General Hospital, Surabaya*
Email: [1]*manggala.pasca@fk.unair.ac.id*

ABSTRACT
Introduction: Increasing of obesity become endemic problem in childbearing age of women. Therefore, this morbidity frequently found in pregnancy with all of the obesity consequences. Some problems in developing country like Indonesia, especially in our tertiary hospital also experienced burden situation of obesity in pregnancy cases.
Aims:To describe obesity in pregnancy cases and analyze obesity status before pregnancy on obstetric outcome of this morbidity
Material and methods:Retrospective case control study using medical record on singleton pregnancy complicated with obesity in major East Java tertiary referral hospital in one year.
Results:of 1144 deliveries, we revealed 337 cases (29%) of obesity. 246 cases were included and analyzed in this study. Majority of cases were multiparity (72.8%), with age of 31.5±5.6 y.o, BMI of 35.6±4.9 kg/m^2 with 19.5% had morbidly obese status.48% of cases had obesity status before pregnancy. Pre pregnancy obesity status not related to Cesarean Section delivery (P=0.07), the occurrence of preeclampsia (P=0.35), gestational diabetes (P=0.97) and fetal macrosomia (P=0.97). Pre pregnancy obesity status related to higher BMI status at delivery (P<0.001) and morbidly obesity condition (P<0.001; OR 5.96; CI 2.58-13.77)
Conclusion:Our study revealed high incidence of obesity during pregnancy. While obesity correlated well with obstetric morbidity, pre pregnancy body mass index status did not associated with obstetric complication in pregnant obesity cases. Higher BMI and morbidly obese pregnancy cases due to pre pregnancy obesity status may contribute to non-significant increase of cesarean section.
Keywords:Obesity, Body Mass Index, Obstetric Outcome.

1. INTRODUCTION

Obesity can harm the person's health and considered as the fifth leading risk factor for global death. The prevalence of obesity has generally improved nearly tripled over the past few decades and World Health Organization (WHO) has described this condition as a global epidemic that poses a threat to public health(1). Raised Body Mass Index (BMI) constitutes a

major risk factor for noncommunicable diseases such as cardiovascular diseases, diabetes, musculoskeletal disorders, degenerative diseases and some cancers[2,3]. As the increasing of obesity in overall population, we also made a special concern of increasing obesity incidence in childbearing age of women[4,5].

Concordantly, this morbidity frequently found in pregnancy which also constitutes a high risk for both maternal and fetal complications such as preeclampsia, gestational diabetes and macrosomia[6,7]. Obesity is a known condition before pregnancy, therefore modification of body weight before pregnancy becomes an important concern[8]. However, the condition of BMI before pregnancy in cases of pregnancy-associated obesity is rarely studied in Indonesia. In this study, we tried to analyse the relationship of BMI before pregnancy in obstetric outcomes for pregnancy-associated obesity cases to provide pre pregnancy prevention strategies to improve the outcome of pregnancy.

2. MATERIAL AND METHODS

This case control study was carried out at Soetomo Academic Medical Center Hospital, the main tertiary level referral hospital of East Indonesia, in Surabaya, East Java. This study was conducted retrospectively by using data from medical records. All singleton pregnancy patient at delivery room in one year with obesity were included in this study. BMI is calculated by dividing one's weight in kilograms by height in squared meters (kg/m^2). The classification of obesity according to BMI used from WHO ($BMI \geq 30\ kg/m^2$)[1].

The data collected in this study were baseline maternal characteristics, history of pregnancy and childbirth (parity), pre-pregnancy obesity status, antenatal body mass index, morbidly obesity status ($BMI \geq 40\ kg/m^2$). Incomplete data will be excluded from this study. All cases with history of Diabetes Mellitus and chronic hypertension (history of chronic hypertension before pregnancy and/or persistent elevation of blood pressure ≥ 140/90 mmHg before 20 weeks) were also excluded from this study.Ethical approval was obtained from the Soetomo Academic Medical Center Hospital Ethics Committee.

Categorical variables were displayed in frequencies and percentage (%), whereas continuous variables were reported using mean ± standard deviance (SD). *Chi Square* or *Fisher's exact test* was used to compare the difference in categorical variables between or among different group, the odds ratio (OR) and 95% confidence intervals (CIs) were also calculated. The *T-Test independent sample* or *Mann-Whitney test* was used to compare the difference in the continuous variables between groups. All statistical analysis were performed using SPSS software package (SPSS, Chicago, IL, USA) version 24. A *p-value* of <0.05 was taken to signify statistical significance.

3. RESULTS

During one-year study period, there were 337 cases (26%) of obesity in pregnancy out of a total of 1285 deliveries. 4 cases had a multiple pregnancy. Total 87 cases were excluded from this study due to incomplete medical records data and the coincidence of chronic hypertension, pragestational diabetes and multiple pregnancy. Consequently, the amount of cases that can be analysed in this study counted 246 cases (figure 1).

The relevant and available clinical characteristics and outcomes of obesity in pregnancy in our study are presented in table 1. According to this study, we found the proportion of patients with obesity before pregnancy was 48%. After getting pregnant, the average BMI during antenatal was $35.58 \pm 4.9\ kg/m^2$with age of 31.5±5.6 y.o.

This study specifically made an analysis of BMI status before pregnancy with pregnancy characteristics and the occurrence of complication in pregnancy with obesity

cases. We divided BMI conditions before pregnancy into obesity and non-obesity. The complete analyses are presented in table 2 and table 3.

There were no significant differences on maternal age in pre-pregnancy obesity woman with non-obesity woman (30.88 ± 5.56 y.o. vs. 32.04 ± 5.55 y.o; p = 0.996), racial origin, parity, gestational age, onset of labor and mode of delivery. On the contrary, there was significant difference on antenatal BMI in pre-pregnancy obesity woman with non-obesity woman (38.06 ± 5.49 kg/m^2 vs. 33.29 ± 2.77 kg/m^2; P<0.001), in line with the occurrence of morbidly obesity during pregnancy 14.1 times in cases with obesity preconception (P<0.001). There were no significant differences for all pregnancy complications in this study between pre-pregnancy obesity and non-obesity status according to obesity in pregnancy cases.In our study, the average gestational age was 35.1 ± 3.7 weeks with average birth weight of 2442.2 ± 843.3 grams. The majority of obesity in pregnancy cases had non- spontaneous labor(80.1%) and caesarean section (73.6%) became a major proportion in mode of delivery. Prepregnancy obesity status associate with insignificantly higher caesarean section in obesity pregnant cases (P=0.074). The main causes of high caesarean section in this study were due to obstructed labor and abnormal fetal monitoring or fetal distress.

4. DISCUSSION

As a tertiary level hospital, our study revealed high proportion of obesity cases in pregnancy. Another research in the north-eastern England showed a significant increase in the prevalence of obesity in pregnancy from 9.9% to 16% (P<0.01) between 1990 and 2003[9]. This result reflecting obesity as an epidemic threat that also occurred in childbearing age and also pregnant woman. Our study showed higher proportion due to the place of research was in the main referral hospital which serving many high-risk pregnancies, one of which is obesity. The condition of obesity in pregnancy in our study also has an impact on the complications of metabolic syndrome that has been obtained before pregnant such as chronic hypertension (4.7%) and pragestasional diabetes (3%). Other study also had a similar result, Torloni et al in 2008 has calculated that for each 1kg m^2 increase in BMI, the prevalence of gestational diabetes as a complication of obesity pregnancy cases had been increased 0.92%[10].

The average of maternal age on this study was quite old (31.5 y.o) compared with average age of pregnant woman in Indonesia. This is similar with studies of 36.821 pregnancies in the northeastern England that showed that pregnant women with obesity are older and tend to have parous with more children[9].This study showed more nonspontaneous labor in pregnancy with obesity cases. The mode of delivery also dominated by caesarean section with indication of prolonged labor or obstructed labor and abnormal fetalassesment or fetal distress. It's similar with the results from other observational studies that have shown the association between obesity and higher intrapartum complications[11]. BMI ≥ 30 causes the possibility of more induction of labor[12]. Labor process is also progressing slower in patients with obesity due to more inefficient uterine activity during labor. A meta-analysis studies reported correlation between raised maternal BMI and Caesarean Section rate. The caesarean section ratios were higher in obese women than in normal BMI (27% versus 19%; P<0.04) due to failure to progress in labor and fetal distress[9]. A meta-analysis study is also performed by Chu et al, which involved only women without comorbidities, showed higher caesarean section rate in obese women without complications 1,75 times than normal BMI[13].

Based on our study analysis, caesarean section rate was higher in our prepregnancy obesity status in obese pregnant cases with no significant difference. Some other research only comparing BMI condition before pregnancy regardless of whether this patient becomes obese while pregnant. Research by Dietz analyzed 24,423 nulliparous women divided by

prepregnancy BMI and pregnancy complications. The cesarean section rate was 14.3% for lean women (BMI < 19.8 kg/m^2) and 42.6% for very obese women (BMI > 35 kg/m^2) [14]. Other study from Usha Kiran also showed the increased of BMI associated with increased of caesarean section[15].

Based on study by Gunderson, obesity or excessive weight gain during pregnancy constitute important risk factors for the mother and the fetus[16]. This study specifically made an analysis to compare the difference between prepregnancy obesity cases and prepregnancy non obesity cases in pregnancy with obesity in order to answer whether in the case of pregnancy with obesity, the condition of obesity before pregnancy will affect the outcome of pregnancy or not. The result from this study revealed only significant difference on the antenatal BMI and the occurrence of morbidly obesity during pregnancy. The pregnancy BMI status tends to be higher in the cases with prepregnancy obesity. In line with that result, the occurrence of morbidly obese during pregnancy increase significantly until 14 times in patient with prepregnancy obesity. No other significant difference in other pregnancy characteristics on this study.

Eventhough obesity correlated well with some of obstetric morbidity such as preeclampsia, gestational diabetes and macrosomia and the proportion quite high in our study especially in preeclampsia, we found that the prepregnancy obesity status did not have a significant impact on these complications. This suggests that the condition of obesity during pregnancy itself more important than prepregnancy obesity status in such cases. As described in this study, preterm gestational age had high incidence and no significant difference in both non-obesity and obesity prepregnancy status.

A retrospective study in the UK of 287.213 patients showed that women with a BMI of ≥ 30 had a higher likelihood of gestational diabetes than BMI 20-24.9, with OR 3.6, 99% CI (3.26-3.98)[9]. Other study from Australia also showed gestational diabetes incidence 2.95 times more in obesity than in normal women[17]. Other observational studies have shown an important correlation between maternal BMI and preeclampsia. A 10-year cohort of Swedish studies showed 2.8% of obese women had preeclampsia compared with 1.4% of non-obese women (with OR 2.62, 95% CI 2.49 - 2.76)[18]. Research from Duckitt and Harrington also showed an increased of BMI compared with normal BMI increased 50% chance of preeclampsia and BMI > 35 would increase the risk of preeclampsia by two times. Risk of preeclampsia typically doubled with each 5 - 7 kg / m^2 increase in prepregnancy body mass index[19]. Maternal obesity also associated with macrosomia. Data from 350,311 pregnancies showed a fifth of women with BMI ≥ 30 underwent macrosomia defined as birth weight ≥ 4 kg (OR 1.97, 95% CI 1.88-2.06) or defined as body weight ≥ 90th centile gestational age (OR 2.08, 95% CI 1.97 -2.17)[20]. This increasing incidence of macrosomia is related to gestational diabetes that can be caused by obesity in pregnancy.

Based on this study, we can suggest that the optimization of BMI before pregnancy should be more focused in order to avoid obesity in pregnancy. Furthermore, controlling weight gain during pregnancy in order to keep away incidence of obesity in pregnancy must also be a special concern, because if the BMI achieved after pregnancy still leads to obesity, the complications that occurred do not decrease and will remain the same. Gestational weight gain before and during pregnancy will become modifiable factor to avoid poor outcomes for obesity during pregnancy cases. There were several limitations to this study. The results reflect the experience only in one tertiary care hospital. Many delayed sick cases that referred to our hospital. Some limitation in medical record also resulted in the inability to conduct a better analysis of this research. Furthermore there was some disadvantage of using BMI as a predictor of metabolic disturbance in pregnancy. The composition of the body that forms BMI could be different. BMI can not distinguish between muscle mass and fat, hence the

individual of similar BMI could have different body compositions especially in pregnant conditions, in which some other pregnancy-related conditions can have an impact leads to BMI changes.

This one-year study revealed high incidence of obesity during pregnancy. While obesity correlated well with obstetric morbidity, prepregnancy obesity status in these cases did not associated with all pregnancy complication studied in this research. There were significant association between prepregnancy obesity status with higher BMI during antenatal care and morbidly obesity cases during pregnancy that may correlate with insignificant increased of caesarean section delivery. Moreover this study showed that the condition of obesity during pregnancy is more substantial than prepregnancy obesity status, leads to many pregnancy complications inflicted.

5. DISCLOSURE

The authors declare that there is no conflict of interest regarding the publication of this paper.

6. REFERENCES

[1] World Health Organization. Obesity: Preventing and managing the global epidemic. No. 894.World Health Organization; 2000. p. 6-60.

[2] Ogilvie RP, Patel SR. The epidemiology of sleep and obesity. Sleep Health 2017;3(5):383-8.

[3] Davies GA, Maxwell C, McLeod L, Gagnon R, Basso M, Bos H *et al*. SOGC Clinical Practice Guideline: Obesity in pregnancy. No. 239. Int J GynaecolObstet 2010;110(2):167-73

[4] Armitage JA, Poston L, Taylor PD. Developmental origins of obesity and the metabolic syndrome: the role of maternal obesity. Front Horm Res 2008;36:73–84.

[5] Heslehurst N, Ells LJ, Simpson H, Batterham A, Wilkinson J, Summerbell CD. Trends in maternal obesity incidence rates, demographic predictors, and health inequalities in 36,821 women over a 15-year period. BJOG 2007;114(2):187–94.

[6] Heslehurst N, Simpson H, Ells LJ, Rankin J, Wilkinson J, Lang R *et al*. The impact of maternal BMI status on pregnancy outcomes with immediate short-term obstetric resource implications: a meta-analysis. Obes Rev 2008;9(6):635–83.

[7] Sebire NJ, Jolly M, Harris JP, Wadsworth J, Joffe M, Beard RW*et al*. Maternal obesity and pregnancy outcome: a study of 287,213 pregnancies in London. Int J ObesRelatMetabDisord 2001;25(8):1175–82.

[8] Sirimi N, Goulis DG. Obesity in pregnancy. Hormones (Athens) 2010;9(4):299-306.

[9] Fitzsimons KJ, Modder J, Greer IA. Obesity in pregnancy: risks and management. Obstet Med 2009;2(2):52-62

[10] Torloni MR, Betran AP, Horta BL, Nakamura MU, Atallah AN, Moron AF *et al*. Prepregnancy BMI and the risk of gestational diabetes : a systematic review of the literature with meta-anaylisis. Obes Rev 2009;10(2),194-203.

[11] Bianco AT, Smilen SW, Davis Y, Lopez S, Lapinski R, Lockwood CJ. Pregnancy outcome and weight gain recommendations for the morbidly obese woman. ObstetGynecol1998;91(1):97-102.

[12] Vahratian A, Zhang J, TroendleJF, Savitz DA, Siega-Riz AM. Maternal prepregnancy overweight and obesity and the pattern of labour progression in term nulliparous women. ObstetGynecol 2004;104(5 Pt 1):943-51.

[13] Chu SY, Kim SY, Lau J, Schmid CH, Dietz PM, Callaghan WM *et al*. Maternal

obesity and risk of stillbirth: a meta-analysis. Am J ObstetGynecol 2007;197(3):223-8.
[14] Dietz PM, Callaghan WM, Morrow B, Cogswell ME. Population-based assessment of the risk of primary caesarean delivery due to excess pre-pregnancy weight among nulliparous women delivering term infants. Matern Child Health J 2005;9(3):237-44.
[15] Abbas, M., Muhammad, S., Shabbir, M. S., Nimer, Q., Mir, Bibi, A., & Siddiqi, A. (2020). CienciasSociales y Arte Año 10 N° 28 Septiembre -Diciembre 2019 TerceraÉpoca Maracaibo-Venezuela Ecological Consequences of Climate Change on Pioneer Business. REVISTA DE LA UNIVERSIDAD DEL ZULIA.
[16] Abbasi, S. G., Shabbir, M. S., Abbas, M., & Tahir, M. S. (2020). HPWS and knowledge sharing behavior: The role of psychological empowerment and organizational identification in public sector banks. Journal of Public Affairs. https://doi.org/10.1002/pa.2512
[17] Abbasi, S. G., Tahir, M. S., Abbas, M., & Shabbir, M. S. (2020). Examining the relationship between recruitment & selection practices and business growth: An exploratory study. Journal of Public Affairs. https://doi.org/10.1002/pa.2438
[18] Ahmad, J., Ahmad, D., Abbas, m., Ashraf, M., & Shabbir, M. S. (2018). Effect of Debt Overhang on the Development of Heavily Indebted Poor Countries: Debt Laffer Curve Analysis. RevistaPublicando, 357-379.
[19] Al-Kumaim, N. H., Hassan, S. H., Shabbir, M. S., Almazroi, A. A., & Abu Al-Rejal, H. M. (2021). Exploring the Inescapable Suffering Among Postgraduate Researchers: Information Overload Perceptions and Implications for Future Research. International Journal of Information and Communication Technology Education, 17(1), 19-41. https://doi.org/10.4018/ijicte.2021010102
[20] Arshad, M. A., Shabbir, M. S., Mahmood, A., Khan, S., &Sulaiman, M. A. (2020). An exploration of IQ, EQ, spiritual quotient (SQ) elements in the human reengineering program (HRP) practices: A study on the drug rehabilitation Centre in Malaysia. Journal of Human Sport and Exercise - 2020 - Winter Conferences of Sports Science. https://doi.org/10.14198/jhse.2020.15.proc2.32
[21] Ashraf, M., Ahmad, J., Sharif, W., Raza, A. A., Shabbir, M. S., Abbas, M., &Thurasamy, R. (2020). The role of continuous trust in usage of online product recommendations. Online Information Review, 44(4), 745-766. https://doi.org/10.1108/oir-05-2018-0156
[22] Balakrishnan, P., Shabbir, M. S., & Siddiqi, A. (2019). Current status and future prospects of renewable energy: A case study. Energy Sources Part A Recovery Utilization and Environmental Effects, 42, 1-6. https://doi.org/10.1080/15567036.2019.1618983
[23] Jabarullah, N. H., Shabbir, M. S., Abbas, M., Siddiqi, A. F., &Berti, S. (2019). Using random inquiry optimization method for provision of heat and cooling demand in hub systems for smart buildings. Sustainable Cities and Society, 47, 101475. https://doi.org/10.1016/j.scs.2019.101475
[24] Khan, M., Shabbir, M. S., Tahir, m. S., Ali, R., & Hussain, M. (2019). Investment-Cash Flow Sensitivity in Family Owned Pakistani Firms. Revista Amazonia Investiga, 8, 376-386.
[25] Usha Kiran TS, Hemmadi S, Bethel J, Evans J. Outcome of pregnancy in a woman with an increased body mass index. BJOG 2005;112(6):768-72.
[26] Gunderson EP. Childbearing and obesity in women : weight before, during, and after pregnancy. ObstetGynecolClin North Am 2009;36(2):317-ix.
[27] Callaway LK, PrinsJB, Chang AM, McIntyre HD. The prevalence and impact of

overweight and obesity in an Australian obstetric population. Med J Aust 2006;184(2):56-9.
[28] Cedergren MI. Maternal morbid obesity and the risk of adverse pregnancy outcome. ObstetGynecol 2004;103(2):219-24.
[29] Duckitt K, Harrington D. Risk factors for preeclampsia at antenatal booking: systematic review of controlled studies. BMJ 2005;330(7491):565.
[30] Jolly MC, Sebire NJ, Harris JP, Regan L, Robinson S. Risk factors for macrosomia and its clinical consequences: a study of 350,311 pregnancies. Eur J ObstetGynecolReprodBiol 2003;111(1):9-14.

Table 1. Maternal Clinical Characteristics and Pregnancy Outcome on Pregnancy with Obesity

Maternal and Clinical Characteristic	n (%)	Pregnancy Outcomes	n (%)
Prepregnancy obesity		**Mode of Delivery**	
No	128 (52%)	Vaginal Delivery	58 (23.6%)
Yes	118 (48%)	Operative Vaginal Delivery	7 (2.8%)
Racial Origin		Cesarean Section	181 (73.6%)
Javanese	207 (84.1%)	**Birthweight**	
Maduranese	39 (15.9%)	< 1000 g	9 (3.7%)
Gestasional Age		1000 - 1499 g	29 (11.8%)
20 - < 28 weeks	10 (4.1%)	1500 - 2499 g	79 (32.1%)
28 - < 32 weeks	21 (8.5%)	2500 - 3999 g	121 (49.2%)
32 - < 37 weeks	111 (45.1%)	≥ 4000 g	8 (3.3%)
≥ 37 weeks	104 (42.3%)	**Preeclampsia**	
Parity		No	78 (31.7%)
Primigravida	67 (27.2%)	Yes	168 (68.3%)
Multigravida	179 (72.8%)	**Diabetes Gestasional**	
Morbidly Obesity		No	225 (91.5%)
No	198 (80.5%)	Yes	21 (8.5%)
Yes	48 (19.5%)	**Macrosomia**	
Onset of Labor		No	238 (96.7%)
Spontaneous	49 (19.9%)	Yes	8 (3.3%)
Non Spontaneous	197 (80.1%)		

Table 2. Analysis on Pregnancy Characteristics in Pregnancy with Obesity

Pregnancy Characteristics	Prepregnancy BMI Status		p	Odds Ratio (95%CI)
	Non Obesity n=128; cases (%)	Obesity n=118; cases (%)		
Racial Origin				
Javanese	112 (87.5%)	95 (80.5%)	0.134	1.695 (0.847 - 3.393)
Yes	16 (12.5%)	23 (19.5%)		
Parity				
Primigravida	29 (22.7%)	38 (32.2%)	0.093	0.617 (0.350 - 1.086)
Multigravida	99 (77.3%)	80 (57.8%)		
Gestasional Age				
Preterm	78 (60.9%)	64 (54.2%)	0.288	1.316 (0.793 - 2.186)
Aterm	50 (39.1%)	54 (45.8%)		
Morbidly Obesity				
No	123 (96.1%)	75 (63.6%)	<0.001	14.104 (4.349 - 37.190)
Yes	5 (3.9%)	43 (36.4%)		
Onset of Labor				
Spontaneous	25 (19.5%)	24 (20.3%)	0.874	0.951 (0.508 - 1.778)
Non Spontaneous	103 (80.5%)	94 (79.7%)		
Mode of Delivery				
Vaginal Delivery	40 (31.2%)	25 (21.2%)	0.074	1.691 (0.948 - 3.015)
Cesarean Section	88 (68.8%)	93 (78.8%)		

Table 3. Analysis on Pregnancy Complication in Pregnancy with Obesity

Pregnancy Complication	Prepregnancy BMI Status		p	Odds Ratio (95%CI)
	Non Obesity n=128; cases (%)	Obesity n=118; cases (%)		
Preeclampsia				
No	44 (34.4%)	34 (28.8%)	0.349	1.294 (0.754 - 2.221)
Yes	84 (65.6%)	84 (71.2%)		
Diabetes Gestasional				
No	117 (91.4%)	108 (91.5%)	0.973	0.985 (0.402 - 2.411)
Yes	11 (8.6%)	10 (8.5%)		
Macrosomia				
No	125 (97.7%)	113 (95.8%)	0.486	1.844 (0.431 - 7.890)
Yes	3 (2.3%)	5 (4.2%)		

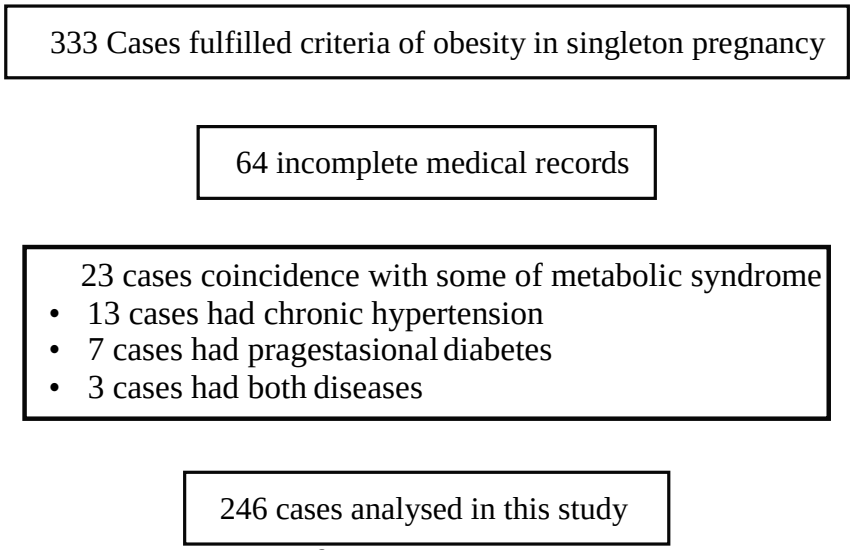

Figure 1. Study Data of Obesity in Pregnancy Cases