Original Research Paper

The Effect of Maternal Body Mass Index on Induction of Labour

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ABSTRACT:

Objective: To evaluate the effect of maternal body mass index on mode of delivery following induction of labour and its subsequent postpartum complications and neonatal outcome. **Method**: A cross sectional study conducted in women admitted for labour induction with PGE2 in MGM Medical College and Hospital, Aurangabad at gestational age 32 weeks to 41 weeks for confinement during study period May 2022 to October 2022. Total 128 participants were stratified into 4 group based on maternal obesity classification and primary outcome of mode of delivery, postpartum complication and neonatal outcome where compared between obese and normal-weight women. **Result**: In study population with increasing maternal BMI, there was increase in failed induction of labour. In obese population there is increased incidence of prolonged pregnancy. Induction of labour was seen more common in primigravida. Preterm induction was indicated due to associated preeclampsia and PPROM. Incidence of postpartum hemorrhage, surgical site infection and shoulder dystocia were more in women with BMI>25kg/m^2. **Conclusion**: Obesity is one of the factor responsible for failed induction. Increasing maternal body mass index had increased risk of prolonged pregnancy and rate of induction of labour. Relationship between failed induction of labor with increasing class of obesity is true and BMI of women to be taken in consideration while counselling patient regarding likelihood of successful induction.

Keywords: Body mass index, Induction of labour, Obesity, Prolonged pregnancy

INTRODUCTION:

Maternal obesity prevalence is increasing in many countries, whereas India is facing a burden of both under nutrition on one side, and the steadily increasing prevalence of overweight and obesity in affluent societies on the other side. The National Family Health Survey 2019-21 (NFHS-5), the fifth in the NFHS series, provides information on women who are overweight or obese (BMI ≥25.0 kg/m2) and percentage of women who are overweight or obese is 24 per cent in NFHS-5 (2019-2021), up from 20.6 per cent in NFHS-4 (2015-2016). The proportion is greater in urban areas at 33.2 per cent, in comparison to 19.7 per cent in rural areas[1]. Obese women are more likely to have obstetric complication preeclampsia, gestational diabetes mellitus (GDM), higher induction rates, dysfunctional labor patterns and cesarean delivery[2-10]. Induction of labour rates have doubled in last 20 years and account to 20-30% of deliveries.[11] The prostaglandins has become common for both ripening and induction of labor and their effectiveness and safety for purpose for labor induction is well established.[12] There is a fraction of women who do not respond to PGE2 and are defined as induction failure. The exact mechanism of dysfunctional labor in the obese woman leading to induction failure is not completely understood. A population-based cohort study was conducted from Ohio department of health database, found that induction rates increased with increasing BMI[13]. Similarly, the induction failure rates increased from 13% in normal BMI women to 29% in class III obese category women. The aim of our study is

to evaluate the effect of maternal body mass index on mode of delivery following induction of labour and its subsequent postpartum complications and neonatal outcome and to report rate of failed induction directly correlates with increasing body mass index.

MATERIAL AND METHODS:

Present descriptive study is a cross sectional study conducted in the department of Obstetrics and Gynecology, MGM Medical College and Hospital, Aurangabad from May 2022 to October 2022. Institutional ethics committee approval was taken prior to commencement of this study. A written consent was obtained from all participants before the start of study. All women admitted for labor induction with PGE2 in labour room of hospital at gestational age 32 weeks to 41 weeks for confinement during this study period were included in the study. Maternal height and weight recorded in 1st trimester pregnancy were used to calculate BMI (kilograms per square meter). Total 128 participants were stratified into 4 group based on maternal obesity classification as defined by the National Institute of Health[14]:

1. Underweight (BMI < 18.5)
2. Normal weight (BMI 18.5 – 24.9)
3. Overweight (BMI 25.0 – 29.9)
4. Obesity (BMI ≥ 30)

Obesity is further classified into:
- Class I obesity BMI (30.0 – 34.9)
- Class II obesity BMI (35.0 – 39.9)
- Class III / severe obesity/morbid BMI (≥ 40 kg /m^2)

The primary outcome of this study was of failed induction of labor, which was defined as delivery by cesarean delivery after an attempted induction, compared between obese women and normal-weight women. Odds ratios were calculated by obesity classification, history of previous vaginal delivery, primigravida, bishop's score and duration of induction. Secondary outcomes included birthweight and NICU admission. Data were entered in Microsoft Excel and analyzed using SPSS version 24.0th. An odds ratio with 95% confidence interval (CI) was calculated to determine the level of significance in outcome of pregnancy. Data are represented in form of visual impression like bar-diagram etc. P- Value of <0.05 was considered statistically significant.
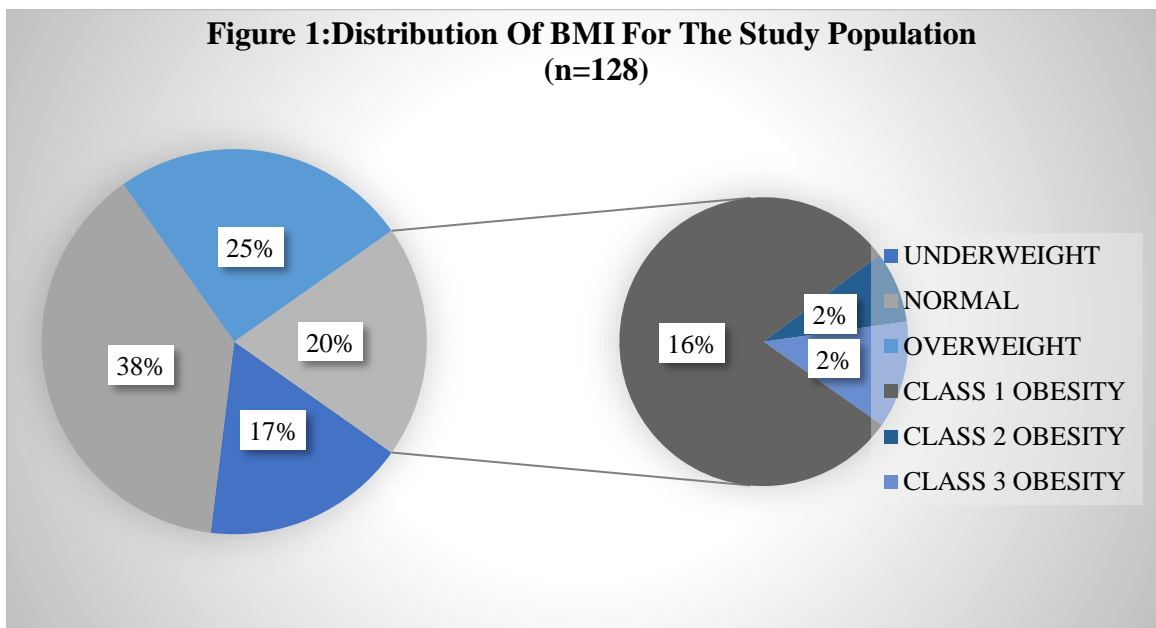
RESULTS:

During this study period, there were 1488 pregnancies out of which 128 (8.6%) underwent induction of labor. For analysis, 128 deliveries that underwent ripening or induction of labor with PGE2 were included. They had complete record of height and weight, obstetric history, duration and number PGE2 application, route of delivery, postpartum complication and neonatal outcome. The distribution of BMI of women undergoing PGE2 induction of labor is given in Figure 1.

Figure 1:Distribution Of BMI For The Study Population (n=128)

Maternal Demographics in the study population

Table 1: Age-wise and parity distribution of women underwent induction of labour by maternal BMI category

Demographics		Underweight (n=22)	Normal (n=49)	Overweight (n=32)	Obese (n=25)
		n (%)	n (%)	n (%)	n (%)
Age	≤ 19 Years (12)	3 (2.34)	3 (2.34)	3 (2.34)	3 (2.34)
	20-34years(110)	19 (14.8)	45 (35.1)	27 (21.0)	19 (14.8)
	≥ 35 Years (6)	0	1 (0.78)	2 (1.56)	3 (2.34)
Parity	Primigravida (77)	19 (14.06)	30 (24.21)	16 (12.5)	12 (9.37)
	Multigravida (51)	3 (3.12)	19 (14.06)	16 (12.5)	13 (10.1)

Table 1 shows that advanced maternal age is associated with increased BMI and same with multigravida women was observed. Induction of labour is more common in primigravida (60.15%).

Table 2: Gestation age at Induction

Gestation Age	Underweight (n=22)	Normal (n=49)	Overweight (n=32)	Obese (n=25)
	n (%)	n (%)	n (%)	n (%)
Preterm (18)	3 (2.34)	3 (2.34)	8 (6.25)	4 (3.12)
Term (60)	11 (8.59)	26 (20.3)	12 (9.37)	11 (8.59)
Prolonged (50)	8 (6.25)	20 (15.6)	12 (9.37)	10 (7.81)

Table 2 shows that more number of women having BMI >25kg/m^2 required preterm induction. In the obese population there is increased incidence of prolonged pregnancy (odds ratio [OR], 1.04; 95%confidence interval [CI], 0.4-2.3.

Table 3: Indications of induction of labour in various class of BMI

Indication Of Induction of Labour	Underweight (n=22)	Normal (n=49)	Overweight (n=32)	Obese (n=25)
	n (%)	n (%)	n (%)	n (%)
Prolonged (50)	8 (6.25)	20 (15.6)	12 (9.37)	10 (7.81)
PROM (39)	9 (7.03)	15 (11.7)	10 (7.81)	5 (3.90)
Pre-Eclampsia (12)	2 (1.56)	1 (0.78)	6 (4.6)	3 (2.3)
Oligohydramnios (16)	2 (1.56)	9 (7.03)	3 (2.3)	2 (1.56)
Other (11)	1 (0.78)	4 (3.12)	1(0.78)	5 (3.90)

Table 3 shows that prolonged pregnancy was the most common indication of induction of labour.

Graph 1:
Outcome Of Spontanous v/s Induction Of Labor
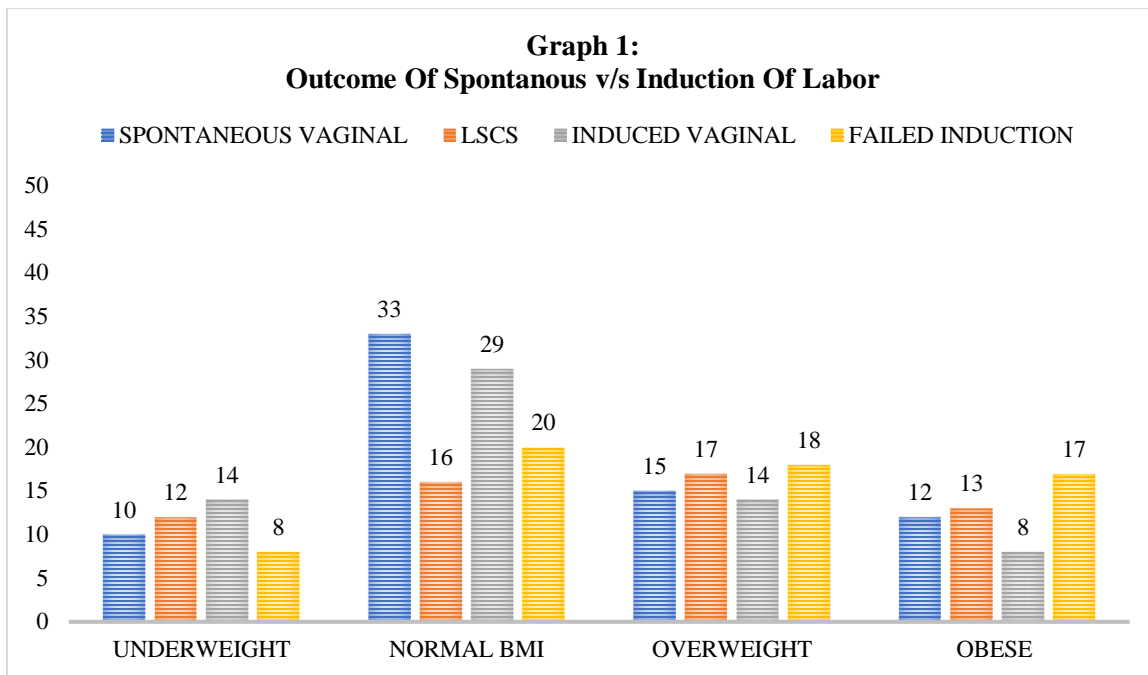
The rate of successful induction that is vaginal delivery after induction was found to be 50% (n = 64). Graph 1 shows that with increasing maternal BMI in study population, there is decrease in successful induction in comparison to spontaneous vaginal delivery.

Table 4: Mode Of Delivery Outcome Following Induction in obese women vs normal weighted women

BMI	Successful Induction (50)	Failed Induction(56)	P Value
	n (%)	n (%)	
BMI >25 (57)	21 (19.8)	36 (33.9)	0.01
Normal (49)	29 (27.3)	20 (18.8)	

Table 4 shows that BMI > 25kg/m^2 significantly affect induction as there is higher failure of induction of labour. (P < 0.01).

Table 5: Mode Of Delivery Outcome Following Induction in underweight women vs normal weighted women

BMI	Successful Induction(43)	Failed Induction(28)	P Value
	n (%)	n (%)	
Underweight (22)	14(19.7)	8 (11.26)	0.36
Normal (49)	29(40.8)	20(28.1)	

Table 5 shows that failure of induction is not significant in underweight women.

Table 6: Causes of failure of induction in various class of BMI

Cause of failure of induction	Underweight (n=8)	Normal (n=20)	Overweight(n=19)	Obese(n=17)
	n (%)	n (%)	n (%)	n (%)
Failed induction(28)	2 (3.12)	8 (12.5)	10 (15.6)	8 (12.5)
Fetal distress(20)	5 (7.81)	6 (9.3)	5 (7.81)	4 (6.25)
Not willing for further induction(16)	1 (1.56)	6 (9.3)	4 (6.25)	5 (7.81)

Table 6 shows that caesarean section for a reason such as fetal distress and not willing for further induction remained comparable in each BMI class. Increase in failed induction was noted with increasing BMI.

Table 7: Factors favoring successful induction in underweight women

Factors Favoring Successful Induction In Underweight Women (n=22)		
Age	20-34years	63.5%
Parity	Primigravida	55.5
	Multigravida	100%
Gestation Age	Term	80%
	Prolonged	66.6%
Bishop's Score	> 6	100%
Method Of Induction	Ripening Followed By Induction	66.6%
Number Of Induction Gel	2 times	72.2%
	3 times	75%

Table 8: Factors favoring successful induction in women with BMI >25Kg/m^2

Factors Favoring Successful Induction In Women With BMI >25Kg/m^2 (n=57)		
Parity	Multigravida	62.0%
Bishop's Score	> 6	65.2%

Table 8 shows that parity and favorable Bishops are only factors influencing successful labour induction in women having BMI >25Kg/m^2.

Table 9: Intrapartum and Postpartum complications in women of BMI group undergoing induction of labour

Intrapartum and Postpartum Complication	Underweight n (%)	Normal n (%)	Overweight n (%)	Obese n (%)
PPH (17)	2 (1.56)	4 (3.12)	3 (2.34)	8 (6.25)
Shoulder dystocia(2)	0	0	2 (1.56)	0
SSI (9)	0	3 (2.34)	1 (0.78)	5 (3.90)

Table 9 shows that PPH and wound complication are more with increasing maternal BMI. Shoulder dystocia was noted in primiparous overweight women. Birth weight of neonate born to women of each BMI category were comparable. 18% of neonate required NICU admission.

DISCUSSION:

Over the last 40 years, the global prevalence of obesity in women has increased 2.5-fold from 6% to 15%[15]. The obesity epidemic presents as challenge to the obstetrician. Our study has found that maternal obesity as a risk for postdated delivery which is consistent with other studies[13]. It was observed that with increasing maternal body mass index, more the requirement of induction of labour was seen in our study. Obesity plays an important role in effecting delivery. Rate of failed induction by class of obesity and to stratify women by primigravida, history of a vaginal delivery, and effective fetal weight to be able to counsel patients regarding likelihood of success of induction of labor.[16] The definition of failed induction adopted by our hospital was lack of significant change in bishops, failure to enter in active phase of labor or delivery by cesarean section due to fetal distress, not willing for further induction and secondary arrest of labour. In our study women having BMI>25kg/m^2 were twice likely to experience a failed induction of labor in comparison to there are their normal-weight counterparts. It was observed that primigravida more commonly required induction of labour but was found not significant in determining the outcome of induction. In induced women having BMI>25kg/m^2, primiparous women had 38% chance of achieving a vaginal delivery and a 62% in multiparous, without any associated postpartum complication. Our data suggested that increased preterm induction in BMI >25kg/m^2 was needed due to associated complication such as preeclampsia and PPROM. Incidence of preterm induction was comparable in all BMI classes where is other studies suggested that underweight women were more likely to deliver preterm[17]. Induction of labour in BMI > 25kg/m^2 significantly effects induction as there is higher rate of failed induction. (P < 0.01) on comparison with normal weighted women whereas in underweight women it was found not significant. Due to increase in the rate of cesarean section its associated complications such as PPH and surgical site infection were also found to be more. The strength of our study was women visiting our tertiary hospital were of various socioeconomic strata having all ranges of BMI. The easily availability of data such as 1st trimester BMI, obstetric history, number of application of induction gel and assessment of bishop's score and its outcome was an advantage to our study. The limitations of our study include matching of the factors such as age, parity and bishops at the time of induction to know the outcome of induction in each BMI group. A well-recognized limitation of our study was non availability of preconception pregnancy BMI and recall method of weight was not used. Our results demonstrated that rate of failure of induction was directly proportional to increasing class of obesity. In neonatal outcome of study birth weight born to women of each BMI category were comparable. 18% of neonate required NICU admission which was less but the possibility of need of NICU admission in inductions of labour with associated maternal co-morbidities cannot be ruled out.

CONCLUSION:

In conclusion of my study, these findings are more important to clinicians to counsel the women regarding the likely outcomes of induction of labour. The relationship between failed induction of labor with increasing class of obesity is true and clinically impactful. Induction of labor with increasing BMI should be undertaken only when indicated after women being counselled regarding risk vs benefits, other alternatives, and likelihood of successful induction. If morbidly obese primigravida woman requires induction,

our study shows that there is increased likelihood of failed induction. Hence woman with BMI > 25kg/m^2 who requires delivery in the absence of spontaneous labor, consideration for obesity class, bishops score assessment, obstetric history, and estimated fetal weight should be taken into consideration while counseling and deciding the route of delivery.

Conflicts of interest:
There are no conflicts of interest.

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