Int J Med. Public Health. 2022; 12(1):20-23
A Multifaceted Peer Reviewed Journal in the field of Medicine and Public Health
www.ijmedph.org

Original Article

Maternal Outcome in Overweight and Obese Women: A Comparison between Revised Consensus Body Mass Indices (BMI) for Asian Indians and WHO Criteria

Ancy T Jacob[1], Deepu Rajendran[2,*], Anaswara T[3], Sheela Jacob[4]

ABSTRACT

Background: Overweight or obesity is a major risk factor for maternal complications. Most western countries adhere to WHO guidelines for classifying obesity. In India, revised consensus Body Mass Indices (BMI) for Asian Indians are used for BMI classification. The present study aims to compare WHO and revised consensus BMI criteria for Asian Indians on the maternal outcome in overweight and obese women. **Methodology:** This was a retrospective study done in 399 women with singleton deliveries during a period of six months in a tertiary care center in South India. Data were gathered from medical records in accordance with the inclusion and exclusion criteria. Two proportion Z-test and Independent *t* test were used for the comparison between the WHO and revised consensus BMI for Asian Indian criteria. **Results:** Overweight/obesity prevalence was 40.60% as per WHO criteria and 63.91% as per Asian Indian criteria. Proportionate difference was significant for the parameters GDM, PIH, and preterm labor between obese and nonobese women in Asian Indian criteria. WHO criteria showed significant difference in GDM and PIH only (p <0.05). Preterm labor was found to be insignificant between both criteria among non-obese women (p>0.05). **Conclusion:** The study could not find statistically significant differences between the two criteria. As the body fat distribution in Asian Indians differs considerably from other ethnic groups, we recommend the use of revised consensus BMI for Asian Indians for BMI classification to prevent maternal morbidity and mortality.

Key words: Revised Consensus BMI for Asian Indians, WHO BMI guideline, Overweight, Obesity, Pregnancy.

Ancy T Jacob[1], Deepu Rajendran[2,*], Anaswara T[3], Sheela Jacob[4]

[1]Department of Obstetrics and Gynaecology, Travancore Medical College, Kollam, Kerala, INDIA.
[2]Consultant, Interventional Cardiologist and Assistant Professor in Department of General Medicine, Travancore Medical College, Kollam, Kerala, INDIA.
[3]Department of Obstetrics and Gynaecology, ESI Super Speciality Hospital, Asramom, Kollam, Kerala, INDIA.
[4]Department of Obstetrics and Gynaecology, Travancore Medical College, Kollam, Kerala, INDIA.

Correspondence
Dr. Deepu Rajendran
Consultant, Interventional Cardiologist and Assistant Professor, Department of General Medicine, Travancore Medical College, Kollam, Kerala, INDIA.
Email: deepudr@gmail.com

History
- Submission Date: 01-11-2021
- Revised Date: 17-11-2021
- Accepted Date: 24-12-2021

DOI : 10.5530/ijmedph.2022.1.4

Article Available online
http://www.ijmedph.org/v12/i1

INTRODUCTION

Overweight and obesity increase worldwide in all age groups and populations. It is also a significant risk factor for maternal and neonatal morbidity and mortality.[1] Prepregnancy obesity may cause polycystic ovary syndrome, disrupting normal ovulation and menstruation, leading to amenorrhea and infertility. Miscarriages tend to occur in overweight and obese women. The risk of miscarriages in obese women was 25-37% compared to those with normal body mass index (BMI).[2]

The complications in obese pregnant women include spontaneous abortions, gestational diabetes, pregnancy-induced hypertension, pre-eclampsia, venous thromboembolism, labor induction, and Cesarean delivery. Pregnancy outcomes are related to prepregnancy BMI. Elective and unplanned Cesarean sections were found to increase with an increase in prepregnancy BMI.[3,4] Stillbirth and perinatal death rates were found doubled in women with obesity.[5] Some studies showed an association of congenital fetal disorders with maternal obesity. Obesity, together with gestational diabetes, may lead to congenital anomalies in the fetus.[6]

Most Western countries have adopted WHO criteria for defining maternal obesity- Normal: BMI 18.5 to 24.9 kg/m^2, Overweight: BMI 25 to 29.9kg/m^2, and Obese: BMI > 30kg/m^2. [7] For Asian Indians, BMI classification for overweight and obesity had been revised - Overweight: BMI 23.0 to 24.9 kg/m^2, and Obesity: BMI >25 kg/m^2.[8] The remarkable variation in the body fat and the fat-free mass mandate the need for a separate classification in Asian Indians.[8]

As per the National Family Health Survey (NFHS-5) conducted during 2019-20, 38.1% of the women in Kerala are overweight or obese. The rate of obesity among Keralite women increased by 5.6% compared to the previous study conducted in NFHS-4 in 2015-16.[9] A study conducted in an institution in Kerala showed that out of the 399 singleton deliveries, 63.9% of the mothers were either obese or overweight.[10] Our study aimed to compare the pregnancy outcome of singleton mothers using WHO and Asian Indian criteria for BMI. As per our knowledge, there is not much literature on this topic, except for very few.

Cite this article : Jacob AT, Rajendran D, Anaswara T, Jacob S. Maternal Outcome in Overweight and Obese Women: A Comparison between Revised Consensus Body Mass Indices (BMI) for Asian Indians and WHO Criteria. Int J Med Public Health. 2022;12(1):20-3.

MATERIALS AND METHODS

This retrospective study was conducted in a teaching hospital at Travancore Medical College, Kerala, India, over six months from July 2020 to December 2020 after obtaining approval from the Institutional ethical committee. The women who had singleton delivery in this institution during the study period, having their antenatal checkups done in the same institution, were included in the study. Women with multiple gestations or late registration to the institution were excluded. The medical records of the patients were checked, and 399 singleton deliveries were found during the period. To describe the characteristics of the study population, the age, height, and weight of the mothers during the first antenatal visit, history of abortion, history of infertility treatment, the gestational age at the time of delivery were collected. The maternal outcome variables included in the study were antenatal complications like pregnancy-induced hypertension (PIH), gestational diabetes mellitus (GDM), preterm labor, LSCS, urinary tract infection (UTI), and postpartum hemorrhage (PPH). The patients' BMI was calculated and categorized both as per the Asian Indian and WHO BMI criteria for comparison.

Statistical Analysis

Descriptive statistics were used for the baseline characteristics of the study population. Binary or categorical variables presented as frequency distributions and numerical variables presented a means and standard deviation. A multiple bar diagram was used for BMI distribution according to Asian Indian and WHO BMI criteria. Two proportion Z-test was used to compare categorical variables, and Independent *t*-test for mean maternal age between Asian Indian and WHO BMI criteria. A p-value less than 0.05 shows statistical significance. All data were entered in Microsoft Excel and analyzed using SPSS version 20.00.

RESULTS

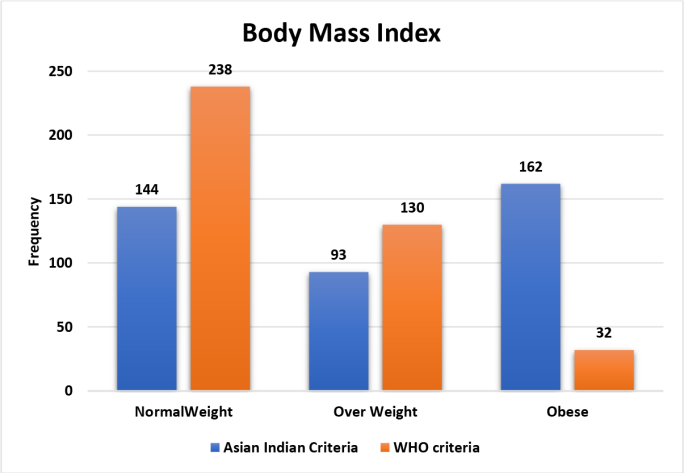
This observational study was conducted among 399 women to assess the maternal outcome among overweight and obese women based on Asian Indian and WHO BMI criteria. Of the total 399 women, 40.60% were either overweight or obese as per WHO criteria, whereas it was 63.91% as per Indian criteria. The range of age varies from 18 to 41 years, with an average age of 27.26±4.63 years. The mean BMI of the study population was found to be 24.5± 4 kg/m^2. Out of the 399 samples, 190 (47.6%) were primigravid.

More than one abortion was found in 28 (7.02%) women. Only 10% of the study population nderwent infertility treatment, GDM was observed in 23.81% of the study population, PIH in 11.53%, and preterm labor in 9.02%.

BMI distribution according to Asian Indian and WHO BMI criteria was represented in Graph 1. As per the Asian Indian criteria, BMI was normal in 144 women, 93 were overweight, and 162 belonged to the obese category. However, WHO criteria showed normal BMI in 238 study subjects, overweight in 130, and only 32 in the obese category.

Table 1 age-wise assessment of BMI distribution for both Asian Indian and WHO criteria was done. It showed that, for all age groups, women with normal BMI were <40% only as per Indian classification. As per WHO classification, more than 50% of the study population had normal BMI.

Table 2 compared maternal parameters between obese and non-obese women using WHO and Asian Indian criteria. The Asian Indian criteria showed a significant difference in the proportions of parameters such as GDM, PIH, and preterm labor between obese and non-obese women (p<0.05).



Graph 1: Distribution of Body Mass Index according to WHO and Asian Indian criteria.

Table 1: Age-wise distribution of BMI according to WHO and Asian Indian Criteria among the study group.

Age Group	Asian Indian Criteria		WHO Criteria	
	Non-obese	Overweight/ obese	Non-obese	Overweight/ obese
<20	2(28.5%)	5(71.5%)	6 (85.7%)	1 (14.3%)
20-29	108(37.9%)	177(62.1%)	167 (58.6%)	118 (41.4%)
30-39	33(31.7%)	71(68.3%)	62 (59.6%)	42 (40.4%)
40 or more	1(33.3%)	2(66.7%)	2 (66.7%)	1 (33.3%)
Total	144(100%)	255(100%)	237(100%)	162(100%)

According to the WHO criteria, only two parameters, i.e., PIH and GDM, showed a significant difference in proportions between the obese and non-obese groups. Both GDM and PIH were found to be more in obese women.

Table 3 the assessment of maternal outcome parameters showed that among the non-obese women, there was no significant difference observed between Asian Indian and WHO criteria in all parameters except distribution of preterm labor (p>0.05). Asian Indian criteria reported only 4.87%, and WHO criteria reported 7.59% preterm labor, and this difference was found to be statistically significant (p<0.01). In the obese group, none of the maternal outcome parameters showed a significant difference between Asian Indian and WHO criteria.

DISCUSSION

The study was conducted retrospectively in 399 women with singleton deliveries. The population included in the study was from middle-to-upper class families in an urban population. The prevalence of overweight or obesity in pregnancy as per Asian Indian Criteria was 63.91%, and that of WHO criteria was 40.6%. We could find an increase of 23.31% in the prevalence of overweight or obesity in pregnancy as per the Asian Indian criteria compared with WHO criteria. The study conducted by Aziz *et al.* showed a 31.3% increase in the overweight or obese category when Asian Indian criteria were used over WHO criteria.[8] More than 60% of the study population falls in the overweight or obese category as per the Asian Indian criteria. Most Western countries use WHO criteria for BMI classification. The body fat distribution differs considerably between various ethnic groups.[11] Asians were found to have more body fat relative to weight when compared with the white populations.[11]

Table 2: Maternal and Neonatal parameters in obese and non-obese women: Asian Indian Versus WHO criteria.

	Asian Indian Criteria			WHO Criteria		
	Normal BMI (*n*=144)	Overweight + Obese (*n*=255)	*P* Value	Normal BMI (*n*=238)	Overweight + Obese (*n*=162)	*P* Value
Mean Maternal Age	26.65±5.56	27.62±4.22	0.049*[a]	26.95±5.18	27.72±4.03	0.115[a]
Primi gravida	80 (55.56%)	110 (43.13%)	0.016*[b]	120 (50.63%)	70 (43.21%)	0.145[b]
Abortions >1	6 (4.17%)	22 (8.63%)	0.094[b]	16 (6.75%)	12 (7.41%)	0.802[b]
Infertility Treatment	14 (9.72%)	26 (10.2%)	0.880[b]	23 (9.7%)	17 (10.49%)	0.796[b]
GDM	25 (17.36%)	70 (27.45%)	0.020*[b]	46 (19.41%)	49 (30.25%)	0.010*[b]
PIH	6 (4.17%)	40 (15.69%)	0.005*[b]	15 (6.33%)	31 (19.14%)	0.001*[b]
Preterm Labor	7 (4.86%)	29 (11.37%)	0.029*[b]	18 (7.59%)	18 (11.11%)	0.228[b]
UTI	27 (18.75%)	58 (22.75%)	0.349[b]	46 (19.41%)	39 (24.07%)	0.264[b]
PPH	14 (9.72%)	19 (7.45%)	0.429[b]	21 (8.86%)	12 (7.41%)	0.606[b]
LSCS	69 (47.92%)	135 (52.94%)	0.336[b]	119 (50.21%)	85 (52.47%)	0.657[b]
LSCS Primigravida	38 (47.5%)	56 (50.91%)	0.643[b]	60 (50%)	34 (48.57%)	0.849[b]

a: Independent *t* test, b: Two proportion Z test, $p<0.05$ shows the significance

Table 3: Comparison of maternal outcome of obese and non-obese women between Asian Indian and WHO criteria.

	Normal BMI			Overweight + Obese		
	Asian Indian Criteria	WHO Criteria	*P* Value	Asian Indian Criteria	WHO Criteria	*P* Value
Mean Maternal Age	26.65±5.56	26.95±5.18	0.594[a]	27.62±4.22	27.72±4.03	0.810[a]
Primi gravida	80 (55.56%)	120 (50.63%)	0.351[b]	110 (43.13%)	70 (43.21%)	0.987[b]
Abortions >1	6 (4.17%)	16 (6.75%)	0.296[b]	22 (8.63%)	12 (7.41%)	0.657[b]
Infertility Treatment	14 (9.72%)	23 (9.7%)	0.994[b]	26 (10.2%)	17 (10.49%)	0.924[b]
GDM	25 (17.36%)	46 (19.41%)	0.618[b]	70 (27.45%)	49 (30.25%)	0.537[b]
PIH	6 (4.17%)	15 (6.33%)	0.371[b]	40 (15.69%)	31 (19.14%)	0.362[b]
Preterm Labour	7 (4.86%)	18 (7.59%)	<0.001*[b]	29 (11.37%)	18 (11.11%)	0.935[b]
UTI	27 (18.75%)	46 (19.41%)	0.874[b]	58 (22.75%)	39 (24.07%)	0.756[b]
PPH	14 (9.72%)	21 (8.86%)	0.778[b]	19 (7.45%)	12 (7.41%)	0.988[b]
LSCS	69 (47.92%)	119 (50.21%)	0.665[b]	135 (52.94%)	85 (52.47%)	0.925[b]
LSCS Primi gravida	38 (47.5%)	60 (50%)	0.636[b]	56 (50.91%)	34 (48.57%)	0.642[b]

a: Independent *t*-test, b: Two proportion Z test, $p<0.05$ showed the significance

Regardless of gender, young Asian Indians with BMI 23 ±2 kg/m^2 have higher abdominal and visceral fat.[12]

The study showed that only 40.6% of the women fall into the overweight or obese category as per the BMI classification by WHO. An additional 23.31% of women were grouped into the overweight or obese category when the Asian Indian criteria were used, enabling them to get exceptional care during the antenatal period, which could prevent further complications during the peri or postpartum period. Both criteria showed that overweight or obesity in pregnancy was more prevalent in the age group, 20-29 years.

NFHS-5 datasheet showed that 6.3% of the women between 20-24 years got married at an age below 18 in Kerala. The datasheet also showed that 38.1% of the women between the age group 15-49 years had BMI >25kg/m^2, and 70.7% of the population had a high-risk waist-hip ratio of ≥0.85, confirming that the overweight and obesity is high in Kerala women. This calls for pre pregnancy counseling in maintaining normal BMI among women of the reproductive age group in Kerala. Pregnancy itself was found to cause obesity due to inadequate weight loss after delivery[13] The children of obese mothers showed higher rates of childhood obesity.[14] Obesity is a multifactorial trait as both environmental and genetic factors contribute to its development.[15] In this study, increasing maternal age showed a significant contribution to maternal overweight or obesity. GDM, PIH, and preterm labor were the significant complications found in overweight and obese pregnant women as per Asian Indian Criteria. However, the WHO guidelines showed only GDM and PIH. We could not find much literature that compared the Asian Indian and WHO BMI criteria. Hence a comparison with other studies was not possible. Studies have shown that PIH, GDM, preterm labor, induced deliveries, and increased Cesarean section are significant maternal complications in overweight or obese women.[15] The infertility treatment success greatly depends on the maternal body weight.[14] In this study, both the criteria

could not show any statistical significance between maternal weight and the success of infertility treatment.

While comparing the effectiveness between the two criteria (Asian Indian and WHO criteria), the Asian Indian BMI criteria showed significance in preterm labor. Studies have already confirmed the increased risk of preterm labor in obese mothers.[14] Obesity or overweight-related antenatal complications like PIH would have contributed to an early pregnancy termination[10] before 37 weeks, contributing to preterm deliveries. However, the WHO criteria could not show any significance in any of the parameters. The rest of the parameters during the comparison study did not show any statistical significance. There was no neonatal death reported during the study period. The body fat percentage in the Asian population was higher than other ethnic populations like Europeans at the same level of BMI.[16] Hence, we strongly recommend the use of Asian Indian criteria to reduce maternal and fetal complications.

The sample size of the study population was small, and the data were collected over six months. This may be why the comparison between the two criteria could not show any significant difference between the Asian Indian and WHO criteria. A study conducted over a more extended period with more pregnant women would have given a better idea of the effectiveness of Asian Indian criteria over WHO criteria. The study was conducted in a tertiary care center that caters to the urban middle-to-upper class population. Hence the results obtained could not be generalized. Moreover, we have not included any neonatal outcome parameters other than NICU admission in the study; hence any significance of Asian Indian criteria over WHO criteria considering neonatal outcome could not be studied.

CONCLUSION

The study did not show a significant difference between the Asian Indian criteria and WHO criteria. The maternal outcome study using Asian Indian criteria showed that PIH, GDM, and preterm labor were found more in the overweight or obese group. When WHO guidelines were used, only GDM and PIH showed a statistically significant correlation. However, considering the body fat distribution in the Asian population, compared to other ethnic groups, we recommend Asian Indian criteria for BMI classification over WHO criteria

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

1. Guelinckx I, Devlieger R, Beckers K, Vansant G. Maternal obesity: Pregnancy complications, gestational weight gain and nutrition. Obes Rev. 2008;9(2):140-50. doi: 10.1111/j.1467-789X.2007.00464.x, PMID 18221480.
2. Hamilton-Fairley D, Kiddy D, Watson H, Paterson C, Franks S. Association of moderate obesity with a poor pregnancy outcome in women with polycystic ovary syndrome treated with low dose gonadotropin. Br J Obstet Gynaecol. 1992;99(2):128-31. doi: 10.1111/j.1471-0528.1992.tb14470.x, PMID 1554664.
3. Graves BW, DeJoy SA, Heath A, Pekow P. Maternal body mass index, delivery route, and induction of labor in a midwifery caseload. J Midwifery Womens Health. 2006;51(4):254-9. doi: 10.1016/j.jmwh.2005.11.008, PMID 16814219.
4. Barau G, Robillard PY, Hulsey TC, Dedecker F, Laffite A, Gérardin P, *et al*. Linear association between maternal pre-pregnancy body mass index and risk of caesarean section in term deliveries. BJOG. 2006;113(10):1173-7. doi: 10.1111/j.1471-0528.2006.01038.x.
5. Kristensen J, Vestergaard M, Wisborg K, Kesmodel U, Secher NJ. Pre-pregnancy weight and the risk of stillbirth and neonatal death. BJOG. 2005;112(4):403-8. doi: 10.1111/j.1471-0528.2005.00437.x.
6. Watkins ML, Rasmussen SA, Honein MA, Botto LD, Moore CA. Maternal obesity and risk for birth defects. Pediatrics. 2003;111(5 Pt 2):1152-8. PMID 12728129.
7. Akram DS, Astrup AV, Atinmo T, Boissin JL, Bray GA, Carroll KK, *et al*. Obesity: Preventing and managing the global epidemic. World Health Organization Technical Report Series. Vol. 894, WHO Technical Report Series, no. 894. World Health Organization; 2000;252.
8. Aziz N, Kallur SD, Nirmalan PK. Implications of the revised consensus body mass indices for Asian Indians on clinical obstetric practice. J Clin Diagn Res. 2014;8(5):OC01-3. doi: 10.7860/JCDR/2014/8062.4212, PMID 24995216.
9. National Family Health Survey-5 Maharashtra [internet]. Ministry of Health and Family Welfare; 2020 [cited Oct 11 2021]. Available from: http://rchiips.org/nfhs/NFHS-5_FCTS/FactSheet_KL.pdf.
10. Jacob AT, Jacob S, George S, Prasannan A, Joseph BB. Maternal obesity: Pregnancy outcome among overweight and obese women in a tertiary care hospital in Kerala. Int J Clin Obstet Gynaecol. 2021;5(2):24-7. doi: 10.33545/gynae.2021.v5.i2a.861.
11. Misra A. Ethnic-specific criteria for classification of body mass index: A perspective for Asian Indians and American Diabetes Association position statement. Diabetes Technol Ther. 2015 Aug 28;17(9):667-71. doi: 10.1089/dia.2015.0007, PMID 25902357.
12. Raji A, Seely EW, Arky RA, Simonson DC. Body fat distribution and insulin resistance in healthy Asian Indians and Caucasians. J Clin Endocrinol Metab. 2001 Nov 1;86(11):5366-71. doi: 10.1210/jcem.86.11.7992, PMID 11701707.
13. 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. doi: 10.1111/j.1467-789X.2008.00511.x, PMID 18673307.
14. Higgins M, McAuliffe F. Obesity and pregnancy. In: Edmonds K, Lees C, Bourne T, editors. Obesity and pregnancy. Nineth. London: John Wiley and Sons, Incorporated; 2018. p. 207-18.
15. Raatikainen K, Heiskanen N, Heinonen S. Transition from overweight to obesity worsens pregnancy outcome in a BMI-dependent manner. Obesity (Silver Spring). 2006;14(1):165-71. doi: 10.1038/oby.2006.20, PMID 16493135.
16. Razak F, Anand SS, Shannon H, Vuksan V, Davis B, Jacobs R, *et al*. Defining obesity cut points in a multiethnic population. Circulation. 2007 Apr 24;115(16):2111-8. doi: 10.1161/CIRCULATIONAHA.106.635011, PMID 17420343.

Cite this article : Jacob AT, Rajendran D, Anaswara T, Jacob S. Maternal Outcome in Overweight and Obese Women: A Comparison between Revised Consensus Body Mass Indices (BMI) for Asian Indians and WHO Criteria. Int J Med Public Health. 2022;12(1):20-3.