Review Article

# Consensus Statement for Diagnosis of Obesity, Abdominal Obesity and the Metabolic Syndrome for Asian Indians and Recommendations for Physical Activity, Medical and Surgical Management

A Misra*, P Chowbey**, BM Makkar***, NK Vikram****, JS Wasir+, D Chadha++, Shashank R Joshi+++, S Sadikot++++, R Gupta+, Seema Gulati#, YP Munjal## for Consensus Group

## Abstract

Asian Indians exhibit unique features of obesity; excess body fat, abdominal adiposity, increased subcutaneous and intra-abdominal fat, and deposition of fat in ectopic sites (liver, muscle, etc.). Obesity is a major driver for the widely prevalent metabolic syndrome and type 2 diabetes mellitus (T2DM) in Asian Indians in India and those residing in other countries. Based on percentage body fat and morbidity data, limits of normal BMI are narrower and lower in Asian Indians than in white Caucasians. In this consensus statement, we present revised guidelines for diagnosis of obesity, abdominal obesity, the metabolic syndrome, physical activity, and drug therapy and bariatric surgery for obesity in Asian Indians after consultations with experts from various regions of India belonging to the following medical disciplines; internal medicine, metabolic diseases, endocrinology, nutrition, cardiology, exercise physiology, sports medicine and bariatric surgery, and representing reputed medical institutions, hospitals, government funded research institutions, and policy making bodies.

It is estimated that by application of these guidelines, additional 10-15% of Indian population would be labeled as overweight/obese and would require appropriate management. Application of these guidelines on countrywide basis is also likely to have a deceleration effect on the escalating problem of T2DM and cardiovascular disease. These guidelines could be revised in future as appropriate, after another large and countrywide consensus process. Till that time, these should be used by clinicians, researchers and policymakers dealing with obesity and related diseases. ©

## Introduction

Obesity is an increasingly important health problem worldwide including the developing countries. In India, obesity is emerging as an important health problem particularly in urban areas, paradoxically co-existing with undernutrition. Almost 30-65% of adult urban Indians are either overweight or obese or have abdominal obesity.[1] The rising prevalence overweight and obesity in India has a direct correlation with the increasing prevalence of obesity-related co-morbidities; hypertension, the metabolic syndrome, dyslipidemia, type 2 diabetes mellitus (T2DM), and cardiovascular disease (CVD).[2,3]

Data suggest that the proposed cut-offs for defining overweight and obesity are not appropriate for Asian Indians, and that Asian Indians are at risk of developing obesity related co-morbidities at lower levels of body mass index (BMI) and waist circumference (WC).[4-7] However, Asian Indian-specific cut-offs for defining and managing overweight and obesity have not been formulated.

In this paper, we discuss the need, background, and rationale for developing such guidelines, process of consensus development, and then go on to describe the revised guidelines. It must be mentioned here, that

*Director and Head, Department of Diabetes and Metabolic Diseases, Fortis Flt. Lt Rajan Dhall Hospital, Vasant Kunj, New Delhi, and Director, Diabetes and Metabolic Diseases, Diabetes Foundation (India). **Chairman, Minimal Access, Metabolic & Bariatric Surgery Centre, Sir Ganga Ram Hospital, New Delhi. ***Sr. Consulting Physician, Diabetologist & Obesity Specialist, Sri Balaji Action Medical Institute, Paschim Vihar, New Delhi. ****Assistant Professor, Department of Medicine, All India Institute of Medical Sciences, New Delhi. +Consultant, Department of Diabetes and Metabolic Diseases, Fortis Flt. Lt. Rajan Dhall Hospital, Vasant Kunj, New Delhi. ++Consultant Cardiologist, Command Hospital, Bangalore. +++Consultant Endocrinologist, Lilavati Hospital, Bhatia Hospital and Joshi Clinic, Mumbai. ++++Consultant Endocrinologist, Jaslok Hospital and Research Centre, Mumbai, President, Diabetes India. #Chief Project Officer (Nutrition), Center for Diabetes, Obesity and Cholesterol Disorders, Diabetes Foundation (India), C-6/57, Safdarjung Development Area, New Delhi.##Director, Centre for Diabetes & Life Style Diseases, BCIMS, New Delhi.

more research is needed regarding all guidelines, and in particular, for obesity cut-offs enunciated for initiation of pharmacotherapy and bariatric surgery. We also describe guidelines for physical activity for prevention and management of obesity and related diseases. The guidelines for nutritional management of obesity and the definition of the metabolic syndrome in children have also been developed in the same conference, but these would be communicated in a later publication. Paucity of research data regarding childhood obesity precluded us from making any consensus statement.

## Why Revisions Of Guidelines For Obesity And The Metabolic Syndrome Are Needed For Asian Indians?

a. In view of rising trend in prevalence of obesity and related metabolic diseases, effective interventions are needed for Asian Indians immediately.

b. Since Asian Indians manifest clustering of cardiovascular risk factors and T2DM at lower levels of obesity, the diagnosis of obesity should be made at a lower level of weight for height than in non-Asian Indian populations.

c. In a consultation on obesity in Asians, the World Health Organisation has decided not to take any firm actions on this issue, and has left to governments of respective Asian countries to take a decision of guidelines for BMI. [8] Hence onus lies on physicians and scientists in India to decide which are the best guidelines for the Asian Indians. The current international criteria of obesity need revision for Asian Indian population.

d. If options of diet, exercise, drug and surgery are applied at lower levels of obesity, nearly 15% of the adult population of India (nearly 5-7 crore people) will benefit and T2DM and CVD could be prevented in them.

The Consensus Development Process

More than 100 medical experts (see Appendix 1) from across the country and belonging to the fields of internal medicine, diabetes, metabolism, endocrinology, nutrition, cardiology, exercise physiology, sports medicine, bariatric surgery and representing reputed medical institutions, hospitals, government funded research institutions, and policy making bodies participated to develop Asian Indian-specific guidelines for defining and managing overweight and obesity. The steering committee (see Appendix 1) prepared a draft document well in advance of the summit, which was communicated to all prospective participants for feedback and comments. After incorporating the valid suggestions, the revised consensus document was circulated among all the experts for a second review before the consensus meeting. The consensus meeting was held at New Delhi on 15-16th of November, 2008. The rationale, background, and proposals were appraised in the form of 12 lectures by the experts on the first day. The next day, 7 panels, steered by 4-5 reputed experts discussed the questions as given below taking into account research and data in Asian Indians.

a. Which is/are the best measure(s) of obesity?

b. What are the optimum cut-offs for BMI and WC for Asian Indians?

c. What is the best definition for the metabolic syndrome for adults and children?

d. What should be physical activity guidelines?

e. What should be dietary guidelines? (consensus on dietary guidelines would be communicated separately)

f. What should be guidelines for drug treatment of obesity?

g. What should be guidelines for bariatric surgery?

The discussion of the panelist was presented to the consensus group and unanimously adopted as guidelines. A writing group worked on the manuscript, which was again circulated by email to all for any comments and suggestions before final publication.

## Which Is/Are The Best Measure(s) For Diagnosis Of Obesity?

Obesity is defined as an excessive accumulation of in the body resulting in adverse effects on health of the individual.[9] Three simple measures of obesity are widely used in clinical practice; BMI, WC and waist-to-hip circumference ratio (WHR). The most widely used method to define thinness and fatness is BMI, a ratio of weight in kilograms divided by height in meters squared (kg/m$^2$). It has been correlated to morbidity and mortality risk in various populations.[10] Abdominal obesity is defined by easy-to-use parameters; WC and WHR. Though BMI, WC or WHR correlate well with each other, it is also believed that combined use of these parameters of generalized and abdominal obesity may be better in identifying people at risk of CVD than either of them alone.[11-13]

Consensus Statement

a. BMI is the most researched measure of generalized obesity and should continue to be used using Asian Indian-specific cut-offs as described later.

b. Waist circumference should be used as a measure of abdominal obesity with Asian Indian specific cut-offs.

c. Both BMI and WC should be used together (with equal importance) for population- and clinic-based metabolic and cardiovascular risk stratification.

## What Are The Optimum Cut-Offs For BMI And WC For Asian Indians?

Cut-offs of BMI

The currently recommended cut-offs of BMI recommended by World Health Organization include 18.5 - 24.9 kg/m$^2$ for normal, 25.0 - 29.9 foroverweight and >30 kg/m$^2$ for obesity.[9]

These are largely based on the morbidity and mortality data from the white Caucasian populations and may not be applicable across all ethnic groups, particularly Asian Indians.[6,7,14] Several investigators have shown that Asian Indians are more predisposed to develop insulin resistance and cardiovascular risk factors at lower levels of BMI as compared to other ethnic groups.[4,6,15] Excess clustering of cardiovascular risk factors could be attributed to a large extent by differences in body composition of Asian Indians vis a vis white Caucasians. Asian Indians have higher percentage body fat, abdominal adiposity at lower or similar BMI levels as compared to white Caucasians.[6,16-18]

### Cut-off of BMI with Body Fat as Standard

Several investigators studied the cut-offs of BMI which would correspond to the cut-offs of percentage body fat (25% in men and 30% in women)[19-24] (Table 1). In most of the studies the BMI cut-offs (kg/m$^2$) ranged from 21.5-24 in men (except one study) and 19-24 in women (Table 1). All these studies indicate that the cut-off of BMI corresponding to the cut-off of percentage body fat is lower for Asian Indians from various parts of India.

### BMI Cut-off Based on Morbidity Data

Cut-offs of BMI have been defined against various cardiovascular risk factors by several investigators. In a study in north India by Misra et al.,[25] (n= 2000), a BMI cut-off of >21 kg/m$^2$ was observed to be optimum in identifying individuals with at least one risk factor (T2DM, hypertension, hypertriglyceridemia and low HDL-c) with a sensitivity and specificity of 63.6% and 65.1%, respectively. The cut-offs >23 kg/m$^2$ and >25 kg/m$^2$ showed higher specificities (79.2% and 90.7%, respectively) but much lower sensitivity (50.8% and 36.0%, respectively). These data have been supported by a study by Snehalatha et al.[26] from South India. Vikram et al.,[5] reported that at least one cardiovascular risk factor was present in 66% and 88% non-obese (BMI<25 kg/m$^2$) men and women, respectively. Non-obese individuals with percentage body fat in the highest quartile had significantly high odds for hypertriglyceridemia (men: 2.8, women: 3.9), hypertension (men: 3.7, women: 3.2) and T2DM (women: 1.3). Similarly, in patients with T2DM, BMI cut-offs of 22 kg/m$^2$ in men and 23 kg/m$^2$ in women showed optimum sensitivity and specificity in identifying those with high percentage body fat.[20] In a study by Mohan et al.,[27] the optimal cut-off in identifying any two risk factors was 23 kg/m$^2$ in both genders.

### Consensus Statement

Normal BMI: 18.0-22.9 kg/m$^2$, Overweight: 23.0-24.9 kg/m$^2$, Obesity: >25 kg/m$^2$

## WC And WHR Cut-Offs For Asian Indians

Abdominal obesity is increasingly being recognized as an important cardiovascular risk factor.[16] In some studies, association of abdominal obesity with various metabolic risk factors appears to be stronger than generalized adiposity.[28,29] The cardiovascular risk associated with abdominal obesity can be attributed to excess abdominal adipose tissue, both intra-abdominal adipose tissue (IAT) and subcutaneous adipose tissue (SCAT).[30,31] Common surrogate measures of abdominal obesity are WC and WHR. Waist circumference is a simple, easily obtainable anthropometric parameter, which can be assessed in the outpatient setting. Measurement of WHR is more difficult as accurate measurement of hip circumference may not always be possible since it requires disrobing, difficult task especially in women in India. Further, changes in WHR may not accurately reflect the extent of obesity or changes in weight. A recent meta-regression analysis of prospective studies of WC and WHR as predictors of cardiovascular events has shown that both the measures are associated with the risk of incident CVD.[32] Recently, some evidence exists that WHR shows a graded and a significant association, stronger than that of BMI, with risk of myocardial infarction,[33] also shown for Asian Indians.[34]

The currently recommended cut-offs of WC (>102 cm in men and >88 cm in women) are not be applicable to all the populations due to heterogeneity in the average levels of measurements and different relationship with

Table 1 : Cut-offs of BMI corresponding to Cut-offs of percentage body fat

| Author | Subjects | Location | BMI cutoff | Sensitivity(%) | Specificity(%) |
|---|---|---|---|---|---|
| Dudeja et al. 2001[19] | Healthy volunteers (n=123) | North India (urban) | Males: 21.5<br>Females: 19.0 | 86.7<br>93.9 | 89.3<br>100 |
| Misra et al. 2003[22] | Dyslipidemic subjects (n=217) | North India (urban) | Males: 24<br>Females: 23 | 74.7<br>85.7 | 79.7<br>62.5 |
| Vikram et al. 2003[20] | T2DM patients (n=308) | North India (urban) | Males: 22<br>Females: 23 | 81.0<br>84.3 | 62.0<br>76.9 |
| Singh et al. 2004[24] | T2DM patients (n=300) | North India | Males and Females: 22.3 | — | — |
| Bhansali et al. 2006[23] | Healthy volunteers (n=150) | North India (urban) | Males: 25<br>Females: 23.9 | 9284 | — |
| Singh et al. 2008[21] | Healthy male volunteers (n=121) | North India (urban) | Overweight: 23.85<br>Obese: 24.38 | 70.2<br>90.0 | 87.5<br>81.2 |
| Vikram and Misra (unpublished data, 2008)* | Healthy volunteers (n=171) | North India (urban) | Males: 22.0<br>Females: 22.1 | 84.4<br>85.4 | 85.7<br>80.8 |

* DEXA scan was used to assess percentage body fat

cardiovascular risk.[35,36] Asian Indians appear to have higher morbidity at lower cut-off for WC than do White Caucasians. In a study by Misra et al.[25] WC cut-offs, 72 cm in women (sensitivity: 68.7%, specificity: 71.8%) and 78 cm in men (sensitivity: 74.3%, specificity: 68.0%) were observed to be optimum for identifying those with presence of at least one cardiovascular risk factor. WC cut-offs of ≥ 90 cm in men and ≥ 80 cm in women identified high odds ratio (4.2 & 2.2, respectively) for cardiovascular risk factors and those with a BMI ≥ 25 kg/m$^2$. The WC cut-offs of 102 cm and 88 cm in men and women, respectively, were much less sensitive in identifying those with at least one risk factor. In the study by Vikram et al.,[5] among non-obese (BMI <25 kg/m$^2$) individuals with WC in the range of 70-80 cm, men had significantly high odds for hypertriglyceridemia (3.2), and women had high odds for hypertension (2.5) and hypertriglyceridemia (2.5). In the study by Snehalatha et al.,[26] WC cut-offs of 85 and 80 in men and women, respectively, showed optimum sensitivity and specificity in identifying those with increased risk of T2DM. The corresponding WHR cut-offs were 0.88 and 0.81 for men and women, respectively. In the study (n= 2350) from South India by Mohan et al.[27] the optimal cut-offs for identifying any two risk factors was 87 cm for men and 82 cm for women. In the study by Misra et al. (unpublished data), the WHR cut-offs of 0.88 in men had the optimum sensitivity (71.0%) and specificity (71.3%) in identifying those with at least one cardiovascular risk factor. Similarly in women, the WHR cut-off of 0.80 was observed to be optimum (sensitivity: 66.2%, specificity: 65.7%).

Consensus Statement

a. Methodology of WC Measurement: WC should be measured using non-stretchable flexible tape in horizontal position, just above the iliac crest, at the end of normal expiration, in the fasting state, with the subject standing erect and looking straight forward and observer sitting in front of the subject.
b. Based on the current evidence, WC is preferred over WHR as a measure of abdominal obesity with Asian Indian specific cut-offs.
c. Both BMI and WC should be used together (with equal importance) for population- and clinic-based risk stratification.
d. WC Cut-offs for Asian Indians:
    a. Action level 1: Men: 78 cm, women: 72 cm. Any person with WC above these levels should avoid gaining weight and maintain physical activity to avoid acquiring any of the cardiovascular risk factor. These action level 1 cut-offs need to be researched further.
    b. Action level 2: Men: 90 cm, women: 80 cm. Subject with WC above this should seek medical help so that obesity-related risk factors could be investigated and managed.

## What Is The Best Definition For The Metabolic Syndrome For Adults?

The metabolic syndrome is defined as a clustering of cardiovascular risk factors in an individual which predisposes the person to a greater risk of developing T2DM and CVDs. Several definitions of the metabolic syndrome have been enunciated; National Cholesterol Education Program, Adult Treatment Panel III (NCEP, ATP III), World Health Organization and the International Diabetes Federation (IDF).

There is evidence to suggest that presence of the metabolic syndrome predicts the future risk for development of T2DM and CVD. NCEP, ATP III recommends that three out of five clinical and/or biochemical abnormalities should be present to satisfy this labeling and the recently proposed definition of the IDF requires abdominal obesity as an obligatory criterion and presence of at least two other abnormal criteria. Other available definitions of the metabolic syndrome include a measure of insulin resistance (e.g., fasting hyperinsulinemia) or another related variable (e.g. microalbuminuria). The universal appeal of NCEP, ATP III and IDF definitions for diagnosis of the metabolic syndrome stems from the fact that all the components could be measured in any clinic or a simple laboratory. The debate continues whether the presently accepted definitions including the IDF, NCEP, ATP III etc. are optimum for identification of risk for T2DM or CVD. Further, there is a paucity of data regarding the applicability of NCEP, ATP III and IDF definitions of the metabolic syndrome, and its relationship with T2DM and CVD in Asians. The originally accepted criteria for the metabolic syndrome were based on risk prediction in the non-Asian Indian populations. However the recent data from the Asian population including Asian Indians indicate that these definitions may not be satisfactory for risk prediction.[1,37,38]

Consensus Statement (Table 2)

Modification of IDF definition which includes abdominal obesity [ethnic specific cut-offs of WC, and WC as a non-obligatory criterion (indifference to the IDF definition)], high triglycerides, low-HDL, dysglycemia (impaired fasting glucose/impaired glucose tolerance) and hypertension should be used. Three out of the five criteria have to be abnormal for diagnosing the metabolic syndrome. It is important to note that these guidelines are based on analysis the cross-sectional data,[38] and need more research.

Physical Activity Guidelines for Obesity and the Metabolic Syndrome Adult Indians

Physical activity is defined as any activity leading to calorie consumption. It reduces risk for cardiovascular diseases, diabetes and other disabilities associated with obesity. It must be stressed that movement as an opportunity and not as an inconvenience. Action is needed at the individual, community and societal level to help Indians become more physically active.

Consensus Statement

a. Physical inactivity should be avoided as far as possible.

Table 2 : Definitions of the metabolic syndrome, including consensus definition for adult Asian Indians

| Definitions | Abdominal obesity(cm) | Dysglycemia: Fasting Blood Glucose (mg/dl) | Hypertension (mmHg) | High triglycerides (mg/dl) | Low HDL (mg/dl) |
|---|---|---|---|---|---|
| Consensus definition for Asian Indians *† | Males: >90, Females: > 80 (Non-obligatory criterion) | ≥ 100 | ≥ 130/ ≥ 85 | ≥ 150 | Males: < 40 Females: < 50 |
| IDF* | Males: >90, Females: > 80 (Obligatory criterion) | ≥ 100 | ≥ 130/ ≥ 85 | ≥ 150 | Males: < 40 Females: < 50 |
| Modified NCEP, ATP III | Males: >102¶, Females: > 88¶ (Non-Obligatory criterion) | ≥ 100 | ≥ 130/ ≥ 85 | ≥ 150 | Males: < 40 Females: < 50 |

*Three out of five factors have to be abnormal for identification of the metabolic syndrome. Includes previously diagnosed patients with hypertension, high triglycerides, low HLD, impaired fasting glucose, impaired glucose tolerance or T2DM, and those on treatment for the above disorders, †similar to the modified NCEP, ATP III definition with ethnic-specific definition of waist circumference, ¶NCEP, ATP III modified definition also specifies ethnic-specific cut-offs.

Table 3 : Physical activity prescription for aerobic and muscle strengthening exercises

| Type of physical activity | Moderate intensity Modality | Duration | Frequency/ days per week | Vigorous intensity Modality repetitions | Duration/ | Frequency/ week |
|---|---|---|---|---|---|---|
| Aerobic physical activity | Brisk walking, stair climbing, jogging (4-7m/sec), cycling, treadmill and swimming | 30 min | 5 | Football, badminton, basketball, running, rope jumping, dancing | 20 min | 3 days |
| Muscle strengthening activity | Resistance weight training, curls, presses, anti-gravity exercise, isometric exercise Children-Body weight activity (Pull ups) | 1-3 sets of 8-12 repetitions targeting major muscle groups | 2-3 | Resistance training, curls, presses, anti gravity exercise, isometric exercise Children- Body weight activity (Pull ups) | >3 sets of >12 repetitions targeting major muscle groups | 2-3 days |

b. Pre-participation medical consultation is recommended for those with chronic conditions or those who are symptomatic.

c. Inactive people should start slow and gradually increase physical activity.

d. Brisk walking (walking at an intensity wherein an individual finds speaking difficult but not impossible) is preferred initial mode of exercise and as this does not require any special training or equipment

e. In general, a total of 60 minutes of physical activity is recommended every day, this includes aerobic activity, work-related activity and muscle strengthening activity.[39] Prescription for physical activity is given in Table 3.

f. Physical activity can be accumulated throughout the day in blocks as short as 10 minutes. Work-related activity should be encouraged wherever possible.

g. There is a dose-response relationship between physical activity and health, greater benefit is derived by exceeding minimum recommendations. For additional and more extensive health benefits, adults can increase their aerobic physical activity to 300 minutes (5 hours) a week of moderate-intensity, or 150 minutes a week of vigorous-intensity aerobic physical activity. This issue should also be researched in Asian Indians.

h. Physical activity must be individualized on the basis of person's abilities and comorbidities. Much like pharmacological therapy it requires prescription with careful consideration of both appropriate dosage and frequency.[40-43]

i. Dynamic yoga should be encouraged but needs more research.

j. Children should undertake at least 60 min of outdoor physical activity. Screen time (television/computers) should be less than 2 hrs a day.

## Pharmacological Treatment Of Obesity

The consensus group agreed that anti-obesity drugs should be used only in conjunction with diet and lifestyle modifications as a part of comprehensive weight loss program. Also, pharmacotherapy should be monitored on an ongoing basis for efficacy as well as safety. As discussed previously, management of obesity in Asian Indians should be initiated at lower levels of BMI than those currently recommended. The current guidelines are based on cut-offs of BMI, but in this consensus it was considered important to include WC as another criterion for initiating anti-obesity pharmacotherapy.

International Guidelines for Drug Treatment of Obesity and Consensus Statement for Asian Indians[44]

Current International Guidelines: BMI above 27 kg/m$^2$ with risk factors or co-morbidities like T2DM, hypertension,

Table 4 : Comparative beneficial effects of various surgical procedures on weight loss and co-morbidities.

| Procedures | Weight loss (%) | Diabetes(%) | Hyperlipidemia(%) | Hypertension (%) | Obstructive Sleep Apnea(%) |
|---|---|---|---|---|---|
| LAGB | 47.5 | 47.9 | 58.9 | 43.2 | 95 |
| RYGBP | 61.6 | 83.7 | 96.9 | 67.5 | 80.4 |
| BPD | 70.1 | 98.9 | 99.1 | 83.4 | 91.9 |

Adapted from[45] : See text for definitions of operative procedures

dyslipidemia, and BMI above 30 kg/m$^2$ without co-morbidity.

Consensus Statement for Asian Indians: The pharmacotherapy should be initiated for BMI above 27 kg/m$^2$ without co-morbidity, or a BMI above 25 kg/m$^2$ with co-morbidity. The cut-offs for WC for initiating pharmacotherapy was unanimously agreed upon as a WC measurement 10 cms more than the upper limit of gender-specific normal value for adult Asian Indians. Sibutramine is the drug of choice unless contraindicated. Orlistat should be used as a second line drug because of its frequent and disturbing adverse effects, lesser ability to induce weight loss, and higher cost. Metformin and exenatide can be used in special clinical scenarios as add-on drugs.

## Surgical Treatment Of Obesity

Bariatric surgery has evolved over the last half century as a treatment option for patients suffering from morbid obesity. It involves modification of the digestive system by either decreasing the gastric volume (restriction) or altering the path of the food bolus causing an element of mal-absorption. These alterations effect appropriate changes in eating behavior and aid lifestyle modifications to help weight loss. The current guidelines for bariatric surgery were arrived at following research regarding resolution of obesity and related co-morbidities in response to various treatment options. As argued previously for pharmacotherapy, the consensus group arrived at the following revised guidelines for indications for bariatric surgery in Asian Indians.

International Guidelines for Surgical Treatment of Obesity and Consensus Statement for Asian Indians

Current International Guidelines: BMI above 35 kg/m$^2$ without co-morbidity, or BMI above 40 kg/m$^2$ with co-morbidity.

Consensus Statement for Asian Indians: BMI above 32.5 kg/m$^2$ with co-morbidity, and BMI above 37.5 kg/m$^2$ without co-morbidity.

The Surgical Options for Weight Loss Surgery: Restrictive Procedures: Adjustable gastric banding (LAGB) & sleeve gastrectomy, Combined Procedures: Roux-en-Y Gastric Bypass (RYGBP), Malabsorptive Procedures: Bilio-pancreatic diversions (BPD), Experimental Procedures: ileal interposition and duodeno-jejunal bypass, various implantable pulse generators.

Each surgical procedure has its advantages and disadvantages as regards weight loss, resolution of surgical co-morbidities, peri-operative morbidity and mortality and long-term sequelae. A systematic review and meta-analysis of various bariatric procedures[45] in which analysis of 136 publications comprising 179 treatment groups and 22094 patients were done, has been shown in Table 4. In addition to effective weight loss, outcomes regarding resolution of co-morbidities showed significant improvement. The response is graded depending on procedure type with malabsorptive procedures showing better results compared to purely restrictive procedures such as gastric banding

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Appendix 1

Conceptualization, Execution and Steering Committee: Pradeep Chowbey, Anoop Misra, Brij Mohan Makkar

Core Faculty and Expert Panelists: Anoop Misra, Arnab Ghosh, AK Jhingan, Anupa Sidhu, Brij Mohan Makkar, Bharat Inder Singh, B. Sivakumar, C. M. Batra, C.R. Sridhar, Dhiraj Bhatia, G. S. Toteja, Jasjeet Wasir, Janaki Srinath, J.P.S. Sawney, Jagmeet Madan, Mahendra Narwaria, M.G. Karmarkar, Naval Kishore Vikram, Pradeep Chowbey, Puneet Mishra, Prashant Joshi, Prashant Mathur, Rekha Sharma, Ritesh Gupta, Raman Goel, Shaukat Sadikot, Shailaja Kale, Shashank Joshi, Sanjay Borude, Shashank Shah, S.V. Madhu, Vinita Sharma, Y.P. Munjal

Participating Faculty : AK Gadpayle*, AK Kriplani*, Aarti Batavia*, Aashish Contractor, Aastha Arora, Ajay Ajmani*, Ajay Bijani*, Ajay Gainda*, Amit Kondal, Amrita Khare, Anil Gurtoo*, Anil Sharma, Anjali Garg, Anu Taneja Gupta, Anuj Maheshwari, Anuja Agarwala, Anura Kurpad*, Arun Prasad, Ashish Dey, Ashish Kohli, Ashish Sadana, Ashish Vashishtha, Ashok Gupta*, Ashok Jhingan, Ashok Kumar Das*, Ashutosh Mishra, Atul Luthra, Atul Sardana, Atul Wadhwa, B. Sivakumar, Brij Mohan Makkar, Balbir Singh*, Banshi Saboo*, Bela Shah*, Chhavi Kohli, CS Ramachandran*, CS Yajnik*, D K Hazra*, D Rajyasree*, Davinder Singh, Chadha, Deepak Gupta*, Deepali Khanna, Deepika Singh, Deepti Arora Gaba, Devki Nandan*, Dimple Kondal, Dr. Wadhawan,

GR Sridhar, Gagan Deep Kaur, Gopi Ghosh*, Gurleer Kaur, HB Chandalia*, Harpreet Kaur, Harsh Vardhan*, IPS Kochar, Ishi Khosla, J.K. Sharma*, J.P.S. Sawhney, Jaya Benjamin, Jayashree Todkar, Jayashree Sood*, KK Aggarwal* , KN Srivastava, K Singh*, K.K. Trehan, Kiran Rai, Kris Vijay*, Kshipra Dhawan, Kumud Khanna*, Lokesh Khurana, MG Karmarkar, MS Mahar, M. Ramesh, Majid Ahmed*, M Janakiraman*, Manish Baijal, Manish Bansal, Manoj Kumar, Meeta Lall, Meeta Mathur, Mohit Jain, Mukta Vasishta, Nabanita Bagchi, Namrata Singh, Naresh Singhi, Neena Bhatia, Neeraj Garg, Neeru Gera*, Neha Singhal, Nikhil Tandon*, Niranjana Shah*, PC Mohanty, P Janaki Srinath, PK Dewan, P.K. Reddy, Pallavi Patankar, Pankaj Sinha*, Paramjit Kaur Sodhi, Parmeet Kaur, Parminder Singh*, Partla Biswas, Parveen Bhatia, Pavitra Ganguly, Peeyush Jain*, Piush Choudhry, Prabeer Ch. Mohanty, Prachi Kolhe, Prasanna Kumar Reddy, Priya Goel, Priyali Shah, Priyanka Nigam, RR Narayan*, R.K. Prasad, R.R. Kasliwal*, R.K. Lalwani, R.K. Marya, R.M. Pandey*, Rajeev Chawla*, Rajesh Bhojwani*, Rajesh Khullar, Rajesh Rajput, Rajiv Gupta, Rajeev Gupta*, Rajnish Kukreja*, Rajul Meswani*, Rakesh Parikh, Rama Vaidya*, Renuka Kishore, Richa Jaiswal, Rishabh Khanna, Rupali Datta, SK Kapoor*, SK Singh*, SK Wangnoo* , S Kapoor, SP Dembla, SV Arya, SY Kothari, Sandeep Agarwal, Sandeep Dave*, Sandeep Malhotra, Sanjay Chaurey, Sanjeev Bhambani*, Santosh Jain Passi, Sarita Khatri, Seema Gulati, SeemaPuri*, Sesikeran*, Shailaja Kale, Shakshi Chawla*, Sharath Gopalan*, Shashank R Joshi, Shashank Shah, Shashi Mathur, Shaukat M. Sadikot, Shelza Saluja, Shipra, Shiv Chopra, Shrihari Dhorepatil, SJ Passi, Somesh Mittal*, Sonal Lalwani, Soneera Arya, Subhash Aggarwal, Sudhir Kumar Kalhan, Sudhir Tripathi*, Sudhish Sehra*, Sujeet Jha*, Sukriti Jain, Sumeet Shah, Supreet Kaur, Surender Kumar*, Suresh K Abrol, Suresh K Chhabra, Surya Prakash Bhatt, Sushum Sharma*, Suviraj John, Swapna Chaturvedi*, Swati Bhardwaj, Swati Bhave*, SY Kothari*, Tarun Mittal, Tarun Jain, U. C. Biswal, Uliyar. V Mani*, Umesh Kapil*, Usha Srivastava, V Prakash*, Vandana Jain, Vandana Soni, Vandana Verma, Vanisha Nambiar, Vasanthi Ramesh, Veenu Seth, Vidya Kumari, Vijay Laxmi Singh*, Vijay Viswanathan*, Vikas Ahluwalia, Vikas Kapur, Vinay Sabharwal, Vinod Gujral*, Vinod Mittal, Vinod Singhal*, Vipin Mishra, Vishwas Gopal Naik*, Vivek Aggarwal, VK Goyal, Y.K. Gupta*, Y. Krishnamohan, Y.S. Kusuma, Yogesh Agarwala, Yogesh Gautam, Yogesh Kumar Sarin*

All names in alphabetical order. *These individuals were contacted, explained about the aims and background of the meeting and emailed draft of the consensus, but they were not present physically present in the meeting. However, any views/suggestions from them were entertained.

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