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BMI CUTOFF IN ASIAN INDIANS: POPULAR TOOL; POSSIBLE RISK?

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ABSTRACT

Obesity - the Global lifestyle epidemic is continuously exploding and is associated with disease clusters making it a public health emergency. Indian obesity graph is reaching its peak at an alarming pace, demanding an urgent curtailing strategy. A valid reliable obesity measurement tool is inevitable for accurate evaluation, classification and reporting. BMI, though an easy, simple and popular tool is prone to flaws, that needs to be considered during interpretation. Asian Indian BMI cutoff aims accurate and reliable region specific obesity measurement. However, it is still not a favorite among researchers, physicians and policymakers of India. The review highlights the merits and demerits of BMI, as a standard obesity tool and emphasize the need for complying with Asian Indian BMI cut off for valid and reliable classification and subsequent intervention of Indian population.

Keywords: Indian Adult Obesity, BMI cutoff, misclassification, validity and reliability

INTRODUCTION

Obesity, the prevailing epidemic lifestyle disorder, elevates global morbidity and mortality risk. Obesity has tripled worldwide with a convincing share, in developing and developed countries alike **[1]**. Also, obesity leads and complicates,

the diseases assembly of diabetes, hypertension, malignancy and compromises mental health: thus, obesity is a serious public health contingency and should be managed at the earliest **[2]**.

A valid and reliable tool for unravelling obesity is imperative, for one-third of world's population is already, graded as overweight or obese, and more than half (58%) is expected to be either obese or overweight by 2030, if trends continue uninterrupted **[3]**. Optimum obesity measuring techniques facilitates early and prompt management, by foreseeing obesity associated health problems. Body Mass Index (BMI) is most popular tool, for estimating obesity in population based studies and framing public health policies **[2]**.

India is evolving and establishing as, an alarming obesity hub pervading in all stages of life, across high and lower social classes surpassing gender, region and occupations **[4]**. Study by Bajaj HS et al projects threefold increase of the waist-weight ratio of young Indian adults, when compared to their US counterparts, both men and women: Asian Indians tend to accumulate central adiposity, irrespective of body size, age and gender, when compared to other populations **[5]**.

BMI cut off values were redefined as early as 2009, to address special case of Asian Indian obesity. Mahajan K *et al*, had reported in 2017, that researchers, predominantly adhere to WHO universal cut off, even in the presence of region specific criteria for Indian obese subjects **[6]**. Researchers claim that, study finding's quality is influenced by, level of understanding, measurement methods used and subsequent obesity classification **[7]**.

In this review, authors intend to address the merits and demerits of BMI, as a standard obesity tool and emphasize the need for complying with Asian Indian BMI cut off for valid, reliable classification and subsequent intervention of Indian population.

ASSESSMENT MEASURES

Obesity is defined as, abnormal or excessive fat accumulation, to an extent of hampering health **[8]** and basis of measurement is fat accumulation in body parts, comprising of both direct and indirect assessments **[9]**.

1. Body Fat Percentage (BF %)

Body fat percentage of 25 % in men and 30 % in women, is considered as obese. More than half of the persons who have body fat percentage cutoffs are not considered obese, as their BMI is not greater than 30.

2. Anthropometric measurements

It includes measurements of height, weight, circumferences of waist, hip and head. Most uncomplicated and simple measure to assess size, shape, body mass and level of fatness. Results may vary depending on the

observer and hence, not reliable in isolation.

3. Skin fat thickness

Method for measuring subcutaneous fat present in body parts. Depends on age, skin type and fat content of the body -biceps, triceps and suprailiac region are the common sites.

4. BMI

(i) Merits

Body Mass Index (BMI) is widely used method for calculating body fat - body weight in kilograms is divided by square of height in meters **[10]**. BMI is user friendly metric, due to accuracy, simple calculation, and association with obesity linked health risks: which, explains its popular usage among medical and non-medical sectors, for more than a decade (1990 onwards) **[11, 12]**. An ideal screening tool should be: affordable, user friendly, preferably non-invasive, desirably harmless. Tool showing optimum test characteristics of sensitivity and specificity will ensure negligible false-positive and false-negative reports. BMI satisfies many of these requirements as, it is obtained from simple measurements of height and weight, easy to use and train users, cost effective, non-invasive, non-threatening and safe **[13]**.

(ii) Demerits

Like other indirect adiposity measures, BMI falls short of discriminating, between bone mass, muscle or fat, thus pliable to misclassification especially, in person with bulky muscles **[14]**. For example, sportsmen like wrestlers, may be tagged obese by BMI, despite less body fat; whereas, increased body fat with decreased muscle bulk, may be termed non obese by BMI, which in turn favors metabolic health risk **[15]**. Studies projected, higher rate of misclassification with BMI compared to DEXA and bipolar bioelectrical impedance analysis (BIA). Such statistical significant studies, also indicates need of caution while interpreting study results, based on single adiposity measurement methods **[16, 17]**. For instance, metabolically obese persons misclassified as normal weight by BMI, subsequently presented with increased visceral fat (muscle and liver fat) **[18, 19]**. Validity of BMI as a comprehensive determinant of body fat is repeatedly debated **[20]**. BMI is unable to address, variability in body fat location which is cardinal indicator of metabolic ill-health, resulting from excessive fat depots. BMI cut off points are also a dispute issue, especially in ethnic groups such as, Asians who exhibit obesity linked comorbidities at lower BMI **[21]**. Predicting comorbidities such as; cardiovascular disease, diabetes, hypertension, malignancies, or overall death rates is strongly linked to amount, site of fat accumulation and not BMI alone **[22]**.

INDIAN OBESITY AND BMI UTILITY

Factors including, but not limited to, life style and diet geographical variations, accounts for persistent yet, varied obesity in urban and rural parts of India **[4]**. Prevalence of obesity is higher among urban populations, high socioeconomic states and also in South India **[30]**. Obesity, like other non-communicable disease, tend to obstinately settle down in unprivileged lower sections of society, where corrective measures are hard to apply **[26]**.

Obesity classification and apt reporting is hence possible only through an easy, efficient tool – BMI is the most common option among medical fraternity and common people. However, steaming popularity of screening tool in itself is solution seeking problem: BMI in itself renders serious misclassification, which is heightened by nonspecific cut off .

Studies, highlight BMI as age and sex dependant, not total representative of body fat: fat distribution that signal disease risk, escapes notice since BMI does not differentiate central obesity from general obesity, lower obesity **[23]**. Even ‘‘nonobese’’ Young Asian Indians with BMI range (23 – 25 kg/m^2) had higher regional fat accumulation (visceral and abdominal fat) when compared to Caucasians with similar BMI **[21]**.

ASIAN INDIAN BMI CUT OFF

In 2000, WHO, voiced need of BMI criterion for overweight as 23–24.9 kg/m^2 and that for obesity as 25 kg/m^2 for people residing in the Asia- Pacific region **[24]**. Following non acceptance, in 2004, the governments of respective Asian countries, were encouraged to adopt suitable stand for BMI guidelines **[11]**. Meanwhile, WHO introduced, moderate-risk and high-risk category- 23 kg/m^2 and >27.5 kg/m^2. Subsequently, Indian Consensus Group in 2009 redefined overweight as 23–24.9 kg/m^2 and 25 kg/m^2 for obesity **[25]**.

However, in India including physicians, researchers and policy makers of health care and medical education sector are less preferring the modified criteria **[6] (Table 2)**.

Table 1: WHO and Asia- Pacific Criteria for BMI

Nutritional Status	BMI – WHO criteria	Asia Pacific (BMI)
Underweight	Below 18.5	Below 18.5
Normal weight	18.5 -24.9	18.5 -22.9
Overweight	25.0 – 29.9	23 -24.9
Obese	Above or equal to 30	Above or equal to 25

Table 2:BMI range in Indian studies during 2009 -2021

BMI Range	Author	Year
≥30	Soma *etal*	2009
≥30	Shashidhar*etal*	2010
≥30	Singh *etal*	2011
≥25	Amrita *etal*	2013
≥30	Ganesh *etal*	2013

≥25	Ramesh *etal*	2013
≥25	Anoop*etal*	2015
≥25	Sangeeta*etal*	2016
≥27.5	Kshatriya *etal*	2016
≥30	TukaramGadekar,MPCariappa	2017
≥25	Rajiv *etal*	2018
≥27.5	Raja*etal*	2019
≥29.9	Shammi*etal*	2020
≥ 30	Anoop*etal*	2020
≥25	Piyush*etal*	2020
≥21	Shajith*etal*	2021
≥30	Sameer *etal*	2021
≥30	Jiten and Umesh	2021

ADVANTAGES OF ASIAN INDIAN BMI CUT OFF

Luhar S and colleagues, who included elder Indian adults in their obesity study, predicts that in India by 2040, obesity prevalence, will achieve threefold increase. Arguably, using global cut off standard, would underestimate, the potential obesity risk: approximately 20 percentage of reporting gap is expected **[26]**. Detecting overweight and obesity in Indian population by Asian cut off is beneficial especially, in primary health care: early stages of metabolic ailments including diabetes, hypertension and dyslipidemia can be effective traced **[27]**. A proportion of 10-15% of Indian population can be accommodated as overweight and thereby subsequently intervened. Community based cross sectional study, by Madhur Verma *et al*, 2019, reported difference of 15 percentage in spotting, overweight and obesity prevalence using WHO Classification and Modified Criteria for Asian Indians **[27]**.

Study by Jeong Uk Lim *et al*, reports, Asia-Pacific BMI classification as a better choice when compared to WHO classification in decoding association between obesity and COPD manifestation in Asians **[20]**. From 2012, NICE guidelines had incorporated BMI cut-points as per India Consensus Guidelines, for all UK based south Asians **[28]**. Study done by Bodicoat DH *et al*, on a impressive sample of whites, indigenous and immigrant South Asians, compels for health intervention in South Asians at lower waist circumference and BMI **[29]**.

Mungreiphy NK *et al* emphasized on considering variability in obesity measurement of North Indian, North East Indian, and South Indian population comprising of Indo-Aryan, Mongoloid, and Dravidian populations respectively, which form lion share of main ethnic groups in India **[30]**. Hus *et al* urges that, absence of data should not limit chances of personalized health interference, based on ethnic groups **[31]**. High prevalence of childhood and adolescent obesity in Indian

population, calls for urgent gearing up prevention strategy includes region specific sensitive measuring tool **[32]**. Developing country status and double burden of malnutrition, collectively weakens, already lean public health funds and staggering health system, which is now is further assaulted by pandemic. We have enough reason to believe that, COVID scenario has invariably flared up obesity epidemic and obese person face increased threat of elevated weight gain during the COVID chaos **[33, 34]**.

CONCLUSION

Obesity is an impending global health concern. Profound and varied association of obesity with socio-cultural-demographic variables, calls for a prospective trend analysis: hence, apt measuring and reporting is essential. Despites inherent weakness; BMI continues to be widely used obesity measurement tool.

Considering the intensity of obesity and diversity of Indian population, use of region specific BMI cut off appears, almost imperative; complying with universal guideline is largely misleading.

CONFLICT OF INTEREST:

Authors declare no conflict of interest.

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