



Review

Obesity Pillars Roundtable: Obesity and South Asians

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ABSTRACT

Background: Compared to other races/ethnicities, individuals from South Asia with obesity are strikingly susceptible to the presence of CVD risk factors and onset of CVD events – in part due to adipopathic anatomic and metabolic responses to positive caloric balance. Pathogenic endocrine and immune effects of adipocyte hypertrophy and visceral fat accumulation both directly and indirectly promote among the most common metabolic diseases encountered in clinical practice – many being major cardiovascular disease (CVD) risk factors. This is especially applicable to those from South Asia – largely due to genetics, epigenetics, unhealthy nutrition, and physical inactivity.

Methods: This roundtable discussion included 4 obesity specialists engaged in the clinical management of obesity among patients of South Asian descent.

Results: Patients with obesity from South Asia have increased adipocyte size, fewer (functional) adipocytes, and increased visceral adiposity accompanied by functional endocrine and immune abnormalities. This helps explain the increased CVD risk factors and increased CVD risk among this unique population. These CVD risk factors include increased prevalence of metabolic syndrome (even at lower body mass index relative to other races), insulin resistance, type 2 diabetes mellitus, increased lipoprotein (a), and adipopathic dyslipidemia [(i.e., elevated triglyceride levels, reduced high density lipoprotein cholesterol levels, increased low density lipoprotein (LDL) particle number, and increased prevalence of smaller and denser LDL particles].

Conclusion: The four panelists of this roundtable discussion describe their practical diagnostic processes and treatment plans for patients from South Asia, with an emphasis on a patient-centered approach to obesity in this unique population.

1. Introduction

Dr. Bays: Hello. My name is Harold Bays MD. I am Editor-in-Chief of Obesity Pillars [official journal of the Obesity Medicine Association (OMA)], and Chief Science Officer of the OMA (Table 1). I am serving as moderator for this “An Obesity Pillars Roundtable on Obesity and South Asians.” Obesity has different clinical implications among

different races and ethnicities. Those indigenous to South Asia, or decedents of those from South Asia, are illustrative of a patient population having a unique susceptibility to the adverse consequences of increased adiposity. Today I am honored to have a discussion with 4 obesity specialists, each with expertise in management of obesity among those from South Asia.

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Table 1
Detailed background of authors.

Harold Bays MD, FOMA, Diplomate ABOM is Medical Director of the Louisville Metabolic and Atherosclerosis Research Center and Clinical Associate Professor of the University of Louisville School of Medicine. He has served as a Principal Investigator for over 500 clinical trials and has written or served as a contributing author to over 300 scientific manuscripts and book chapters, as well as authored/presented hundreds of national and international scientific abstracts. Dr. Bays is Board Certified in Internal Medicine and Endocrinology and Metabolism, Diplomate of the American Board of Obesity Medicine, and a Diplomate of the American Board of Clinical Lipidology. Dr. Bays is Chief Science Officer of the Obesity Medicine Association and Editor-in-Chief of Obesity Pillars.

Varalakshmi Niranjani MD, Diplomate ABOM is Assistant Professor of University of Connecticut School of Medicine. Dr. Niranjani has practiced Internal Medicine for more than two decades and practiced obesity medicine for the past five years after becoming an American Board of Obesity Medicine (ABOM) certified diplomate. Dr. Niranjani has created obesity medicine curricula for medical students, internal medicine residents, endocrine fellows in training, and taught management of the complex, recurring, multifactorial disease of obesity. Having knowledge of the unique manifestations of obesity among South Asians, and because of the ethnic and cultural differences in dietary pattern influence healthcare outcomes among those from South Asia, Niranjani has been invited to present her clinical observations of this complex patient population in obesity conferences both nationally and internationally.

Amardeep Shrestha MD, Diplomate ABOM is an Internal medicine physician and diplomate of the ABOM who works as a primary care physician in a solo private practice located in the St Louis metro area. Dr. Shrestha loves to connect with his patients in every aspect of their lives. His special interests are obesity and metabolic diseases. Dr. Shrestha finished his medical school training in Nepal and moved to the US for further education. St. Louis has a large South Asian population. Formally or informally, Dr. Shrestha is involved in taking care of health care needs that include metabolic diseases such as hypertension, hyperlipidemia, and diabetes. Dr. Shrestha has learned firsthand how nutrition and physical activity impacts overall health and wellness among patients from South Asia. He has not only provided obesity care for this population, but also have lived through their life struggles.

Monu Khanna MD, Diplomate ABOM is a Staff Physician of the Extended Care and Rehabilitation Services, Veterans Administration (VA) St Louis Health Care System. Dr. Khanna has a deep understanding of the culture and social situations that help determine the choices of the South Asian community. Her interest in obesity piqued upon providing internal medicine consults for bariatric surgery, seeing the complexities of unhealthy body weight, and witnessing how it related to other chronic medical conditions. What Dr. Khanna found most striking was that despite being so successful at high performing jobs, many South Asian individuals have sub-optimal health lifestyles, whether it be at social events, work, or amongst friends and families. Despite best efforts, many South Asians often do not achieve their desired health goals.

Dr. Lalitha Kambhamettu Diplomate ABOM is a primary care Internal Medicine physician who is a lifelong vegetarian. During her travels to the western world in the '80s, she faced the challenges of food choices. This firsthand experience naturally led to an interest in cuisines and nutrition. Dr. Kambhamettu completed her internal medicine residency from Christiana Care Health System in Delaware USA and have been with the Veteran Administration system for the last 8 years. Dr. Kambhamettu became an ABOM certified Diplomate in 2019 and utilizes her skills to care for her veteran patients.

ABOM = American Board of Obesity Medicine.



I would like to start by asking panelists to briefly provide their background. Dr. Niranjani, please summarize your clinical background as it applies to obesity care for those from South Asia.



Dr. Niranjani:

The prevalence of obesity is increasing in the world in all races and especially among South Asians. I am honored to take part in this roundtable discussion on the adverse health consequences of obesity among South Asians. I was trained in India, United Kingdom, and then in the United States, which gives me a global perspective. I manage patients of South Asian descent having obesity in my clinic daily (Table 1).

Dr. Bays: Dr. Shrestha, please briefly summarize your clinical background as it applies to obesity care for those from South Asia.



Dr. Shrestha:

Hello everyone. I would like to thank you for giving me this opportunity. My name is Amardeep Shrestha. Being in a metro area, my community has a diverse population of various ethnic groups and I have learned about their variability and uniqueness. I was born and raised in Nepal, which is a part of the South Asian subcontinent along with India, Pakistan and Bangladesh. I am delighted to share what I have learned from these experiences thus far and be a part of this discussion.

Dr. Bays: Dr. Khanna, please briefly summarize your clinical background as it applies to obesity care for those from South Asia.



Dr. Khanna: Having grown up on the Indian subcontinent, I know the region well and speak the language. While in India, I worked as chief medical officer of a tertiary health care center. That was my first glimpse into the extent of urban obesity in India. After my residency, I served as a primary care physician and then later as a Hospitalist. As with other ethnic groups, those from South Asia have unique health challenges to overcome.

Dr. Bays: Dr. Kambhamettu, please briefly summarize your clinical background as it may apply to obesity care for those from South Asia.



Dr. Kambhamettu: Thank you for this opportunity and thank you for your special interest in obesity in the South Asian population. Regarding my expertise in treating obesity specifically in the South Asian population, I not only help friends and family in their weight management efforts but also bring in my personal perspective.

2. Terminology, culture, nutrition, and physical activity

Dr. Bays: Thank you for your introductions. Your backgrounds and perspectives certainly suggest we have an outstanding panel for this discussion. I would like to start by ensuring we are all on the same page regarding terminology. For decades, I have had an interest in the adiposopathic effects of obesity on metabolic disease, especially among those from South Asia [1–4]. I find one of the challenges for clinicians is how best to sort out patient populations at most risk for the complications of obesity. This is made challenging in the part of the world where the number of people is not just counted in the hundreds of millions (i.e., the US population is > 300,000,000), but rather counted in billions. Another challenge is that while anti-obesity medications are approved for treatment of obesity among South Asians, barriers to South Asians receiving anti-obesity medications include cost, lack of availability, lack of acceptance for the need for treatment, reluctance to take medications long-term, and reluctance to take injectable treatment. Some patients fear adverse events reported with older weight loss medications [5]. Similarly, bariatric surgery is a treatment option for obesity, with some guidelines recommending bariatric surgery for Asian Indians having a BMI of ≥ 32.5 kg/m² in the presence of weight related complications and ≥ 37.5 kg/m² in the absence of weight related complications. However, similar to anti-obesity medications, barriers to bariatric surgery include cost, fear of surgery, lack of acceptance for the need of surgery, and apprehension about potential adverse complications [5].

Some define South Asians as those indigenous to Indian subcontinents such as India, Pakistan, Sri Lanka, Nepal, and Bangladesh, with South Asians making up over 20% of the world population [4]. Dr. Khanna, while clearly a genetic component exists, can you comment on the degree of nutritional and physical activity diversity within the population we often collectively term “South Asia.”?

Dr. Khanna: Sure. As you can guess, with so many different cultures, South Asians engage in a wide variety of traditional foods and cooking practices. This includes dependence on fisheries for the coastal folks. As we move inland, we rely on agriculture as the main source of food. Due to socio economic factors and different faiths practiced in the region, a large section of population does not eat meat. Thus, a substantial number of those from South Asia rely heavily upon grains, wheat in the north and rice in the south. Many habitually incorporate religious fasting in their lifestyles or practice elimination of certain food groups. At the same time, those from South Asia often overindulge – as attributable to communal celebration and feasting.

When we talk about the South Asians in the US workforce, a substantial proportion are employed in jobs that are often sedentary (e.g., computer sciences such as Informational Technology, business, or health care sectors). Additionally, organized sport opportunities are scarce in many South Asian areas; a substantial proportion of the population may not be engaged in rigorous physical exercise. Transition to work-from-

home in 2020 and 2021 due to the coronavirus disease 2019 (COVID-19) pandemic did not help. Competing priorities like juggling longer work hours and the complicated post-COVID life on the computer has negatively impacted optimal levels of physical activity and body weight [6].

Dr. Bays: Dr. Kambhamettu, what is your perspective about the degree of cultural similarities and diversity among those from South Asia, and how this influences obesity and obesity care?

Dr. Kambhamettu: Cultural similarities and diversity are two shades of yarn that weaves the beautiful fabric of this region! Being home to several religions, diverse cultural traditions, several languages, and cuisines, people of all backgrounds celebrate festivals, weddings and other occasions with much fervor and passion. Lavish ethnic cuisine is usually a central feature of all celebrations. In addition, making, serving, offering (especially to deities) and sharing of sweets and fried foods is an indispensable part of the religious, cultural and traditional scene. An interesting aspect of south Asian food culture is the utilization of multiple spices in varying combinations creating several flavors leading to ingestion of larger portions of macronutrients at any one meal. In addition, meals served at religious events are obligatorily consumed in entirety. As you can imagine, such behavior can easily promote obesity.

3. Genetics, epigenetics, cardiovascular disease risk

Dr. Bays: Drs. Shrestha and Niranjana, what is your sense about unique physiology, and potential pathophysiology among many of those from South Asia? In my publications on “adiposopathy,” I have described how the pathogenic endocrine and immune effects of adipocyte hypertrophy and visceral fat accumulation both directly and indirectly promotes among the most common metabolic diseases encountered in clinical practice – many being major cardiovascular disease (CVD) risk factors [7]. Those from South Asia have increased adipocyte size, fewer (functional) adipocytes, and increased visceral adiposity [7]. As true with other diseases, these anatomic changes of obesity are accompanied by functional endocrine and immune abnormalities that help explain the increased CVD risk factors, and increased CVD risk among those from South Asia. These CVD risk factors include increased risk of metabolic syndrome (even at lower body mass index relative to other races), insulin resistance, type 2 diabetes mellitus, adiposopathic dyslipidemia [(i.e., elevated triglyceride levels, reduced high-density lipoprotein cholesterol levels, increased low-density lipoprotein (LDL) particle number, and increased prevalence of smaller and denser LDL particles] [4,7].

Additionally, those from South Asia may also have increased risk for thrombosis due to increased plasminogen activator inhibitor, fibrinogen, homocysteine, and lipoprotein (a), with lipoprotein (a) potentially having both atherogenic and thrombotic properties [4]. Finally, Asians may have impaired cerebrovascular autoregulation and sympathovagal activity, increased arterial stiffness, and endothelial dysfunction [4]. Taken together, it is not surprising that compared to other ethnic/racial groups, those from South Asia have a 3- to 5-fold increase for myocardial infarction and cardiovascular death [8]. This brings me to you Dr. Shrestha. What is your sense about the relationship between obesity and the prevalence of cardiovascular risk factors among those indigenous to South Asia, and those migrating from South Asia?

Dr. Shrestha: The clinical manifestation of adiposopathy among South Asians is unique. Anatomically, body fat accumulation is sometimes termed as representing a South Asian phenotype or “thin fat” phenotype. Many from South Asia have shorter height, lower body mass index, reduced lean body mass, excess body fat in relation to the body mass index (BMI), higher amount of truncal, abdominal, and visceral adiposity, and greater accumulation of fat in ectopic sites such as the liver and skeletal muscle. One of the explanations for this is the adipose tissue overflow hypothesis. The adipose tissue within our bodies is divided into superficial subcutaneous adipose tissue, deep subcutaneous adipose tissue, and visceral adipose tissue. The superficial subcutaneous adipose tissue compartment is present throughout the body, especially in lower

limbs and is the primary storage site with excess energy. It is hypothesized that compared to Whites, South Asians have a more limited genetic ability to store excess energy in superficial subcutaneous adipose tissue compartment (i.e., limited adipocyte proliferation and differentiation). This may result in energy “overflow” (i.e., often in the form of increased circulating free fatty acids), leading to increased energy storage in visceral fat, and other body organs (e.g., liver, skeletal muscle, heart). Increased fat storage in adipose tissue may result in adipocyte hypertrophy which promotes release of various fat cell endocrine hormones called adipokines and other pro-inflammatory factors – all potentially contributing to insulin resistance. The increased flux of fatty acids to the liver (i.e., “fatty liver”) results in greater hepatic lipid accumulation and increased very low-density lipoprotein particles from the liver, increasing triglyceride blood levels and increased number of circulating atherogenic apoB lipoproteins (including atherogenic remnant lipoproteins) [9].

Other unique features noted in South Asians compared to the whites are larger sized adipocyte cells, increased amount of small dense low-density lipoprotein (LDL) particles and increased C-reactive protein levels (CRP). While all LDL particles are atherogenic, smaller LDL particles may have increased atherogenicity; elevated CRP is a CVD risk factor.

Environmental factors that increase CVD risk in South Asians include unhealthy dietary habits and physical inactivity. Compared to other ethnicities, South Asian diets are often heavy in carbohydrates and lower in polyunsaturated fatty acids. This promotes hypertriglyceridemia, hyperinsulinemia, weight gain, and increases risk of future development of type 2 diabetes mellitus, metabolic syndrome, and atherosclerotic coronary heart disease. Physical activity level in the South Asian population is also lower compared to many other ethnic groups. Increased economic affluence has led to urbanization and migration whether intra country (from rural to urban) or intercountry. This migration leads to further adverse dietary imbalances with increased consumption of fat, saturated fat, and refined carbohydrates. In other words, a diet already suboptimal may get worse with urbanization. Migration also leads to long working hours, worsening of physical inactivity and chronic stress.

Finally, in addition to genetic and lifestyle (i.e., nutrition and physical activity) factors, epigenetic modifications (e.g., deoxynucleic acid methylation, histone modification, chromatin remodeling due to unhealthy environmental exposure) may lead to phenotypic variation contributing to central obesity predisposition in South Asians. An illustrative example would be the increased prevalence of low birth weight in the South Asian community. Increased birth weight is associated with increased obesity and metabolic disease. What may be less recognized is that low birth weight may similarly increase the prevalence of CVD risk factors later in life. Largely attributable to epigenetic effects, low birth weight individuals who undergo accelerated weight gain during their childhood period may be more prone to central obesity and cardiometabolic disease in adulthood [10].

Dr. Bays: One of the more insightful studies applicable to the care for those of South Asian descent is the “Mediators of Atherosclerosis in South Asians Living in America” (MASALA) [11]. Dr. Niranjana, given the disproportionate increase in risk for CVD for the same level of increased adiposity among those from South Asia, compared to other races, and compared to some other Asians, to what degree do you believe those from South Asia are genetically predisposed for increased complications of obesity? To what degree do you believe this is related to culture (i.e., nutrition & physical activity)?

Dr. Niranjana:

One of the major CVD risk factors in South Asians is diabetes mellitus, irrespective of their BMI. Multiple potential explanations for the increased incidence of diabetes mellitus among South Asians include [12]: (1) evolutionarily determined limitations in beta cell function potentially resulting in impaired insulin secretion and (2) response to unhealthy lifestyle resulting in increased visceral fat, as well as fat deposition in liver and muscle, all promoting insulin resistance. In my clinical practice, many of my South Asian patients have pre-diabetes,

diabetes, gestational diabetes, non-alcoholic fatty liver disease at lower BMI compared to patients of other races and ethnicity. Many South Asian patients are vegetarians and have a unique dyslipidemia pattern with elevated triglycerides, decreased high-density lipoprotein cholesterol and despite a lack of a disproportionate increase in LDL cholesterol, may have an increase in LDL particle number [13]. CVD risk may be increased among non-vegetarian South Asians who consume excess processed red meat. Thus, South Asians are susceptible to the double hit phenomenon of genetic predisposition to CVD risk factors, coupled unhealthy nutrition and physical inactivity that exacerbates the genetic predisposition. This helps account for higher risk for CVD. We may not be able to change the genetic make-up, but we can change the lifestyle. Healthful nutrition and increased physical activity can reduce metabolic diseases and CVD risk factors.

4. Diagnosis of obesity in south Asians: body mass index and waist circumference

Dr. Bays: It is understood that body mass index assessment (BMI) is often inexact in diagnosing overweight and obesity among those from South Asia. That is because those from South Asia may have a disproportionately higher degree of body fat per body mass index compared to other races, disproportionately higher adiposopathic visceral (and ectopic) adipose tissue accumulation, and disproportionately increased risk for CVD [14]. Some have suggested that percent body fat may enhance body fat diagnosis. At our site, we perform dual x-ray absorptiometry to quantify visceral and android fat. We find the Obesity Medicine Association Obesity Algorithm cut-off points for android and visceral fat useful [15]. Nonetheless, body mass index remains a commonly used measure to diagnose overweight and obesity among South Asians. As such, some have suggested that for Asian Indians, BMI cut-off points should be changed to ≥ 23 kg/m² for overweight and ≥ 25 kg/m² for obesity [16]. Dr. Kambhamettu, how do you diagnose obesity among those from South Asia?

Dr. Kambhamettu: I often explain to South Asian folks that, as opposed to Whites for example, simply having a BMI of 25 kg/m² does not mean they are in a healthy weight range. A misconception is that a BMI of 25 kg/m² or less is “okay” for everyone. Having said that, I don't know if the BMI <23 kg/m² cut-off point necessarily gives us the full picture about weight-related health in the South Asian group. Percent body fat assessment might provide additional information. Additionally, an important aspect of making the diagnosis of obesity is a discussion about health risks of obesity, offering hope that habits and customs can be changed or adapted to support healthy weight, promoting healthful eating and physical activity and identifying barriers to change.

Dr. Niranjana:

South Asians exhibit complications of obesity at lower BMI. So we have to use the ethnicity specific criteria and consider those with BMI more than ≥ 23 kg/m² as high risk for developing adiposity related complications [1,17]. In short, I use the BMI criteria of ≥ 23 kg/m² to diagnose overweight in South Asians and use a bioelectrical impedance device to further diagnose body composition among South Asians.

Dr. Bays: Another way to measure obesity is via waist circumference, which may better correlate to CVD risk than BMI alone. The good news is we already have established differential in cut-off points for waist circumference. While central obesity is defined as waist circumference ≥ 40 inches (102 cm) for men and ≥ 35 inches (88 cm) for women in other populations, the respective cut-off points are ≥ 90 cm for Asian men and ≥ 80 cm for Asian women. However, the challenge is how best to measure waist circumference. Different waist circumference methodologies include measurements made the level of the iliac crest, at the midpoint between highest point of iliac crest and lowest rib, and at the level of the umbilicus.

In the past at our clinical research site, we routinely used the National Institutes of Health recommendation of measuring at the highest point of the iliac crest. However, it seems that lately, within our clinical trials, we

are frequently using the at the midpoint between highest point of iliac crest and lowest rib – especially for clinical trials having European sites. Valid reasons potentially exist to choose one method over another. My sense from a longitudinal standpoint is that what is most important is that waist circumference be accurately measured and by the same consistent method at each patient visit. From a clinician standpoint outside conduct of clinical trials, I believe accuracy and consistency matter more than the method of waist circumference measurement. Dr. Khanna, how often do you measure waist circumference? When you do measure waist circumference, how do you measure it? How valuable do you find waist circumference measurements in your care of patients with obesity?

Dr. Khanna: BMI alone may not be the most accurate indicator for CVD risk, and additional information from the waist circumference can offer us more insight. Different people carry their weight differently. You could be the same height and weight (BMI) as another person, but *where* you carry your weight could result in a completely different CVD risk factor profile. People from South Asia often have slender limbs and carry their unhealthy weight around their waist. Waist measurement is a cheap & handy intervention in tracking abdominal obesity, which is the most dangerous distribution of weight due to its risk associated with CVD risk factors and CVD risk. I use a tape measure and find the most reliable method is palpating and measuring around a bony landmark. In my opinion, the superior iliac crest works best. Incidentally, waist measurements have been an integral part of the fitness tests for the US Military and is directly linked with current and future health risks and readiness to serve.

Also, I would like to echo a prior comment from Dr Niranjan. Some suggest that South Asian patients may have smaller and greater prevalence of multivessel disease; however, direct comparison with Caucasians has not always supported this notion [18]. Nonetheless, apart from the elevated risk of insulin resistance, the altered metabolic profile among many South Asians increases cardiovascular disease. For example, South Asians have higher calcium artery calcification burden as compared to other minorities [19]. Additionally, the glycemic impact of chronic stress, poor sleep habits, lack of protective social support and inconsistent medication adherence are other factors that determine effectiveness of weight management strategies.

Dr. Bays: Drs. Niranjan and Shrestha, I believe most agree that waist circumference provides little additional diagnostic information among patients with BMI ≥ 35 kg/m² [15]. But for those with BMI < 35 kg/m², what are your thoughts about the utility and method of measuring waist circumference in patients from South Asia?

Dr. Niranjan:

When I started my obesity clinic in 2016, I was measuring waist circumference for all my patients. I had difficulty with consistent measures because of the variability in how waist circumference was measured by different medical staff at different office visits. I also noticed this measurement made my patients uncomfortable and increased obesity stigma. This was irrespective of their BMI and ethnicity. Based on the feedback from my patients, I stopped measuring waist circumference. I would also argue having a BMI 35 kg/m² in South Asians is an inherent risk factor for obesity related complications irrespective of the waist circumference. The value of measuring waist circumference may be higher in South Asian patients with normal or low BMI with CVD. We also know that the waist circumference varies widely among South Asians. Observational studies have demonstrated waist weight ratio (WWR) may be more beneficial in assessing risk in Asian Indians than waist hip ratio (WHR) [20]. Due to the high prevalence of insulin resistance among South Asians, homeostatic model assessment for insulin resistance (HOMA IR) calculation may be used to assess insulin resistance; but HOMA-IR does require drawing blood for fasting insulin and glucose.

Dr. Shrestha: As you mentioned, the cut offs for diagnosis of obesity/overweight in South Asians is lower compared to Whites (i.e., for South Asians, overweight is ≥ 23 kg/m² and obesity ≥ 25 kg/m²). For waist circumference, the cut-off points are ≥ 90 cm for Asian men and ≥ 80 cm for Asian women.

Increased waist circumference (WC) is considered a surrogate marker for abdominal adiposity and correlates to android fat mass – which includes visceral fat. Higher levels of WC are associated with cardiometabolic risk factors and CVD - independent of BMI. Hence, I believe the utility of using waist circumference in the South Asian population is high which helps early diagnosis and treatment. The flaws would be standardization in the technique in measuring WC.

Clinically, the South Asian phenotype is predominantly abdominal obesity resulting in an “apple shaped” body type. The two most common ways to measure abdominal obesity are waist circumference and waist to hip ratio (WHR). These are equally effective methods of measuring abdominal obesity. However, measuring waist circumference in patients is much easier to perform and interpret than waist to hip ratio, making waist circumference the better choice. It is an easy, inexpensive test that can be performed quickly in clinical practice. One of the drawbacks is that the technique of measuring is not standardized. Some of the literature reports the measurement of waist circumference to be done in a fasting state, standing erect with the observer sitting in front. An unstretchable flexible measuring tape is used in horizontal position, with some recommending measures just above the iliac crest and at the end of normal expiration, while others measure maximum waist circumference midway between the lower ribs and the anterior superior iliac spine. We need to standardize the technique to minimize variability.

5. Practical tips and recommendations

Dr. Bays: Those from South Asia are at increased risk for cardiometabolic risk factors and increased risk for CVD. After understanding this risk, and after applying the most applicable diagnostic criteria, the next question is what can we do? Table 2 represents our site's patient recommendations for Indian foods. This brings me to my last question. Beyond general principles of care for the patient with obesity, I would like each of you to provide your top 3 practical “tips” as it specifically applies to the management of obesity in patients from South Asia.

Dr. Shrestha: Besides typical obesity management principles, I suggest the following three practical tips. The three goals are to improve provider awareness, improve patient awareness, and provide tips for healthful nutritional and physical activity changes.

1. **Improve provider awareness:** I suggest providers be aware of the ethnic variability and higher susceptibility for obesity-related metabolic comorbidities among the South Asian population. South Asians are at higher risk for developing cardiometabolic diseases and hence appropriate measures are best taken early. Cut-off points for anti-obesity drug treatment of most non-Asian populations is ≥ 27 kg/m² with weight-related comorbidities and >30 kg/m² among those without weight related comorbidities. However, the cut-off points for South Asians are different [21], and include:
 - Normal BMI: 18.0–22.9 kg/m², Overweight: 23.0–24.9 kg/m², Obesity: >25 kg/m²
 - 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
 - Action level 1: WC Men: 78 cm, WC women: 72 cm. Any person with WC above these levels should avoid gaining weight and maintain physical activity to avoid acquiring additional cardiovascular risk factors.
 - Action level 2: WC Men: 90 cm, WC women: 80 cm. Subject with WC above this should seek medical help so that obesity-related risk factors could be investigated and managed.
 - Anti-obesity pharmacotherapy should be initiated for BMI above 27 kg/m² without weight-related co-morbidities, or a BMI above 25 kg/m² with weight related co-morbidities [5] or WC measurement

Table 2
 “Your Body Goal” Nutrition Patient Recommendations for Indian food.

BACKGROUND	When people think of Indian food, they often think of lentils (pappu), meats, spicy vegetables, stews (pulusu), curry, rice, and many spices.
BREADS AND RICE	Roti is a name for Indian breads made with whole wheat flour (atta). Unleavened breads are without rising yeast, so the bread does not rise and remains flat. Phulka is a roasted thin unleavened roti which is free of fats. Chapati is also an unleavened flatbread, that can be made without oil. Different kinds of roti have different calories. Wheat phulka and chapati have around 50–60 Calories. One slice of deep-fried Puri/Poori puffed flatbread has over 100 Calories. Fried bread with chana can have as much as 450 Calories. Polished white rice cooks quicker, but has had many of its nutrients and fiber removed. Brown rice has a lower glycemic index than white rice, and better maintains its nutrients and fiber. Basmati rice is a long grain rice found in India. It can be brown or white. Like other white rice, the milling or “polishing” removes the outer bran. While this makes it easier to cook, it removes vitamins B & E, minerals (e.g., potassium, calcium, magnesium, manganese), fiber, iron, healthful fatty acids some proteins, and antioxidants. The processing results in a higher glycemic index.
SPICES:	Common Indian spices include cumin, turmeric (similar to ginger), and mustard seed. One of the more common powders used in Indian foods is curry powder, which may contain various spices and herbs, such as cumin, turmeric, coriander, amchoor, mustard, pepper, and anise. Other Indian spices include cardamom, cloves, coriander, fenugreek, black pepper, cinnamon, coconut, basil, mint, nutmeg, and saffron. Dried red chilis can make Indian food very “spicy hot.” While some of these spices are sometimes said to have health benefits, perhaps the main benefit of adding non-sodium containing spices and seasonings is that it may reduce the desire to add unhealthy sodium.
MILK, VEGETABLES, AND MEAT:	Indian food may contain milk products, such as dahi (yogurt), which is typically modest in calories. Other common ingredients in Indian food include onions, tomatoes, cumin, turmeric, mustard, garlic, and ginger. Indian food is often healthful, due to dishes made from broth-based lentils and pulses (dals), stir-fried and sautéed vegetables, lean meat cuts, and wheat rotis. Brown basmati rice is more healthful than white rice. Where you might run into trouble is in regard to Indian butter and butter dishes. Makhan (white butter) and ghee (clarified butter) have the same number of calories as other butter (~100 Calories per tablespoon), and should only be eaten in moderation. Butter dishes have the highest number of calories, so be careful. Butter chicken is about 400 Calories. Pav Bhaji is a fast food dish of potatoes, tomato, onion and vegetables, with thick curry and butter, and served with a soft bread rolls (pav), which are buttered on both sides. It has around 600 Calories.
INDIAN SNACKS AND DESSERTS:	Indian desserts vary in calories. At one serving size respectively, dosas (crispy pancakes) contain about 100 Calories, dried banana chips or jackfruit chips have between 100 and 150 Calories, and burfi (a spicy Indian cheesecake often served in small cube-like portions) can contain 100 Calories or higher, depending on what is added. Rasgulla is Indian cottage cheese and semolina dough, cooked in light syrup, and kulfi or Indian ice cream is has a frozen custard consistency, with spices such as cardamom, saffron, and cinnamon. One serving of either is around 200 Calories. Fried and seasoned poppadoms or papads (larger crispy disc wafers), jalebi (deep-fried dough soaked in syrup) may have 350–400 Calories. Falooda is a drink of rose syrup with mericelli, psyllium or basil seeds, jelly pieces, tapioca pearls, and milk or ice cream. One serving is 300 Calories.

of 10 cm more than the upper limit of gender-specific normal value for adult Asian Indians.

- While the International Guidelines for bariatric surgery is often recommended for BMI above 35 kg/m² with weight-related comorbidity, or BMI above 40 kg/m² without weight related comorbidity, the recommended cut-off points to consider bariatric surgery for Asian Indians is BMI above 32.5 kg/m² with weight-related co-morbidities, and BMI above 37.5 kg/m² without weight-related co-morbidities.
2. **Improve patient awareness:** Compared to other races/ethnicities, South Asian Americans may underestimate their weight status and the effect of their weight on their risk for chronic diseases. Thus, an important component of interventions to promote weight loss among South Asian Americans is modifying perceptions of normal weight and the relationship between overweight and chronic diseases [22]. Weight misperception is a prime limitation to weight loss attempts, with persistent social myths such as the perception that a chubby baby is a healthy baby, leading some mothers to overfeed children with calorie dense and saturated fat dense food to increase the weight of their children. Changes in these misperceptions might best be encouraged from childhood, and likely require a robust public health campaign. We, as an obesity medicine provider, should all advocate for such a public health change.
 3. **Provide appropriate guidance in different healthful dietary and physical activity measures to take to combat obesity and adiposity-related comorbidities.** Healthful nutrition and physical activity are prime factors in obesity management in South Asian population. The adoption of nutritional habits and degree of physical activity in South Asia are not just influenced by misperceptions but also by traditional culture. The South Asian diet is often rich in refined carbohydrates, particularly high sugar and sweet, high in saturated fat oil in some fried snacks, low in fiber due to low fruit and vegetable intake, low in monounsaturated fatty acids and low in omega 3 polyunsaturated fatty acids. As such, South Asians are best advised to reduce calories through less energy dense foods and attention to portion sizes, reduce simple sugar intake, increase consumption of complex carbohydrates (i.e., low glycemic index foods), increase proteins and nut intake, and reduce consumption of saturated fats and partially hydrogenated vegetable oils.

South Asians traditionally have frequent festivals and socializing events, often worsening unhealthy dietary intake. Physical activity levels are also frequently low in most South Asians, which suggests the need to evaluate physical activity levels at each clinician encounter and advise patients on physical activity and physical exercise practices and goals. Other considerations include need motivation for adequate physical activity according to socioeconomic status, lifestyle, and environment. For example, a clinician might best advocate that patients from South Asia with obesity engage in an intensive physical activity goal of a total of 60 minutes per day including 30 minutes of moderate intensity aerobic activity, 15 minutes of work-related activity and 15 minutes of muscle strengthening exercises [23]. Involvement of family may enhance overall long-term nutritional and physical activity adherence.

Dr. Niranjana:

My practical tips in obesity management for patients from South Asia include:

Pillar 1 Nutrition

- South Asians who are vegetarians eat predominantly carbohydrates. Many carbohydrate foods may be processed and/or energy dense. Patients may benefit when clinicians educate such patients on low carb, low energy dense plant-based meal plans.
- South Asians who mostly eat home cooked meals and who consume less processed foods, often consume desserts and sweets in excess. Addressing all meal components and portion sizes is crucial to ensure healthful behavior change.
- Intermittent fasting among South Asians may modestly reduce body weight and improve CVD risk factors [24].

Pillar 2 Physical Activity [23]

- Many South Asians do not exercise and should be motivated to do planned physical activity regularly.
- A total of 60 min of physical activity is recommended every day for healthy Asian Indians.
- This should include at least 30 min of moderate-intensity aerobic activity, 15 min of work-related activity, and 15 min of muscle-strengthening exercises.

Pillar 3 Behavior

- Mental health stigma and binge eating is high among South Asians and is best addressed by trained professionals [25].
- Support groups are available, and this can be utilized if needed especially if patients are resistant to go to professional therapy sessions. The following are some of the resources that are supervised by trained healthcare providers that I use in my clinical practice to engage patients for lifestyle changes.

South Asian Lifestyle Medicine & Gut Health: Dr. Vani Paleti, a gastroenterologist, Obesity Medicine diplomate educates community through her Instagram handle @gastromom_md. https://www.instagram.com/p/CTsA825FqX4/?utm_source=ig_web_copy_link

Desi Carb Fix - Facebook Group: Dr. Amy Shah, an Allergy immunologist, a wellness consultant educates community with low carb South Asian recipes <https://www.facebook.com/groups/desicarbfix/>

Free 12-week Fitness Project: Rujuta Diwekar, a leading nutritionist and sport science specialist from India educates community through her free fitness project. <https://rujutadiwekar.com/c/content/The%20fitness%20project%202018.pdf>

Plant-based for Holistic Health: Shobha Swamy, certified plant based nutritionist and certified yoga instructor educates medical community and patient community through her cooking skills combined with teaching ability through her website called Annapoorna-Nutrition.com. <https://annapoorna-nutrition.com/>

Medical Nutritional Indian Recipes: Indira Pulliadath, a pharmacist, certified nutrition therapy practitioner teaches community about healthy stress free lifestyle by incorporating healthy nutrition in life through her website cook2nourish.com <https://cook2nourish.com/>

South Asian Mental Health Initiative & Network (SAMHIN): South Asian Mental Health Initiative and Network address a broad range of mental health needs of the growing South Asian community in United States and includes a team of psychiatrists and behavior therapists who have expertise in working with South Asians. <https://samhin.org/>

Pillar 4 Pharmacotherapy

- Among South Asians with obesity complicated by prediabetes and type 2 diabetes mellitus, preferred obesity and/or anti-diabetes agents may include metformin, glucagon like peptide - 1 receptor agonists, and sodium-glucose co-transporter-2 (SGLT2) inhibitors [26].

Dr. Khanna: In addition to advocating for mindful eating practices (e.g., eating only for nutritional needs), and eating without any distractions, my practical tips for providers taking care of patients from South Asia are:

1. **Watch that fruit intake:** While other panelists suggest Asian Indians often have low fruit intake, my experience is this that many Asians love to eat their fruit, be it mangoes, papaya, or pineapple. Under the guise of being 'healthy', a lot of patients may be unaware of the

fructose load that this adds to their weight management goals which can be especially detrimental for those with prediabetes or fatty liver.

2. **Keep it moving:** Encourage patients walk after a heavy meal. This may go a long way in blunting the postprandial glycemic response. "Movement" can include several activities, such as household chores or gardening. Each minute of increased physical activity counts and may help achieve physical activity and perhaps weight goals.
3. **Ask about the family situation:** A lot of families from this community live in multi-generational homes. They could be taking care of their seniors or having their grown children move back in with them, which has happened a lot during the COVID-19 pandemic. This adds an additional layer of responsibilities, maybe not cooking their own meals anymore, having caregiver burden, or no time for self-care.

Dr. Kambhamettu:

My tips:

- 1) Limit eating or better yet, stop eating white rice as a daily food choice. Limit chapatis/phulka to one per meal.
- 2) Increase intake of lentils, beans, soaked peanuts (avoid if allergy), horse gram, channa, rajma and various other pulses and whole grains
- 3) Make it a habit to eat a healthful meal or snack before attending a celebration or event serving food to avoid overindulging

Dr. Bays: Thanks to all of you for a practical overview of obesity and South Asians. I think we all can agree the unique physiology and culture can present challenging for both the clinician and patient. But given the number of Asians encountered in clinical practice and given the unique importance of obesity in this population, I believe readers will highly benefit from your expert insight in this informative Roundtable discussion. Thanks again!

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Author contribution

HEB conceptualized the submission, wrote/sent questions to the other authors, and assisted with editing the manuscript. AS, VN, MK, and LK responded to their assigned questions, reviewed their sections for accuracy, and gave final approval of their contribution.

Ethical review

This Obesity Medicine Association Roundtable represents original works, with work and/or words of others appropriately cited or quoted in the submission. This submission did not involve human test subjects or volunteers. HEB was not involved in the peer review process, nor the acceptance/rejection of this submission. Responsibility for the editorial process for this article was delegated to an independent Editor and/or Associate Editor.

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