

## Abdominal Obesity: A Stepping Stone to Non-Communicable Diseases in South Asia

Deepika Dhawan<sup>#,\*</sup> and Sheel Sharma<sup>§</sup>

<sup>#</sup>Department of Dietetics and Applied Nutrition, Amity University, Gurugram - 122 412, India

<sup>§</sup>Department of Food Science and Nutrition, Banasthali Vidyapith, Vanasthali - 304 022, India

\*E-mail: deepikadhawan10@gmail.com

### ABSTRACT

This article provides an overview of the relationship between abdominal obesity (AO) and Non-Communicable Diseases (NCDs) in South Asia. A literature review has been conducted using key words: Abdominal obesity, Non-Communicable Diseases, Adipokines and South Asia, searching Scopus, Pubmed, Google scholar and Medline databases. South Asians suffer from abdominal obesity that results in systematic inflammation giving rise to excess production of harmful adipokines that eventually leads to the occurrence of NCDs. The incidence of NCDs related mortality ranges between 44 per cent - 84 per cent. Impaired developments during pregnancy may also have a linkage with AO and NCDs. Adipokines and fat derivatives produced in abundance by the abdominal fat tissues have a crucial implication in the progression of NCDs. South Asians have unhealthy metabolic profile leading to several forms of NCDs. Further research needs to be done in the population groups suffering from abdominal obesity to derive interventional strategies to prevent as well as manage NCDs in clinical settings.

**Keywords:** Abdominal obesity; Non-communicable diseases; Adipokines

### 1. INTRODUCTION

South Asians have been one of the most vulnerable populations for AO and NCDs in the whole world<sup>1</sup>. AO may be marked by raised Waist Circumference (WC $\geq$ 90 cm in males and  $\geq$ 80 cm in females for South Asians. Individuals may suffer from AO even when they fall within a normal BMI (Body Mass Index) range indicating excess deposit of visceral fat in the abdominal area only. Hence, WHO (World Health Organisation) recommends that in Asian countries BMI  $\geq$ 23 kg/m<sup>2</sup> cut off point should be observed strictly for the risks of AO and NCDs<sup>2-3</sup>. This population may have several forms of obesity like “metabolically healthy obese”, “metabolically abnormal obese”, “metabolically obese normal weight” and “sarcopenic obese”, all of them having excess fat deposition at the abdominal area, are at high risk of NCDs due to the effect of pro-inflammatory adipokines (endocrine cell signaling molecules produced by adipose tissue) for progression of chronic diseases. Thus, the prevalence of all forms of abdominal obesity and the associated NCDs should be studied on a large population to visualise a clear scenario<sup>4</sup>. A recent study by ICMR (Indian Council of Medical Research) suggests that the incidence of abdominal obesity in Indian ranges from

16.9 % to 36.3%<sup>5</sup> pointing towards the fact that South Asians are inclined to have a high fat percentage with accumulated fat in abdominal and ectopic regions that potentially increases the risk for NCDs. In fact, the incidence of AO and NCDs in South Asian countries is high owing to genetic profile and lifestyle habits, especially cardiovascular diseases (CVDs) are the most common form of NCDs with highest mortality<sup>6</sup>. Table 1 presents the prevalence of NCDs related deaths in South Asian countries<sup>7</sup>.

Table 1. Incidence of NCDs related deaths in South Asian countries

Country	Death due to NCDs (%)	Diabetes (%)	CVDs (%)	Cancers (%)	Respiratory Disorders (%)	Other NCDs (%)
India	63	3	27	9	11	13
Nepal	66	4	30	9	10	13
Bhutan	69	4	28	10	9	17
Bangladesh	67	3	30	12	10	12
Afghanistan	44	3	21	8	3	10
Pakistan	58	3	29	8	5	12
Maldives	84	3	36	17	9	19
Srilanka	83	9	34	14	8	18

### 2. METHODOLOGY

The literature related to abdominal obesity in South Asians was searched on Scopus, Pubmed, Google scholar

and Medline databases. The keywords used for this included: Abdominal obesity, Non-Communicable Diseases, Adipokines and South Asia.

### 3. ABDOMINAL OBESITY IN SOUTH ASIANS

AO so common in South Asians originates from history of starvation and malnutrition during pregnancy. The resultant low birth weight babies tend to be metabolically unhealthy individuals in the later life. Malnutrition has been a prevalent phenomenon in the past in South Asian countries, though it has declined over the years with urbanisation and development<sup>8</sup>. This theory was given by Barker who suggested that malnutrition during foetal growth causes permanent programming of a thrifty metabolism and causes impaired growth of organ systems<sup>9</sup>. As a result, the body had a low energy output to survive starvation even after environmental conditions change towards the availability of abundant nutrition in later life. The lower metabolic functional capacity of important organs like liver, kidneys, heart, endocrine system, and adipose tissue resulting in thrifty metabolism cause NCDs in that adult<sup>10</sup>.

The reason for excess deposition of fat in the abdominal area is due to the insufficiency of primary adipose tissue (present all over the body) to store fat. Consequently, the excess energy is stored in the secondary depot in the abdominal area making this organ more metabolically active than that of primary adipose tissue. This may release higher amount of free fatty acids and harmful adipokines into the blood circulation. These adipokines and free fatty acids find their way into the liver during circulation and accumulate there as well as in other parts of the body. It also affects the homeostatic mechanism resulting in NCDs like diabetes mellitus, non-alcoholic fatty liver diseases, CVDs, several forms of cancer and related health problems<sup>11-12</sup>. A case study on diabetic patients reported high abdominal fat accumulation in comparison to non-diabetic patients<sup>13</sup>. Above all, abdominal obesity is linked to a constant synthesis and supply of adipokines. Their role is prominently seen in various NCDs as becomes evident in Table 2<sup>14-18</sup>.

Defence personnel not only use their physical strength and stamina but also withstand stressful conditions due to inhospitable terrain and climatic conditions while defending

the country's borders. With Asians and Indians declared extremely vulnerable to abdominal fat deposition, they have to keep considerably lower cutoffs of BMI and WC values. 'Thin Fat Indian' is the term applied to lean Indians with normal BMI who otherwise carry excess covert fat deposits in the abdominal region. Besides, this abdominal fat tissue is not inert but metabolically most active secreting a plethora of adverse hormones and cell signals of which adipokines are most prominent and vicious<sup>19</sup>. In order to take care of all these aspects and keep abdominal obesity at bay in defense people, testing, tracing and preventing such developments is an absolute necessity in order to nip fat deposition in the bud. A long-term strategy to this effect becomes an important need of the hour secularly in the South Asian nations including India, all the more in armed forces for obvious reasons. Therefore, interventions to promote healthy lifestyle to prevent the seeding of abdominal fat accumulation should become a priority area. The ball needs set rolling when the life begins by preventing foetal malnutrition denting at the foetal basis of adult NCDs. Further, stress bursting techniques need also become part of the strategy in adults. A thoughtful action on these fronts can become the cornerstone of the edifice preventing abdominal obesity and development of metabolic syndrome that snowballs as NCDs in defence personnel among others<sup>20</sup>.

"South Asians tend to have a calorie dense diet with less fibre, essential fatty acids, amino-acids, micro-nutrients content as per recommended dietary allowances. However, improvement in NCDs is seen if they are balanced in the diet along with optimal physical activity. Nutrition and exercise programs may be used as an intervention for management of several forms of NCDs."

### 4. CONCLUSION

The management of abdominal obesity and related NCDs should come from increased physical activity by regular practice of exercise and yoga as revealed in many studies. A diet rich in fibre, essential micronutrients, antioxidants, and balanced level of macronutrients can become key to its prevention and control<sup>21-23</sup>. The area should be explored for utilised for effective prevention and management of NCDs.

**Table 2. Some of common adipokines and their implicated NCDs**

Implicated NCDs	Adipokines
Obesity (if leptin resistance is seen)	Leptin, Adipsin & ASP (acylation-stimulating protein)
Diabetes mellitus	Adipophilin, TNF $\alpha$ (Tumor necrosis factor alpha), MIF (macrophage migration inhibitory factor), PAI-1 (plasminogen activator inhibitor-1), Tissue factor, IL-6 (interleukin 6), Resistin, TGF $_{\beta}$ (transforming growth factor beta), MCP-1 (monocyte chemoattractant protein-1)
Atherosclerosis, atherogenesis and cardiovascular diseases,	IL-6 (interleukin 6), PAI-1 (plasminogen activator inhibitor-1), Adipophilin, MCP-1 (monocyte chemoattractant protein-1), CETP (cholesteryl ester transfer protein), Adipsin & ASP (acylation-stimulating protein), MIF (macrophage migration inhibitory factor)
Fatty liver diseases & hepatic disorders	MIF (macrophage migration inhibitory factor), Adipophilin, Resistin
Polycystic ovary syndrome	Cytochrome P450-dependent aromatase
Breast and other cancers	Cytochrome P450-dependent aromatase, TGF $_{\beta}$ (transforming growth factor beta)

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## CONTRIBUTORS

**Ms Deepika Dhawan** has done M.Sc. Food Science and Nutrition and is presently working as an Assistant Professor,

Amity University, Gurugram. Her research interests include Clinical and Community Nutrition, Health Sciences, and Food Science.

She wrote the manuscript and has done editing and proofreading.

**Prof Sheel Sharma** has attained a Ph.D. in Biochemistry and is currently designated as Professor in the Department of Food Science and Nutrition, Banasthali Vidyapith, Rajasthan. His research interest includes Biochemistry, Food Technology, and Nutrition Sciences.

In the current study, he has done writing, proofreading, and provided critical suggestions.