

## Chapter 4

# Role of Herbal Supplements in the Treatment of Obesity and Diabetes

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### ABSTRACT

*Around the world, the prevalence of obesity and diabetes are high raising multiple severe diseases. Some of the common disorders associated with obesity are diabetes, heart diseases, and hypertension. These disorders have a tremendous effect on social lifestyles of every individual. However, another lifestyle disorder is diabetes, which can also be called hyperglycemia. Uncontrolled diabetes has the potential to cause serious complications in the body including kidney disease, loss of vision, and cardiovascular disease, which contribute towards morbidity and mortality. Though various allopathic drugs are available in the market, the herbal products and their derivatives have enough potential to treat such diseases with little or no side effects. This chapter is concerned and focuses on the application of herbal drugs along with proven mechanisms of action.*

## **INTRODUCTION**

Obesity, as well as diabetes mellitus, is considered an important health issue worldwide. Their increasing high rate of incidence might be producing numerous social costs (Desai, 2006). Obesity is the most commonly seen factor in those individuals who had high profile lifestyles, consuming fast foods or either suffer from genetic diseases. Some factors such as insulin resistance, oxidative stress and enhanced inflammation are responsible to generate a complex disease, Obesity. According to International Obesity Taskforce, it is analyzed that around more than 300 million individuals have a BMI index higher than 30 kg/m<sup>2</sup>, called obese. In developing countries, the cases of obese-born children are increasing rapidly, as the number of obese adults in developed countries (Sharma, 2012). It is calculated that in the current century, 1-in-3 children born would be expected to have obesity-related diabetic problems (Mokdad, 2001; Ogden, 1999-2004).

Obesity, considered as one of the major cause of developing metabolic dysfunctions including diabetes mellitus, cardiovascular diseases, hypertension, and so on (Devendra, 2004). Research findings reported that in upcoming years approximately 600 million people will develop diabetic related issues, due to their increasing obesity incidence, living standards. Incoming 20 years nearly 600 million individuals will become diabetic, due to high obesity prevalence, ageing, increased living standards, enhanced urbanization, and fast food (Guariguata, 2014). As the rate of incidence of obesity increased, the number of diabetic patients also increased proportionally (Shi Y, 1948). Diabetes mellitus is defined as a metabolic dysfunction with enhanced levels of blood glucose for a prolonged duration, due to destruction in the regulation of insulin-secreting pancreatic  $\beta$  cells (WHO, 2014; Kawser, 2016). It is responsible for causing several vascular complications in the body (Fowler, 2008). The treatment of diabetes includes a well-defined healthy diet, exercise and medication. A healthy nutritious diet is important for those who have diabetic complications (Patel, 2012). Numerous allopathic drugs are available in the market for the treatment of obesity and diabetes, but with many adverse side effects. Therefore, identification of phytoconstituents and dietary supplements for proper regulation and function of accumulated body fat and elevated blood sugar level. Such supplements have some potential to enhance antioxidant activity, insulin secretion (Sandborn, 2000).

Flavonoids are originated from the Latin word '*flavus*', which means yellow colour, and are abundantly present in numerous plants. Such components are polyphenolic, commonly found present in the human diet (Prasad, 2010; Castellarin, 2007). Chemically, they have a 15 carbon skeleton structure with a heterocyclic ring and two phenyl rings; they are even regarded as secondary metabolites of plants. More than 5000 flavonoids have been isolated till now, among which only selected ones are possessing beneficiary effects over chemically synthesized compounds. These compounds contain a tremendous mechanism of action in controlling and regulating obesity and diabetes.

## **Mechanism linked between Obesity and Diabetes with related pathophysiology**

Obesity is closely concerned with the low level of inflammation, showing a close relationship between immunity and metabolism (as shown in Figure 1) (Xie B, 2012; Al-Goblan, 2014). Adipocytes, a kind of fat cells secrete product that links obesity with diabetes. In obese individuals, Macrophage infiltration is prominently present in their adipose tissues (Weisberg SP, 2003; Xu HY, 2003). The adipose tissue-derived MCP-1 plays an important role in inducing macrophage infiltration into adipose tissue and it also exhibits the chemotactic action in inflammatory cells. MCP-1 activates the macrophage infiltration, which

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