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PHYTOCHEMICALS IN TREATMENT OF OBESITY

NAFEESA S* AND ANJANA M

Department of Pharmaceutical Analysis, Nirmala College of Pharmacy, Atmakur, Mangalagiri, Guntur District, Andhra Pradesh, 522503, India

***Corresponding Author: Shaik Nafeesa: E Mail: shaiknafeesa7@gmail.com**

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ABSTRACT

Obesity is an increase in body weight because of excess body fat. It is difficult to directly measure body fat, Body Mass Index (BMI) is popular method of defining a healthy weight. BMI is a measure for human body shape based on an individual's mass and height. BMI is Weight (kg) divided by Height (m) ^{2}. Obesity is commonly found to be associated with metabolic disorders such as Diabetics, Hypertension, Cardiovascular diseases. The main causal factor for obesity is hypo - caloric diets (decreased energy intake) and increased physical activity (increased energy output). Pathogenesis of obesity involves two related but distinct processes: 1) Sustained Positive Energy Balance (energy intake > energy expenditure) and 2) Resetting of the body weight "Set Point" at an increased value. Phytochemicals are chemicals of Plant origin. Phytochemicals (from Greek *Phyto,* meaning "Plant") are chemicals produced by plants through primary or secondary metabolism. Phytochemicals have been used as poison and in traditional medicine. For e.g. The tropane alkaloids of *A.belladonna* were used as poisons, and early humans made poisonous arrows from the plant. Phytochemicals are secondary metabolites of which there are several classes including alkaloids, flavonoids, coumarins, glycosides, gums, Polysaccharides, Coumarins, glycosides, polysaccharides, Phenols, tannins, terpenes and terpenoids. Phytochemicals are used as potential agents in treatment of obesity. The compounds of phytochemicals have biological properties such as antioxidant, modulation of detoxification

enzymes, stimulation of immune system. This review aims to elucidate the beneficial role for treatment of obesity in case of phytochemicals.

Keywords: Obesity, Pathogenesis, Phytochemicals, Causes, Symptoms

INTRODUCTION

The World Health Organization (WHO) defines obesity as an abnormal or excessive fat accumulation detrimental to human health. WHO defines overweight as a BMI (Body Mass Index) greater than or equal to 25 and BMI greater than or equal to 30 as obese. Obesity is rapidly increasing in both developed and developed countries, by increasing the risk of morbidity and mortality. Around 3.4 million adults die each year as result of being overweight or obese.(WHO, 2014) **[1]**. The prevalence of overweight and obesity in India is increasing faster than the world average. For instance, the prevalence of overweight increased from 8.4% to 15.5% among women between 1998 and 2015, and the prevalence of obesity increased from 2.2% to 5.1% over the same period **[2-4]**. Obesity is more common in men than women's. Changes to diet and exercising are the main treatments **[5]**. Diet quality can be improved by reducing the consumption of energy-dense foods, such as those high in fat or sugars, and by increasing the intake of dietary factory **[6]**.

Phytochemicals can be defined as bioactive non nutrient plant compounds present in fruits, vegetables, grains and other plants. Phytochemicals also referred as phytonutrients. Phytochemicals are also found in fruits, vegetables, whole grains, legumes, beans, herbs, spices, nuts, and seeds and are classified according to their chemical structures and functional properties. The terminology used to describe phytochemicals (flavonoids, flavonols, flavanols, Proanthocyanidins, Procyanidins) can be confusing. Phytochemicals include compounds such as salicylates, phytosterols, saponins, and glucosinolates, polyphenols, protease inhibitors, monoterpenes, phytoestrogens sulphides, terpenes, lectins and many more. Finally, the Phytochemicals plays a major role in treatment of obesity.

CAUSES OF OBESITY

The balance between calorie intake and energy expenditure determines a person's weight. If a person eats more calories than he or she burns (metabolizes), the person gains weight (the body will store excess energy as fat).

The main causes of obesity are given below:

1. Physical Inactivity
2. Overeating

3. Genetic factors
4. A diet high in simple carbohydrates
5. Frequency of eating
6. Medications
7. Psychological factors
8. Diseases such as hypothyroidism, insulin resistance, polycystic ovary syndrome, and Cushing's syndrome are also contributed to obesity.
9. Social issues.
10. Drugs: Corticosteroids, antidepressants and seizure medications.

SYMPTOMS OF OBESITY

Symptoms of obesity can negatively impact one's daily life. The symptoms of obesity is commonly observed in both adults and children's too.

Common symptoms of Childhood Obesity:

1. Eating Disorders
2. Fatty tissue deposits (may be noticeable in the breast area)
3. The appearance of stretch marks on the hips and back
4. Shortness of breath with physical activity
5. Sleepapnea

Common Symptoms of Obesity:

1. Excess body fat accumulation (Particularly around the waist)
2. sweating (more than usual)
3. Snoring
4. Fatigue (Mild to Extreme)
5. Pain (Commonly in the back and joints)

PATHOGENESIS OF OBESITY

There are many possible Pathophysiological mechanisms involve in development of obesity. The mechanism of obesity is "Leptin Disorder".

- Insufficient amounts of this hormone
- Resistance to leptin
- Defect in leptin carriage, transport into the CNS
- Leptin receptor defect in the hypothalamus(as occurred in db/db mice)
- Post receptor Signalling
- Mediators other than leptin are certainly implicated in obesity.
- TNF-α and cytokines that can relay information from fat tissue to brain, is increased in the adipose tissue of the obese individuals
- Reduced insulin Sensitivity of muscle and fat, Alternations in the function of specific nuclear receptors such as PPARα, β, and γ may play a role in obesity.

PHTOCHEMICALS INVOLVED IN TREATMENT OF OBESITY

Phytochemicals generally are regarded as research compounds rather than essential nutrients because proof of their possible

health effects has not been established yet **[7-8]**. The Phytochemists study phytochemicals by first extracting and isolating compounds from the origin plant, followed by defining their structure or testing in laboratory model systems, such as cell cultures, invitro experiments, or invivo studies using laboratory animals **[9]**. Phytochemicals were studied for their weight loss, efficacy based on five broad mechanisms of actions, namely 1) decreased lipid absorption 2) decreased energy intake 3) increased energy expenditure 4) decreased pre-adipocyte differentiation and proliferation, or 5) decreased lipogenesis and increased lipolysis (Yun, 2010) **[10]**. Some of the medicinal herbs that can help to treat obesity include Fenugreek, Cayenne Pepper, Ginger, Oregano, Ginseng, Turmeric, Cinnamon, Cardamom etc. The Phytochemicals found in plants are of many kinds, but most are in four major biochemical classes, the alkaloids, glycosides, polyphenols, and terpenes. These compounds are well known to possess biological and pharmacological activity against various chronic diseases such as cancer and cardiovascular etc.

Phytochemicals involved in the above compounds:

1. **Alkaloids:**

   Alkaloids are bitter-tasting chemicals, very widespread in nature, and often toxic. The Phytochemicals of alkaloids are atropine, scopolamine, and hyoscyamine (all from nightshade) **[11]**, the traditional medicine berberine (from plants such as Beriberi's and Mahonia), caffeine (Coffea), cocaine (coca), ephedrine (*Ephedra*), morphine (*opium poppy*), nicotine (tobacco), reserpine (*Rauvolfia serpentine*), quinidine and quinine (*cinchona*), vincamine (Vinca minor), and Vincristine (*Catharanthus roseus*) **[12-13]**.

2. **Glycosides:**

   Anthraquinone glycosides are found in laxatives senna **[14]**, rhubarb **[15]**, and Aloe **[12]**. The cardiac glycosides are powerful drugs from plants including foxglove and lily of the valley. They include digoxin and digitoxin which support the beating of the heart, and acts as diuretics **[16]**.

3. **Polyphenols:**

   Polyphenols of several classes are widespread in plants. They include colourful anthocyanin's, hormone-mimicking phytoestrogens, and astringent tannins **[17, 12]**. In

Ayurveda, the astringent rind of the pomegranate is used as a medicine **[18]** while polyphenols extracts from plant materials such as grape seeds are sold for their potential health benefits. They have been continually studied in cell cultures for their different anti-cancer effects **[19]**.

Plants containing phytoestrogens have been used for centuries to treat gynaecological disorders such as fertility, menstrual, and menopausal problems **[20]**. Among these plants are Puerariamirifica **[21]**, kudzu **[22]**, angelica **[23]**, fennel **[24]**, and anise **[25]**.

4. **Terpenes, and terpenoids**

Terpenes, and terpenoids of many kinds are found in resinous plants such as the conifers. They are strongly aromatic and serve to repel herbivores. Their scent males them useful in essential oils, whether for perfumes such as rose and lavender, or for aromatherapy **[12, 26, 27]**.

Some have had medicinal uses: thymol is an antiseptic and was once used as vermifuge (anti-worm medicine) **[28, 29]**.

CONCLUSION

Obesity is a complex disorder caused by the the interaction of numerous genetic dietary, lifestyle, and environmental factors. In order to overcome disorders, these review suggests that the phytochemicals of plants are very useful in treatmentof obesity.

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