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DIABESITY- AN EMERGING GLOBAL THREAT!

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ABSTRACT

Diabesity is the coexistence of both diabetes and obesity, with or without any other associated risk factors like dyslipidemia or hypertension. It is now considered as one of the major public health problem that has now evolved as a global threat. A basic and thorough overview of the literature was done. Many offline and online data-bases (NCBI, PubMed, Google Scholar, ProQuest, Scopus and EBSCO) were taken into consideration. The review articles and research papers related to this topic, published by various reputed publishers were considered as the data collection primary resource for this review article. The paid articles were accessed through the Centre Library facility of the university in order to maximize the information about the current topic. Worldwide, a rapid rise in the prevalence of cases of diabetes as well as obesity has been observed. The major causes of diabesity are the sedentary life style, change in the environment and dietary habits. Diabesity increases the morbidity and mortality hence needs to be managed in time. The management strategies must aim to achieve glycemic control, and also simultaneously aim in acquiring an optimal weight in case of diabesity. Various management protocols like lifestyle modification, exercise, healthy diet, medicines and surgeries have been recommended to manage diabesity. Diabesity is now considered as global epidemics now. However, timely intervention and management strategies can reduce the financial and health related burden arising due to it and also help in tackling the complications associated with it.

Keywords: Diabetes, Diabesity, Mortality, Obesity

INTRODUCTION

The term 'diabesity' is comparatively a newer terminology. It was first coined by Sims *et al*. in 1973 **[1, 2]**. It indicates the coexistence of both Diabetes and obesity, which may or may not be associated risk factors like dyslipidemia and hypertension. It is also denoted as "obesity-dependent diabetes". Today, Diabesity is considered to be a major public health issue all over the world and therefore it is referred to as a modern epidemic **[3-5]**. The overall increase in both type 2 diabetes and also obesity cases throughout the world during the past few years is mainly due to the lifestyle changes in human beings i.e. from an active to a sedentary type, change in behavior, food habits, genetic susceptibility and environmental changes **[6–10]**. In obese persons there is fat accumulation near the belly which is thought to increases insulin resistance and increases the risk of the development of Diabetes **[11, 3]**.

METHODOLOGY

A basic and thorough overview of the literature was done. Many offline and online data-bases were taken into consideration. The review articles and research papers related to this topic, published by various reputed publishers such as Elsevier, Springer and Taylor & Francis imprints, Hindawi were considered as the data collection primary resource for this review article. Some online databases including NCBI, PubMed, Google Scholar, ProQuest, Scopus and EBSCO were also accessed using keywords related to this topic. The paid articles were accessed through the Centre Library facility of the university. The conference proceedings, magazines, web pages and book chapters were also reviewed and accessed as the other sources of literature in order to maximize the information about the current topic.

EPIDEMIOLOGY OF OBESITY

As per the World Health Organization (WHO), obesity is defined as ‘a condition in where the percentage of body fat (PBF) is elevated to an extent which impairs the health and wellbeing of a person, and, because of the alarming increase of the condition worldwide, it is declared as a "global epidemic." **[12]** Worldwide, there has been almost three-fold increase in obesity since the last few decades. In the year 2016, over 1.9 billion of the adult population were found to be overweight. Out of this, more than 650 million were found to be obese. Today majority of the population, throughout the world, are residing in the countries where there are more deaths due to overweight and obesity than underweight. Another shocking

reality is even the children and adolescent age group are not spared from the menace of overweight and obesity. As per researches done between 2016 and in 2019, more than 340 million children and young adults of the age range, 5-19 years were suffering from overweight or obesity, almost 38 million children below the 5years of age were found to be suffering from overweight or obesity. The rising trend of obesity is posing one of the major public health issues now as it is associated with several other comorbid conditions and a decrease in the lifespan. **[13-15]** It is a consequence of complex chain of interaction between various genetic factors, lifestyle modifications, changing dietary habits, the imbalance in the energy input and expenditure, several nutritional factors and some metabolic factors, which changes the metabolism in the adipocyte **[16-18]**.

Obesity, is a result of an imbalance between the calories that we take in and the calories which is expended by us.

It leads to excessive or abnormal fat accumulation and poses a significant public health issue as it is allied with increased risk of several comorbid conditions like increased blood pressure, diabetes, coronary heart disease, stroke, many types of cancers, urinary bladder diseases, sleep disorders like sleep apnoea, osteoarthritis, and many other disorders **[19-23]**.

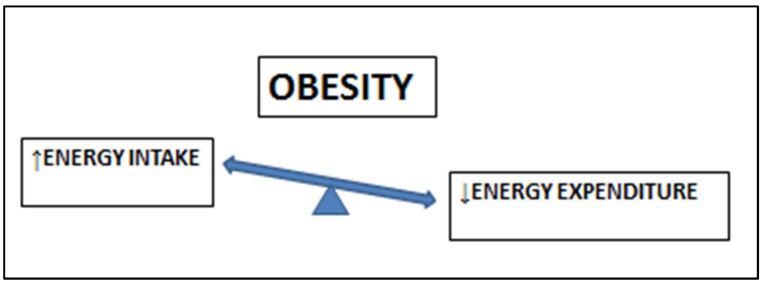

Figure 1: Cause of obesity

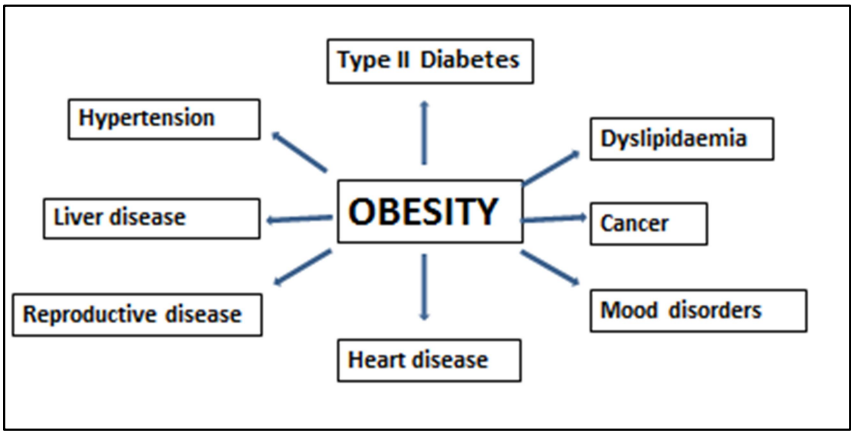

Figure 2: Complications of obesity

EPIDEMIOLOGY OF DIABETES MELLITUS

Diabetes mellitus is a type of metabolic disorder which is characterized by a long term increase in the blood sugar or hyperglycaemia resulting from either defective secretion of insulin from the beta cells of pancreas or defective action of insulin, or both. There is a steady rise in the prevalence of Diabetes over the last few decades, so, it's now being referred to as "worldwide epidemic" **[24]**. The occurrence of Diabetes is predicted to be around 366 million by 2030, and if this trend continues, almost one-fifth of the entire diabetic population worldwide will be from India **[25]**. The major impact on health as a result of type 2 diabetes mellitus (DM) is for its long-lasting complications, like, nephropathy, retinopathy, neuropathy, cardiovascular diseases, stroke, peripheral vascular diseases etc. **[26]**. It is revealed from various studied that reversing Diabetes, not only increases the life expectancy of a person but also increases the health-adjusted life expectancy in case of men and women by 1.5 to 2 years. Additionally, it was concluded that patients without Diabetes had a markedly lower health-related issue and a good quality of life compared to those with Diabetes **[27]**.

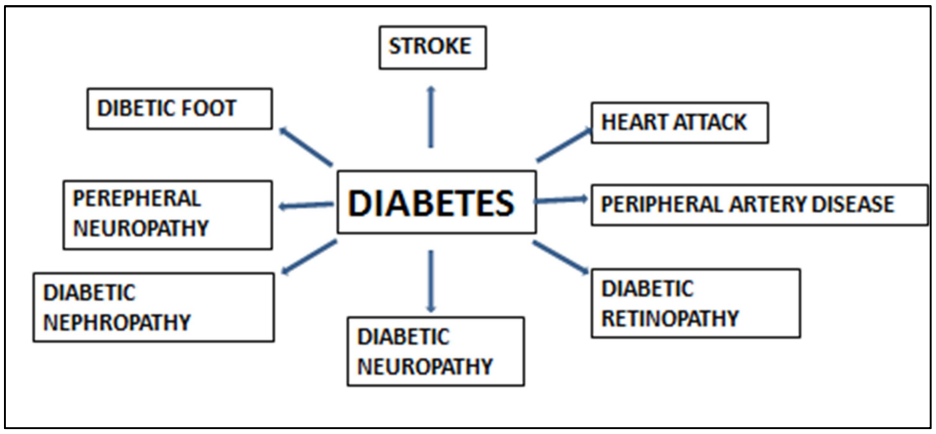

Figure 3: Complications of Diabetes mellitus

THE VISCIOUS RELATIONSHIP BETWEEN OBESITY AND DIABETES MELLITUS

There is a rising trend of Diabetes and Obesity worldwide. The researcher found people suffering from obesity also had diabetes. This made them to ponder over the relationship between Diabetes and obesity and found out some surprising fact regarding their coexistence.

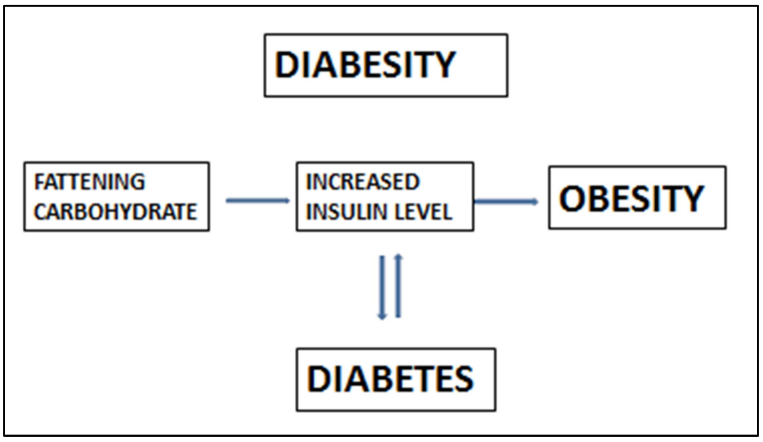

Figure 4: Relationship between diabetes and obesity

- In accordance to the statement by WHO, overweight and obesity responsible for nearly 44% of people suffering from diabetes.
- By 2025, the prevalence of obesity-related to Diabetes is expected to increase to nearly 300 million
- Together obesity and diabetes increase the individuals' mortality risk by 7-folds and this close association between the two also led to the connotation of a new term ‘diabesity'

RISK OF DIABETES IN OBESITY

- Mild obesity: Two-times increased risk of Diabetes
- Moderate obesity: Five- times increased risk of Diabetes
- Severe obesity: Tenfold increase in risk of Diabetes

MOLECULAR LINK BETWEEN OBESITY AND DIABETES

There are three main hypotheses suggesting the association between obesity and diabetes **[28].**

1. **"Inflammation hypothesis":** According to this hypothesis, obesity is defined as a state of chronic inflammation wherein the inflammatory molecules that are secreted from the invading macrophages into the adipose tissue causes certain kind of pathological changes in the pancreatic beta-cells and insulin-sensitive tissues.

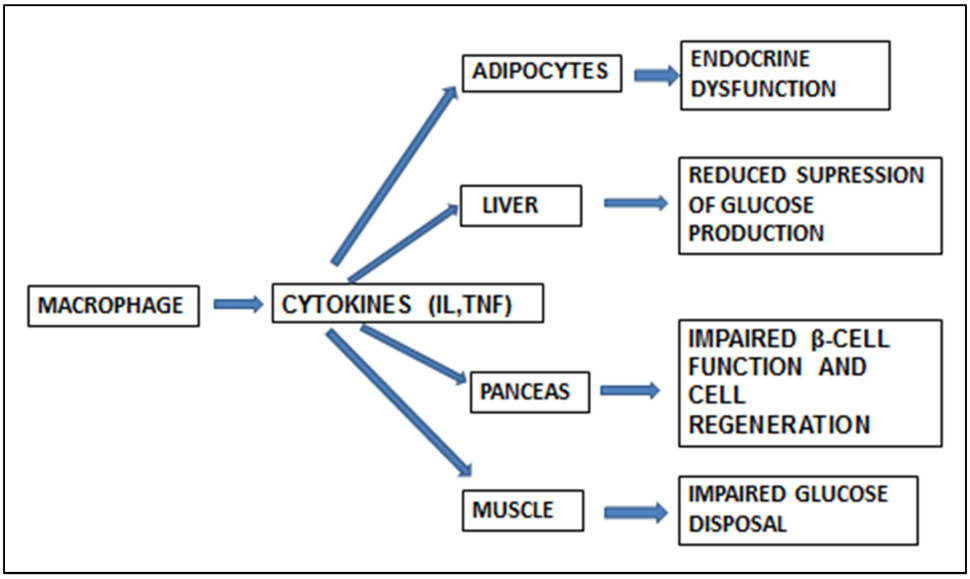

Figure 5: Inflammatory Hypothesis of Diabesity

2. "**Lipid overflow hypothesis**": Lipid overflow hypothesis or the "Adipose Tissue Expandability Hypothesis" states that obesity causes an elevated 'ectopic lipid deposit' (The lipids concentrate outside the normal depots, like in the muscles, liver, and pancreas) as a result of the decreased ability of the adipose tissue to store the fat properly in the obese subjects. The significantly dangerous lipid products and also the metabolites may impose cytotoxic influence on the peripheral cells, like the liver and the pancreatic β-cells, thus grossly affecting its function, its survival, and also its regeneration.

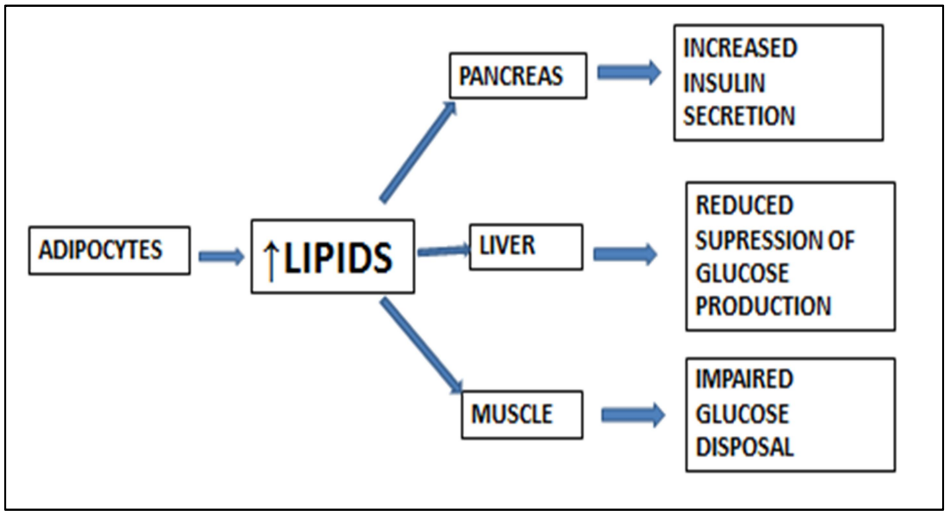

Figure 6: Lipid overflow Hypothesis of Diabesity

3. "**Adipokine hypothesis**": Adipokine hypothesis indicates towards those characteristics of the white adipose cells, where it functions like an endocrine organ, and to produces numerous hormones which exhibit autocrine and paracrine function. It has been found out that the expansion of the fat stored in our body in obesity cause dysregulated secretion of the endocrine factors, and hence resulting in metabolic dysfunction of insulin target tissues and ultimately leading to failure of the pancreatic insulin-producing cells ie the β-cells of pancreas.

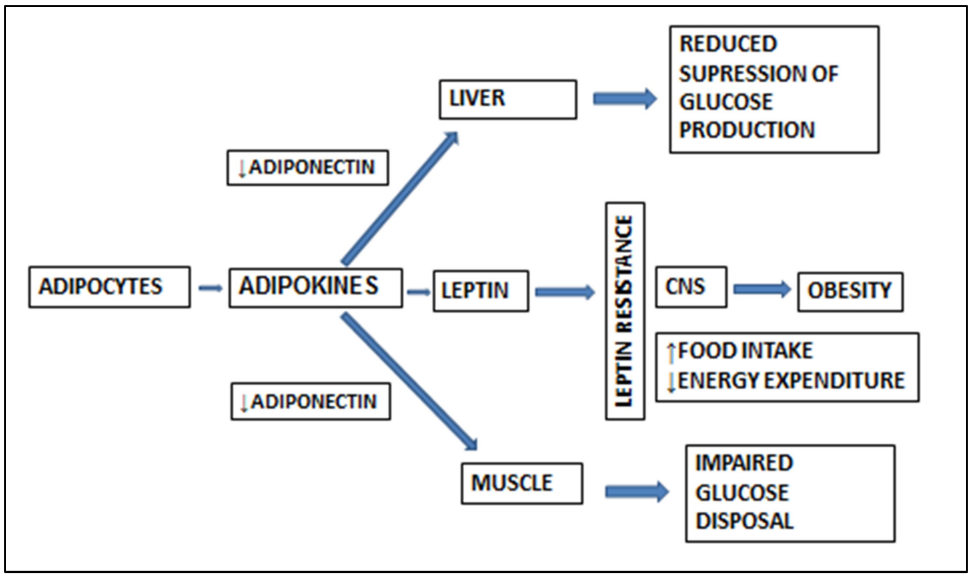

Figure 7: Adipokine Hypothesis of Diabesity

MANAGEMENT OF DIABESITY

It is very important for monitoring Diabesity as it is clearly evident that Diabetes, obesity, and complications related to it are associated with higher mortality, higher morbidity, lower longevity. It increases the health care cost and lower productivity in almost all the nations. Diabesity has evolved out as one of the major threats which act as a slow poison which presents a very complex therapeutic challenge that can be controlled but not cured **[29]**. So, we must battle Diabesity and avoid future consequences due its complications. The management plan should target towards achieving a normal glycaemic index, and also simultaneously reaching an optimal weight in diabesity **[30]**.

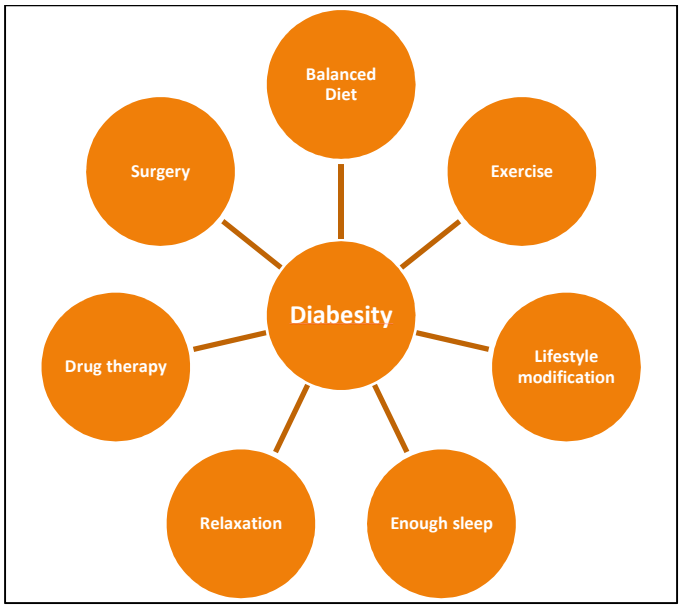

Figure 8: Management of Diabesity

1. Nutritionally Balanced Dietary Regime:

- Lots of whole grains (brown rice, whole wheat, oats etc.)
- Colourful variety vegetables (not potatoes)
- Different types of whole fruits (not fruit juices)
- Protein rich food like beans, nuts, seeds and increase of other healthy and rich sources of protein (for example fish, poultry etc)
- Use of plant oils (such as olive oil and other vegetable oils)
- Drink plenty of plain water and beverages that are naturally calorie-free.

Limit the certain food and drinks such as:

- Sweetened beverages (soda, fruit drinks, sports drinks etc)
- Fruit juice (should not exceed small amounts in a day)
- Super refined grains (for example: pasta, white bread, white rice) and sweets
- Red meat (pork, beef, lamb) and also processed meats (for example: salami, ham, sausage bacon,)
- Highly processed fast foods

2. Lifestyle Modification

People who feel currently overweight, have to start prevention program. They must do more exercise daily. Moderate-intensity exercise such as fast walking and swimming for about 150 to 250 minutes per week is beneficial for us to keep us free from obesity. Even minimum half an hour of moderate intensity physical exercise or activity every alternate day is advisable to improve insulin sensitivity and alsoat the same time help to reduce weight. Resistance exercises for the same duration, two times a week, can also be

performed. Certain folk dances like the vigorous bhangra of Punjab, jhumro of Sindh, and jhoomer of Baluchistan, khattak of Khyber-Pakhtunkhwa and all the traditional sports such as martial arts (like, pehlwani) and kabaddi, and should be recommended as forms of healthy exercise which are acceptable and low cost **[30]**.

3. Limit screen time

Watching television or mobile phones is considered as entirely a sedentary activity and it can also lead to all types of unhealthy eating habits (like intake of low-nutrient, high-calorie, food and drinks). It is advisable that all adults should limit television/mobile phone/screen media time to not more than two hours per day. The lesser, the more better.

4. Enough Sleep

A good sleep at night is the secret of good health and this may also help to keep a control over excessive gain of weight.

Adults: should sleep for at least seven to eight hours at night

Children: 1-3 years old: should sleep for twelve to fourteen hours a night; 3-5 years old: eleven to thirteen hours a night and 5-12 years old: ten to eleven hours a night.

5. Relaxation

- Today's world is not free from daily stresses and our unhealthy activities hardly gives us any time for relaxation.
- Regular physical activity is one of the best methods to overcome stress and weight gain.
- Mind-body approaches, for example yoga, breathing exercises, meditation can also be extremely beneficial

6. Drug Therapy:

Several drug therapies have been tried, like, Sibutramine which enhances satiety, and Orlistat inhibits Lipase, Phentermine is an anorexic agent and Metformin, which increase insulin sensitivity and Insulin.

7. Surgical procedures

Obesity can now be managed by Bariatric surgery which is showing promising results in the management of Diabesity. Certain surgeries for weight reduction include Jejuno-ileal bypass; Jejuno-colic bypass; Gastric bypass; Bilio- Pancreatic Diversion; Inflatable band; BPD-DS; Sleeve gastrectomy. These surgical procedures are now believed to 'cure' both Diabetes and obesity. But these surgeries may be associated with a numerous endocrine and metabolic disorders and should be used only in selected, resistant cases.

CONCLUSION

Health is not valued till sickness comes. So, we need to take care of our health as it is our real wealth. Screening human beings routinely is one of the best-known methods of controlling the epidemic of Diabesity, very early, before it further advances and thereby helps to lead a normal and healthy life. Thus, there is an urgent need for timely detection of signs and symptoms and taking precautions for its prevention. It is essential to prevent Diabesity as it is now an epidemic which interferes with the heath and major wellbeing of people and is a financial burden on the society**.**

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CONFLICT OF INTEREST

The authors declare, they have no conflict of interest among themselves.

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