Descriptive and Retrospective Study on the Prevalence of Overweight and Obesity among Patients with Type 2 Diabetes Mellitus

Samera S[*1], Jayaprakash S[2], Jeyasundari K[3], Bharathi P[2], Suryaprakash R[1]

[1]Department of Pharmacy Practice, K.M. College of Pharmacy, Madurai, Tamil Nadu, India
[2]Department of Pharmaceutics, K.M.College of Pharmacy, Madurai, Tamil Nadu, India
[3]Department of Pharmacy Practice, Pannai College of Pharmacy, Trichy - Dindugal Rd, Mullipadi, Tamaraipadi - 624005, Tamil Nadu, India

ABSTRACT

Weight gain has been declared as one of the top 10 global health risks by the World Health Organization (WHO). In the past few decades, obesity has increased alarmingly around the world. Most patients with type 1 diabetes possess anti-insulin antibodies before receiving insulin therapy. About 80% of patients with type 1 diabetes have circulating islet cell antibodies. Both developed and developing countries are facing a medical disaster due to obesity. The incidence of type 2 diabetes is correlated with insulin resistance. Insulin resistance does not lead to hyperglycemia in most obese individuals. The purpose of this study is to determine whether Type 2 diabetes mellitus patients are overweight or obese, and to identify risk factors for such disease. Preventing diabetes complications and reducing its prevalence. A study was conducted to determine whether obesity increases the risk of diabetes. Identify dyslipidemia in Type 2 diabetics by studying its prevalence pattern. The age range of 40 to 70 years for type 2 diabetes mellitus patients. The study also excluded participants with dyslipidemia. Various metabolic parameters were measured as well as baseline anthropometric indices (BMI, WHR). We found 25 patients in normal weight category, 3 patients in underweight category, 50 patients in overweight category, and 53 patients in obese category among the patients aged 40-50 years. Developing appropriate and controlled strategies for improving nutrition and promoting weight loss is urgently needed to mitigate Type 2 diabetes patients' increasing health challenges.

*Corresponding Author

Name: Samera S
Phone:
Email: sameraparveen07@gmail.com

INTRODUCTION

Overweight and obesity are on the rise worldwide and have become global issues. Overweight has been named one of the top 10 health risks in the world and one of the top five health risks in developing countries by the World Health Organization [1]. The number of overweight people worldwide is estimated to be over one billion, with 250 million being clinically obese (WHO,1998). An imbalance between food intake and actual energy requirements is at the root of overweight and obesity. A chronic disorder, diabetes mellitus (DM) affects the metabolism of carbohydrates, proteins, and fats [2]. This condition results in the absence of insulin

secretion due either to a progressive or marked malfunction of the Langerhans cells of the pancreas or from a defect in the cannulation of insulin by the peripheral cells of the body [3, 4].

Type 1 and type 2 diabetes are the two broad categories of diabetes mellitus. Children are most often affected by type 1 diabetes, but adults in their late thirties and early forties can also develop the condition. Diabetes ketoacidosis is a medical emergency that occurs in patients with type 1 diabetes who are not obese. A variety of environmental or infectious agents can damage the pancreatic cells, which is the etiology of type 1 diabetes [5, 6]. An immune response is produced by the immune system when susceptible individuals become infected by viruses. There are anti-islet cell antibodies circulating in about 80% of individuals with type 1 diabetes, and most of these individuals have anti-insulin antibodies before receiving insulin therapy [7, 8].

Obesity

In obesity and overweight, excessive adipose tissue is accumulated to a degree that impedes both physical and psychological well-being. In developed as well as developing countries, obesity is considered a major health problem [9].

Obesity and type 1 diabetes

Children and adults are becoming more likely to develop type 2 diabetes due to obesity epidemics. Type 1 diabetes also increases due to the same etiology. According to twin studies, environmental factors and genetic factors are both involved in the etiology of type 1 diabetes. An increase in type 1 diabetes incidence among immigrants from low to high incidence regions further illustrates the importance of environmental factors in the etiology of diabetes. In addition to short-duration breastfeeding and cow's milk protein exposure, some types of infection, such as enteroviruses or rubella, may contribute to the onset of type 1 diabetes. It has yet to be proven definitively that any of these factors causes the disease.

Obesity and type 2 diabetes

Nowadays, obesity has become one of the biggest problems in the world due to its increasing prevalence. Overweight and obesity are prevalent in the US, with approximately two-thirds of the adult population being overweight or obese.

The global trend is similar. There is a link between insulin resistance and type 2 diabetes. Insulin resistance does not cause hyperglycemia in most obese individuals. Normal glucose tolerance is maintained when insulin is released by the islets of Langerhans adequate to overcome a reduction in insulin levels.

Obesity and insulin resistance

Natural life cycle fluctuations affect insulin sensitivity. In puberty, during pregnancy, and as a result of aging, insulin resistance may be observed. The degree of insulin sensitivity fluctuates according to lifestyle factors, such as carbohydrate consumption and physical activity. Leptin, cytokines, adiponectin, and proinflammatory substances, as well as NEFAs are released by adipose tissue, which affects metabolism. These substances are secreted more frequently in obese people.

Obesity and β-cell dysfunction

Neurons within beta cells control the release of insulin despite their fragility. Insulin levels are fluctuating and changing in the cellular response to various types of stimuli, including the quantity, nature, and route by which they are administered. Therefore, β-cells play maintains a relatively normal physiological range of blood glucose concentrations in healthy subjects. Diabetes increases insulin sensitivity through modulating beta-cell function, which decreases in obese people [10, 11].

Global and Asia-Pacific overweight prevalence

The obesity epidemic began in the United States, then spread across Europe, and then to developing countries.

The prevalence of obesity and overweight varies across different regions, with the Middle East, Central and Eastern Europe and North America having the highest rates.

Polynesia (76.8%) and Micronesia (70.3%) have the highest obesity prevalence [12]. In several developing countries, obesity prevalence increased from 2.3 percent to 19.6 percent in 1998. The sedentary lifestyle in many developing countries has been associated with higher obesity rates among women than among men.
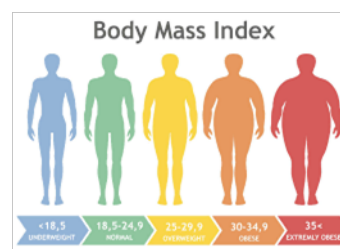

Figure 1: Age based on Body Mass Index

Phases

Phase: - I: Diabetes patients with Type II diabetes mellitus are more likely to be overweight and obese, as well as discuss the factors associated with them. Enquiring the relevance of study with Dr. A. Ashir-
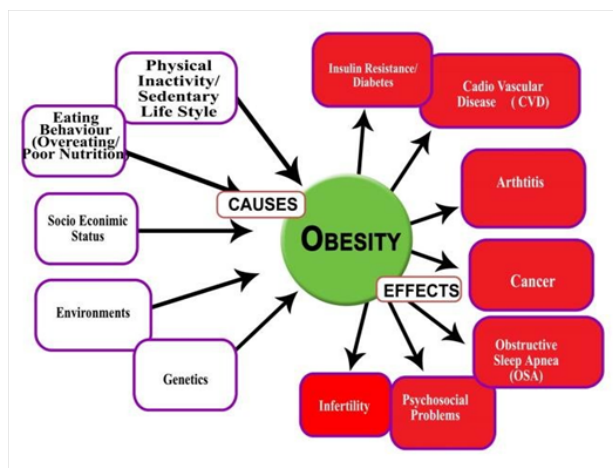
Figure 2: Effects and Causes of Obesity

vatham Chief doctor of A. Ashirvatham Hospital collection of literature review was done.

Phase: - II: Designing of the protocol was done. Selection, Interview and Inclusion of Patient into the study as per the protocol.

Phase: - III: Information like demographic profile, anthropometric measurements biochemical Investigations, Social habits, Dietary habits, Drug therapy were collected from Hospital Medical Record.

Phase: - IV: The data was collected and compiled and analyzed with statistical tool (graph pad chart in stat software).

Phase: - V: Collected data will analyzed and processed systematically and presented in Tabular form.

Phase: - VI: Analysis of results and Interpretation was made, after Interpretation of data, Discussion was made with Diabetologist for further risk reduction.

The data used was sourced from

Patient interview, case note, treatment chart.

METHODOLOGY

This was a retrospective study analyze the patient details from medical records of Arthur Ashirvadham Hospital, Madurai. Initially we select 600 records at the period of March 2020 to December 2020.Various metabolic parameters and baseline anthropometric measures were recorded. Patients' records were also checked for lifestyle factors such as smoking, drinking alcohol, exercising, and eating fruit.200 patients excluded due to missing data especially BMI, WHR, Lipid profile. Final analysis performed among 400 patients. The descriptive study reviewed among 400 Records of Selected Patients on the basis of Inclusion and Exclusion criteria. In this study, the

subjects were grouped under 4 categories, where Group A Taken as Normal weight, Group B Taken as underweight, Group C taken as overweight Group D taken as obese. Several baseline adiposity indices are examined in this retrospective study. The demographic,anthropometric, and clinical data including medications were recorded [13, 14]. A routine clinical evaluation was conducted in a hospital to collect the data for this study. In addition to social demographic data, medical history, glycemic control, medication usage, complications associated with diabetes mellitus, and biophysical measurements were collected for the review. Obesity is defined as a body mass index of 30 Kg/m2 or more, and overweight as a body mass index between 25 and 25.9 Kg/m2.

Calculation of BMI

As a matter of course, we made use of the WHO's BMI definition for Kg/m2: 18 kg divided by square of height in meters (KG/m2).

Statistical Tools

A chi square test was used to examine baseline characters. A master chart was used to record information for all cases selected, and graph pad instant was used to analyze the data. Means, standard deviations & P values were calculated using this software.

RESULTS AND DISCUSSION

Demographic details

Age group Distribution

In 40-50 years of age category, 25 patients in normal weight, 3 patients in underweight, 50 patients in Over Weight, 53 patients in obese category were present.In the age group of 50-60 yrs. ,46 patients in Normal weight, 3 patients inUnderweight, 70 patients in Overweight, 72 patients in Obese were present.In the age group of 60-70, 29 patients in Normal weight. One in Underweight, 22 patients in Overweight and 20 patients in Obese Category. Among the age group category, people between the ages of 50-60 are at greater risk of obesity and overweight. People aged 45-65 were most likely to be overweight or obese; people 50-60 years old and older were least likely to be overweight or obese.

Gender

Regarding gender, in normal weight category, 48 were Male and 52 were Female. In Underweight Category, 4 were Male and 3 were Female. In Overweight Category, 68 were Male and 74 were Female and In Obese Category 60 were Male and 85 Female were observed. Among gender, females were more in Overweight and obese category. Arabic societies

Table 1: Calculation based on Body Mass Index

Under Weight	Below 18
Normal Weight	18 to 24.9
Over Weight	20 to 22.9
Obesity	30 or High

Table 2: Age in years

Age group	Normal Weight	Under Weight	Over Weight	Obese
40-50 Years	25	3	50	53
50-60 Years	46	3	70	72
60-70 Years	29	1	22	20
Total	100	7	142	145

Table 3: Gender

	Normal Weight	Under Weight	Over Weight	Obese
Male	48	4	68	60
Female	52	3	74	85

Table 4: Fruits and Vegetable Intake

	Normal Weight	Under Weight	Over Weight	Obese
Rarely	44	4	60	55
Once a week	32	2	55	55
Daily	24	1	27	35

Table 5: Family History

	NORMAL	UNDER	OVER	OBESE
YES	30	5	77	75
NO	70	2	65	70

Table 6: Physical Activity

	NORMAL	UNDER	OVER	OBESE
YES	80	2	60	50
NO	20	5	82	95

Table 7: Waist Hip Ratio

WHR RATIO	NORMAL	UNDER	OVER	OBESE
Normal<.95	75	5	42	35
OBESE>.95	25	2	100	110

are characterized by very high prevalence rates of obesity and non-insulin dependent diabetes mellitus (NIDDM). According to our study, women were more likely than men to be overweight and obese among those with T2DM. Although the causes of this are unclear, they may be a combination of social and biological factors. Nevertheless, as these findings indicate, when designing interventions to target at-risk groups, it is critical to understand the local context. A 0.0049 p-value was calculated for this study. Multi-comparative test of turkey Kramer significance 0049.

Residence

According to Residence 25 patients in the normal weight category, 2 patients in underweight category, 32 patients in over weight category, and 30 patients in obese category were residing in rural area. In semi urban area, 35 patients in Normal weight category, 2 patients in Underweight category 45 patients in Over weight category and 50 patients in Obese category were present.

In Urban area, 40 in Normal weight category, 3 patients in Underweight category, 65 patients in Over weight category 65 patients in Obese category were present from the observation, people Living in Urban area were more, when compared to Semi urban and rural. Due to Lifestyle, stress and higher Income, more number of people present in this Category. This study considered significance in turkey Kramer multiple comparison test with the p value of 0.0070

Education

In Primary level education, 40 patients in normal weight,3 patients in underweight,60 patients in underweight, 65 patients in obese category, in secondary level, 40 patients in normal weight,3 patients in underweight, 58 patients in overweight and 65 patients in obese category.in degree level 20 patients in normal weight,1 patient in underweight,24 patients in overweight and 15 patients in obese category. In this study Primary education level more among over weight and obese patient.

Socio Economic Status

According to Socio-Economic Status, 20 patients in Normal weight, 1 patient in Underweight, 17 patients in Overweight and 18 patients in Obese category, were present in lower economic status. In Middle class 43 patients in Normal weight, 2 patients in Underweight, 40 patients overweight and 83 in Obese category. Among the Upper class, 37 patients in Normal weight, 44 patients in Over weight and 4 patients in under weight and 44 patients in obese category were present [15]. The

Middle and Upper Socio-economic status were associated with Increased Risk of Obesity & Over weight Respectively.

Fruit and Vegetables Intake

According to fruit & vegetable consumption 44 patients in normal weight category, 4 patients in underweight, 60 patients in Over weight and 55 patients in Obese were rarely consuming the fruits & vegetables. 32 patients in Normal weight, 2 patients in Underweight, 55 patients in overweight, 55 patients in obese were consuming fruits & vegetables once a week. In daily, Intake of fruits and vegetables 24 patients in Normal weight, 1 patient in underweight, 27 patients in overweight and 35 patients in obese category were present. This study shows the P value of 0.0044 and considered significance in turkey Kramer multiple comparison test.There was a greater likelihood of being overweight or obese among those who rarely consumed fruits and vegetables compared to those who consumed them regularly. The consumption of vegetables by individuals with higher SES might also be related to other factors, such as dietary habits and behaviors (such as physical inactivity). Generally speaking, studies have shown that increased fruit and vegetable intake requires other weight loss strategies such as reducing energy intake in order to be effective at controlling overweight and obesity.

Family History

Regarding family history, 30 Patients in normal weight, 5 patients in underweight, 77 in overweight, 75 in obese category having family history of diabetes.

Physical Activity

Regarding physical activity,80 patients in normal weight, 2 patients in underweight, 60 patients overweight, 50 patients in obese category having regular physical activity and 20 patients in normal weight,5 patients in underweight,82 patients in overweight,95 patients in obese category did not perform physical activity.

Life Style

According to Life style 9 patients in Normal weight category, 2 patients in underweight category, 37 patients in over weight category and 45 patients in obese category were smokers. This study shows the P value of 0.0008 and considered significance in chi square test. Regarding Alcohol consumption, 15 patients in Normal weight, 2 patients in Underweight, 47 patients in overweight, and 50 patients in obese category having alcohol drinking habits. This study shows the P value of 0.0051 and considered significance in chi square test.

Diabetes Mellitus Treatments

Regarding DM treatment, 5 patients were present in normal weight. 2 patients in underweight, inoverweight 9 patients and 10 patients in obese category having Life style intervention. 50 patients in Normal weight, 2 patients in underweight, 65 patients in over weight and 65 patients in obese category taking Monotherapy [16]. Regarding Dual Therapy, 25 patients in normal weight, 1 patient in underweight, 52 patients in overweight, 45 patients in obese category. 10 patients in Normal weight,1 patient in Underweight, 10 patients in Overweight, 20 patients in obese category Taking Triple Therapy. Regarding combination drugs with Injection Therapy, 10 patients in normal weight, 1 patient in underweight, 6 patients in Over weight and 5 patients in Obese category. Among the results, people over weight and obese category Taking dual Therapy was more than other Therapy. This study shows the P value of 0.0025 and considered significance in Bonferroni multiple comparison test.

Baseline parameters

Diabetes mellitus complications

Peripheral Neuropathy

Regarding Diabetes MellitusComplications, in normal weight, 25 patients affected by peripheral Neuropathy, in underweight 2 patients, overweight 18 patients, obese 15 patients were affected. Regarding Nephropathy complications 6 patients in normal weight, 1 patient in underweight, 22 patients in overweight,25 patients in obese category. Complications more among over weight and obese patient.

Retinopathy

Regarding Retinopathy, 2 patients in normal weight, 0 people in underweight, 15 patients in overweight, 12 patients in obese were affected Retinopathy.

Angiopathy

Angiopathy Complications 30 in normal weight, 2 in underweight,42 in overweight,48 in obese category. In stroke complications, 12 patients in normal weight,1 patient in underweight,18 patients in overweight, and 16 patients in obese category. Diabetic patient who had Hypertension, 25 patients in normal weight,1 patient in underweight, 27 patients in overweight, and 29 patients in obese category. In this hypertension complications, more among overweight& obesity compared to Normal weight and Underweight. Regarding diabetic complication, Angiopathy more among overweight and obese patients. Their mean value was 24. standard deviation was 13.3. The observed P value was 0.0025 and considered significance in Bonferroni multiple comparison test.

Glycemic Control

In hypoglycemia 2 patients in normal weight,1 patient in underweight,10 patients in overweight, 25 patients in obese category, Regarding optimal therapy 75 patients in normal weight, 2 patients in underweight, 42 patients in overweight, 42 patients in obese category, In uncontrolled Hyperglycemia 23 patients in normal weight, 4 patients in underweight, 90 patients in overweight, 78 patients in obese category. Uncontrolled glycemic level more among over weight & obesity patient. In this study poor follow up Treatment more observed among over weight and obesity patient. Their mean value was 48.3.

Standard deviation value was 40.2 P value was <0.001 and considered significance in Chi square test.

Lipid Profile

Regarding Observation of Lipid Profile, Total cholesterol 24 patients in normal weight,1 patient in underweight,40 patients in overweight, and 38 patients in obese category, In LDL 40 patients in normal weight,2 patients in underweight,52 patients in overweight,58 patients in obese category. Among this, LDL was more among obese and overweight. In HDL,16 patients in normal weight,2 patients in underweight, 15 patients in over weight and 13 patients in obese category. In this, HDL Ratio was more among normal weight patients. In TG 10 patients in normal weight, 1 patient in underweight,15 patients in overweight and 26 patients in obese category.In VLDL 10 patients in normal weight, 1 patient in underweight, 20 patients in overweight and 10 patients in obese category. Their mean value was 28 SD -17 and P value was <0.0001 considered significance among Chi-Square test.

Waist Hip Ratio

From the observation WHR, 75 patients in normal weight,5 patients in overweight,42 patients in underweight and 35 patients in obese category, having normal waist hip Ratio and 100 patients in over weight and110 patients in obese, coming under category of more than 0.95 obese waist hip ratio. This shows patients with obese waist hip ratio more among over weight and obese. Their mean value was 50.SD-53 and P value <0.001 and considered significance among Chi square test.

Followup Treatment

Regarding Follow up 5 patients in normal weight,5 in underweight,125 in overweight, 130 in obese were not having regular follow up treatment. 95 in normal weight, 2 in under 17 in overweight, 15 in obese had regular treatment. This study shows P

value of <0.0001 and considered significance in chi square test.

Recommendation

The development of Type 2 diabetes can be detected through the screening for changes in BMI. By registering diabetics, we are reducing latent complications associated with diabetes. For most patients, losing weight is a desirable goal for improving glycemic control, hyperlipidemia, and hypertension. Obesity and its consequences should be promoted to the public through education. All ages of the population should be made aware of methods of preventing and controlling obesity and overweight.It would be useful to present a simple public lecture about diabetes mellitus and its complications to highlight the importance of being aware of this health condition.

Study Limitation

We may not be able to generalize our results to all diabetes patients because of selection bias. The contact record of a type 2 patient who was receiving care at public non-paying health facilities was included, as with most clinic care records [17]. Research purposes are not satisfied with the quality of the data recorded. Compared to other studies, this study consisted of small sample size, very few variables in patient charts, and therefore provided very limited information for the purpose of research. The baseline was not measured in this single-center study. Diabetic complications were not adequately evaluated in relation to WHR.

CONCLUSION

To reduce the risk of diabetes, intensive lifestyle modifications need to be introduced early. The clinical application of this boundary value needs to be evaluated in future studies involving large diverse populations. We found that Type 2 diabetic patients were more likely to be overweight & obese, resulting in increased disease burden & poorer outcomes. Aged 50-60 years old, female gender. Overweight & obesity were associated with middle & higher socioeconomic status, an increased use of antidiabetic drugs, and a greater number of diabetic complications. To mitigate the increasing health challenges facing diabetic patients with Type 2 diabetes, appropriate controlled strategies to improve nutrition and promote weight loss are urgently needed.

Conflict

Nil.

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