Relationship between obesity and type 2 diabetes.

Diabetes and obesity have been highest in the most serious threats in world's health. Diabetes is now one of the serious chronic diseases which have affected many of the Australians as it is the sixth highest cause of the death by disease in Australia (" Type 2 Diabetes and Obesity still on the Rise" 2007). It is caused by the constant increase in the blood glucose level in the body due to the inability to either produce or properly use insulin, which lead to many complications which can be acute and long term (Greenbaum & Harrison, 2008, pg. 1). According to the recent data, it has been shown that the prevalence of diagnosed diabetes has been doubled from the last studies. This disease and it complications were found to 8% of the total burden of disease in Australia in 2003 such as person with diabetes is at twice at the risk of developing cardiovascular, eye and kidney disease (Australian Institute of Health and Welfare, 2008).

This article is mainly based on the data from 200-08 National Health Survey conducted by the Australian Bureau of Statistics. It involves type 2 diabetes related factors such as demographics, medical history, height, weight, smoking, and physical activity. In 2007-08, national health survey estimated that 818, 200 people or 4% of the population have been diagnosed with diabetes which excludes gestational diabetes (Australian Government: Department of Health and Ageing, 2009). By comparing this data with data from 2004-05, it has been increased by 0. 5% that is number of people reporting to have diabetes is increased from 700, 000 to 818, 200 (Australian Bureau of Statistics, 2010). Recent national data indicate that with every one diagnosed case, there is one undiagnosed case (Australian Institute of Health and Welfare, 2008).

Type 2 diabetes is the most common type of diabetes as people diagnosed with diabetes, 88% reported to have this type 2 diabetes where as only reported to have type 1 diabetes. The other 2% left was not being diagnosed with particular type of diabetes. Even though there is increase in number cases of developing this disease, there is also improvement in early detection of this disease and people are living longer (Australian Government: Department of Health and Ageing, 2009). There are more cases of type 2 diabetes since 2004-05 survey, it increased from 83% to 88% in total diagnosed diabetes. Type 2 diabetes increases in obesity and physically inactive lifestyles, and with the age. Diabetes is more prevalent among Aboriginal and Torres Strait Islander peoples as compared to non-Indigenous people. Demography does play a role in diabetes prevalence as it was least prevalent among people born in north-west Europe (2. 7%) as compared to people born in southern and central Asia (8. 7%). Being overweight and lack of physical activity can increase the risk of developing type 2 diabetes (Australian Bureau of Statistics, 2010).

The majority of diabetes is classified into two types that is type 1 which is insulin dependent diabetes and second is type 2 which is insulin independent diabetes. Type 1 diabetes can be defined as an autoimmune destruction of pancreatic beta cells which slows or stops the production of insulin in the body. Type2 diabetes can result from insulin resistance that is inability to use insulin properly or insulin deficiency that is inability to produce adequate amount of insulin in the body (Type 2 Diabetes and Obesity Research, 2007, p. 1). This type 2 diabetes is responsible for 85-90% of all diabetes (Greenbaum & Harrison, 2008, pg. 1). Due to the inadequate insulin

production, body could convert sugar which is present in the blood in the energy needed for that body. After eating, body need insulin which is produced by pancreas to transport sugar from the blood into the cells and also to inhibit the production of glucose produced in liver. When inadequate insulin is produced by the body, glucose is overproduced by the liver which stays in the blood. This cause high blood sugar level which damage blood vessels and body organs (" Diabetes – Type 2" n. d.).

Type2 diabetes can be caused by both genetic and environmental factors. Some genes can cause impaired insulin production in the body and family history can also increase the risk of developing diabetes. Other lifestyle factors such as poor diet, obesity and lack exercise can also cause diabetes. Obesity is the most common factor which is found in most the people suffering from type2 diabetes (" Diabetes – Type 2" n. d.). Obesity defined as having body mass index greater than 30 kg/m2. Obesity is the major risk factor for the type2 diabetes that is more is the body mass index (BMI) greater is the risk of diabetes which is also associated with hypertension, cardiovascular disease and hyperlipidaemia (Marks, Coyne, Pang, 2001). As per the research 90% of the people suffering from diabetes are obese or overweight (World Health Organization, 2005). As per researched statistics, over 7 million Australians adults were obese in 2004-2005. Obesity is a serious health problem which is mainly influenced by various risk factors such as heredity, diet, and lack of exercise.

Type 2 diabetes cases in 2009 versus Body Mass Index
Data sourced from (" Australian National Diabetes Information Audit and Benchmarking", 2009, pg. 139).

This graph above shows the increase in the prevalence of type 2 diabetes with an increase in Body Mass Index (BMI) that is BMI greater than 30 is at the highest risk of developing diabetes type 2.

Insulin resistance

Insulin resistance refers to metabolic abnormality state in which body cells become insensitive to insulin. Inability of cells to utilise insulin to enhance glucose uptake by muscle and adipose tissue can lead to high blood glucose level. This insulin resistance is mainly associated with abdominal obesity and high blood pressure (Dolson, 2010).

This insulin resistance can be both genetic and acquired. Impairment in insulin receptor signal transduction pathways can decrease the biological response to insulin which will ultimately affect glucose uptake and increase in blood glucose (Surampudi, Kalarickal & Fonseca, 2009, p. 218). Acquired insulin resistance is associated with obesity which can result from circulating free fatty acid that disrupt insulin signal pathways and resists insulin action to transport glucose in muscles which cause type 2 diabetes. (Guilherme, Virbasius, Puri & Czech, 2008, p. 367).

There are more factors which are involved such as fat distribution, genetic susceptibility and some metabolic problems.

Fat distribution

Body fat can be divided into two parts, first is subcutaneous fat which accounts 80% of the total body fat where as other 20% is visceral fat which lies within thorax, abdomen and pelvis (Langin et al, 2009). This visceral fat is the main contributor to the problems such obesity. This visceral fat

increase the production of adipocytokines, which cause the inflammation and insulin resistance and also reduce the secretion if insulin sensitizing adipocytokines. Hepatic and muscle insulin resistance can be caused by the increased amount of free fatty acids in the portal and systemic circulation system (Bays et al, 2004). Study revealed that distribution of the abdominal fat is more effective in diagnosing diabetes than the total abdominal fat. Through CT scanning, they found that the diabetics had greater amount of intra-abdominal fat than non-diabetic groups with the mean difference of 14. 1 cm3. Stieler and Yelland (2009) elaborates that the abdominal fat within the peritoneum layer is more common with diabetic patient that non-diabetic patients.

Free fatty acids

Lipolysis refers to breakdown of triglycerides into free fatty acids which is more frequent in visceral tissue than the subcutaneous fat. When fat mass increases, it increases the rate of lipolysis which is more common in obese people and those with type 2 diabetes. These free fatty acids stimulate gluconeogenesis and can lead to insulin resistance and also reduce the insulin secretion. The ability of β cells to secrete sufficient insulin so as to compensate insulin resistance in the individual to maintain their normal blood glucose level will help to determine that whether the person will remain insulin resistant with normal glucose level or will the person develop type2 diabetes (Whitmore, 2010, p. 880-881).

Adipocytokines

Adipose tissue in the body helps for the fat storage which increases insulin sensitivity by secreting large amount of cytokines and other related

hormones. Bays et al (2004) states that in type2 diabetes, due to the reduced secretion of adipocytokines and increased production of inflammatory cytokines can cause adipocyte dysfunction. To prevent this dysfunction, it is important to control cytokines in the body system. As per Dewan & Wilding (2005), these hormones can be controlled by reducing body weight/mass.

Adipose tissue plays an important role in balancing glucose level in the body in both normal and disease body state. It helps to secrete appropriate level of adipokines which influence metabolism in the whole body and neuroendocrine control of the behaviours related to feeding. It also helps to store lipids as adipose triglycerides which reduce the harmful effects of both circulating free fatty acids and ectopic triglycerides stores. In the normal body, adipocytes help to synthesise and store triglycerides during feeding whereas in fasting stage, it help to hydrolyse and release triglycerides as free fatty acids and glycerol. In most lean individuals, insulin sensitivity and glucose uptake is normal in skeleton muscles. In obese body, deposition of triglycerides increases due to high caloric intake which cause adipocytes enlargement. Due to this enlargement, adipocytes continue to store further triglycerides even in fasting stage. As the adiposity increases, it affects adequate functioning of adipocytes as endocrine cells. The development of inflammatory state in adipose tissue due to large amount cytokines secreted by adipocytes can cause insulin resistance. Accumulated triglycerides in the form of long chain in skeleton muscles disrupt normal metabolic and secretory function of these tissues. Due to prolonged high caloric intake can

cause inflammatory response which ultimately leads to adipocyte dysfunction (Guilherme, Virbasius, Puri & Czech, 2008, p. 368-369).

Prevention/ management of Type 2 diabetes

Poor dietary habits decreased physical activity and obesity can increase the risk of developing diabetes as it affects insulin action or secretion in the body system. Therefore it is important to control the unwanted weight gain.

To address the significant growth of type 2 diabetes and to lower its risk, Council of Australian Governments announced the Prevention of type 2 diabetes program in April 2007. To address risk for type 2 diabetes, health practitioners use Australian type 2 diabetes risk assessment tool (AUSDRISK) which help to prioritize people with high risk of developing this diseases. Some of the other program which assists in prevention of type 2 diabetes is lifestyle modification program (Australian Government: Department of Health and Ageing, 2010).

Australian type 2 diabetes risk assessment tool (AUSDRISK) which will help to get a score from the question related to one's life. If a person scores more than 12 points in AUSDRISK, than that person may have undiagnosed type 2 diabetes or is at high risk of developing this disease (Australian Government: Department of Health and Ageing, 2010).

Lifestyle modification programs help participants to make positive lifestyle changes which include diabetes risk factors, nutrition advice and education, goal setting for weight loss, energy balance, physical activity goals and encouraging participants to self-monitor their progress (Australian Government: Department of Health and Ageing, 2011).

National health survey, 2007-08 showed that 61. 4% of the Australian population are either overweight or obese in which 25. 6% of males and 24% of females were classified as obese (Australian Government: Department of Health and Ageing, 2010). It is not possible to change specific risk factors like age and genetic background but it still possible to minimise the risk of developing this disease by maintaining healthy weight, healthy eating such as eating plenty of vegetable, fruits and high fibre cereal products every day, and by increasing physical activity. Type 2 diabetes is strongly linked to obesity as recent data showed that 80-90% of people diagnosed with type 2 diabetes are over-weight or obese. International studies revealed that regular physical activity of at least 30 minutes and 5-7% of weight loss can reduce the risk of developing diabetes by 60% (" Type 2 Diabetes and Obesity still on the Rise" 2007).

This weight loss can reduce the risk of related comorbidities such as cardiovascular diseases, sleep apnoea and obesity-related malignancy by improving blood glucose level and blood pressure. People with type 2 diabetes will need to work 50% more than non-diabetic people to lose weight it can be a slower process as compared to general population and will be more difficult for the obese patient suffering from type 2 diabetes (Whitmore, 2010, p. 881).

Using pharmacotherapy for obesity like orlistat that works well by blocking the hydrolysis of dietary triglycerides and inhibit fat absorption. Bariatric surgery can also be one of the option for the patient with BMI more than 35 kg/m2 (Whitmore, 2010, p. 884-885).

Conclusion

Obesity and type 2 diabetes are strongly linked as obese person is at the higher risk of developing type 2 diabetes than the normal person with the healthy weight. Healthy weight, healthy eating and regular physical activity will improve insulin sensitivity, blood glucose level and the other health related issues such as cardiovascular risk factors. Weight management will the best way to reduce the risk of developing this disease. By using the AUSDRISK and diabetes related programs initiated by Australian government will help to prevent type 2 diabetes.