OBESITY RELATED DISEASES AMONG SRI LANKANS

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ABSTRACT

Obesity, widely referred as excess body fat that were usually considered as diverse health problems in the modern developing world. According to the percentage of Sri Lankan adults in the overweight, obese and centrally obese categories were considered as 25.2%, 9.2% and 26.2%, respectively and this expresses thereference values for Asians analysis by the World Health Organization (WHO). The reports of overweight and obesity, which has high prevalence,are mostly occurred in children and adolescents in the developing countries. Overweight and obesity would increase the risk rate of many health issuessuch as diabetes, metabolic syndrome, hypertension, osteoarthritis, nonalcoholic fatty liver diseaseetc.Therefore, we have documented a relatively high occurrence of obesity and overweight, specifically the kind of diseasesfollowed through it and the urgent public health interferencesthat are needed to control the disease at an early stage. This review article covers the diseases, which are an emerging health issue in the society and in the most developing countries such as Sri Lanka.

Key words

BMI, obesity, non-communicable disease, risk factors, overweight, undernutrition

Abbreviations

BMI-Body Mass Index, CAD-Coronary Artery Disease, WHO-World Health Organization, T1D-Type 1 Diabetes, T2D-Type 2 Diabetes, OA-Osteoarthritis

1. Introduction

Obesity has reached its epidemic levels in thewealthiest countries thereforein contrast, South Asia is currently considered as aslight affected region as malnutrition and infectious diseases.South Asians have poor insolences towards obesity and being obese is considered as a sign of material comfort(Jayawardena et al., 2013).

Generally, obesityisknownto bean abnormal or extreme fat growth that alters theentire health system whereas it is clarified as the imbalance of calories consumed and calories expended (Jayawardena et al., 2013). The population which are most effected are those who have changed from tradition to western lifestyle or have become rapidly industrialized over a short time period andit also said that changes in transportation methods and increased urbanization (Jayawardana et al., 2017). An individual with a BMI equivalent to or more than the value of 25 is viewed as overweight or obese.The low birth weight infants are now recognized as a potential risk factor of increasing interest for obesity. Female sex and maternal BMI also have been identified as risk factors for developing obesity (Rathnayake et al., 2001).

In 2016, WHO has estimated around 1.9 billion of adults were overweight and 650 million of individuals were obese. Overall 13% of worlds' adult population were meant to be obese and not only adults even the children are obese and overweight.According to WHO over 340 million adolescents (aged 5-19) were obese in the year of 2016.Therefore, the childhood obesity is related to adult levels of lipid, lipoproteins, blood pressure and insulin to morbidity from coronary heart disease, however, the importance of age at which obesity develops in this association remain uncertain (WHO., 2017). In another research the childhood obesity is predictive of adult risk factor, soit is said to be 50% of overweight children have a possibility of becoming obese adult.[3] Childhood obesity associates with cardiovascular disease has the risk factor of *hypertension*, *diabetes mellitus* and *dyslipidemia*.Obesity associated metabolic problems are emerging as major health problems in all over the countries (Jayawardena et al., 2015).

In this review article we have discussed obesity related diseases among Sri Lankans with therelationship between lifestyle patterns and obesity in western countries which was widely discussed in the past few years, yet risk factors related with obesity and overweight in Asians has not investigated broaden enough. Nevertheless,there is only limited information on obesity overweight and life style patterns of Sri Lankans. In the future as the populace age, and urbanization continues, prevalence of obesity and overweight would increase. With the population aging as the consequences, people are more likely to get diseases like cardiovascular disease, diabetes, *osteoarthritis*, nonalcoholic fatty liver disease and respiratory disease (Jayawardena et al., 2015).

2. Obesity Related Disease

2.1. Cardiovascular Disease

Obesity has many adverse effects independently associated with the risks for coronary heart disease, atrial fibrillation, and heart failurewhere the total blood volume and cardiac workload are increased and it is associated with numerous comorbidities such as type 2 diabetes, hypertension, certain cancers, and sleep apnea/sleep-disordered in Sri Lanka (Poirier.,2006).

The excess amount of fat tissue, especially around the waist has a direct effect on heart structure and function even in the absence of other heart disease risks. Therefore,left ventricular diastolic dysfunction is characterized by changes to the structure of the heart's main pumping chamber (left ventricle), which prevent it from filling sufficiently between beats. Although left ventricle diastolic dysfunction can often be symptomless, it constantly predicts future heart failures.

A moderate association was found between the increase in BMI and stroke therefore, each one-unit increase in BMI would increase 4% in the risk of ischemic stroke and 6% for hemorrhagic stroke. The increased stroke rate in obesity may be predicted by the prothrombotic or proinflammatory state that often accompanies excessive adipose tissue accumulation.

A 10 kg higher body weight is associated with a 3.0 mm Hg higher systolic and 2.3 mm higher diastolic blood pressure; this increase estimates a 12% increase in coronary heart disease and 24% increased risk for stroke.

The association between obesity and high blood pressure was found to be strong so that weight loss in obese individuals was found to be associated with decrease in blood pressure. In 50% or more of the individuals has the average decrease in diastolic blood pressure of 1 to 4 mm Hg systolic and 1 to 2 mm Hg diastolic per kilogram of weight reduction (Varilly and Chandler, 2012).

The epidemiology of cardiovascular disease risk factors was changing rapidly with the obesity pandemic. According to the percentages of over-weight, obese and centrally obese are determined by WHO of Sri Lankan adult population expressing the cut-off values in Asians as 25.2 %, 9.2 % and 26.2% are in the categories respectively and the level of obesity has increased 3-fold during the last two decades (Mathew, 2008).

2.3. Diabetes

Diabetes mellitus is a metabolic disorder of multiple etiology categorized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism causing defects in insulin secretion, insulin action, or both therefore, it effects includes long-term damage, dysfunction and failure of various organs(WHO, 2016). There are two main types of diabetes which are taken under consideration such as Type 1 diabetes (T1D) which develops in childhood and adolescence as well as patients require lifelong insulin injections for their survival and Type 2 diabetes (T2D) which develops in adulthood and it is related to obesity by lack of physical activity, and unhealthy diets. Therefore, it is more common type of diabetes (representing 90% of diabetic cases worldwide) and treatment may involve lifestyle changes and weight loss alone, or oral medications or even insulin injections (WHO, 2016)

T2D has traditionally been observed as a disorder in grownups found most commonly in middle-aged and elderly,after the age of 30 or 40 years onset of diabetes has frequently been used as both a clinical and a research tool to differentiate type 2 diabetes from type 1 diabetes. The prevalence of type 2 diabetes in recent decades were appeared in younger adults and is now happening in adolescents and youth hence type 2 diabetes is largely preventable compared to type 1 diabetes, whereas studies have found that 5-10% of weight loss can be prevented or postponement the development of type 2 diabetes in adults (Shaw, 2007).

According to the World Health Organization (WHO), 90% of diabetes patients have type 2 diabetes (T2D) where obesity is the main reason to cause T2D andnon-obese people could also develop T2D. The non-obese T2D patients have a risk of heart disease and rapid progression to insulin treatment compared to obese T2D patients. Somultiple studies have reported the increase of visceral fat accumulation in some non-obese T2D patients which may be a consequence of either high insulin levels during insulin resistance or increased inflammatory responses. Several factors such as inflammation and environmental factors also contributes to non-obese T2D (WHO, 2010).

In 2005, Sri Lanka had the prevalence's of type 2 diabetes were nearly 11%(Katulanda, 2017). Several studies evidence have proven the increased risk of diabetes is due to obesity and weight gain and also purposeful weight loss reduces the risk that overweight people will develop diabetes(Mokdad,. *et al.*2003).Current findings in present has proven that diabetes affects a major proportion of the Sri Lankan population and together with a recent study emphasizing the unsatisfactory status of diabetes control in six centers in Sri Lanka based on glycosylated hemoglobin estimation makes diabetes a substantial burden to the current and future health of the country. An estimate of 2.8 million diabetes cases was found in current findings [Wijewardene,. et al. 2004).(Figure 1) gives more details about obesity related data collected in Sri Lanka (WHO, 2016).
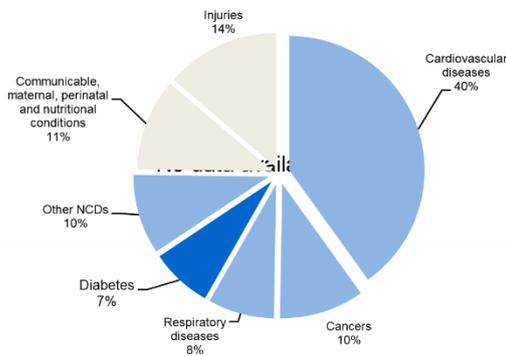
Sri Lanka

Total population: 20 715 000

Mortality*

Number of diabetes deaths	males	females
ages 30–69	2 860	1 740
ages 70+	2 830	2 700

Number of deaths attributable to high blood glucose	males	females
ages 30–69	4 660	2 470
ages 70+	4 690	4 400

Proportional mortality (% of total deaths, all ages)*

Trends in age-standardized prevalence of diabetes

Pie chart: Injuries 14%; Communicable, maternal, perinatal and nutritional conditions 11%; Other NCDs 10%; Diabetes 7%; Respiratory diseases 8%; Cancers 10%; Cardiovascular diseases 40%.

Line chart (1980–2014): No data available. % of population. males, females.
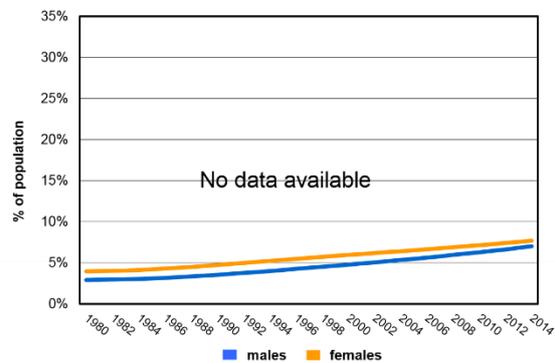
Prevalence of diabetes and related risk factors

	males	females	total
Diabetes	7.3%	8.4%	7.9%
Overweight	18.9%	32.9%	26.1%
Obesity	3.5%	10.0%	6.8%
Physical inactivity	16.9%	30.2%	23.7%

Figure 1: Obesity Related Data In Sri lanka (World Health Organization – Diabetes country profiles, 2016).

2.4. Metabolic Syndrome

Metabolic Syndrome which is also known as cardio-metabolic syndrome, syndrome X and insulin resistance syndrome, is a name given to a group of risk factors when occurring together increases the risk for Coronary Artery Disease (CAD), stroke, and type-2 diabetes.[17] These risk factors includes obesity, dysglycaemia, dyslipidemia and hypertension. Insulin resistance plays a central role in the pathophysiology of Metabolic Syndrome (MS) (WHO, 2010).

Evidence indicates that MS begins with excess central adiposity, soin the genetically predisposed individuals defects in insulin secretion follows leading to impaired fasting glucose (IFG) and or impaired glucose tolerance/glucose intolerance (IGT) (Jayawardena et al., 2013). Patients with rare single-gene disorders express the clusters of metabolic abnormalities associated with MS. However, the association is complex and unresolved issues such as the role of gene-environment interactions, ethnicity, and gender in pathogenesis need to be further explored (Jayawardena et al., 2013).

Studies have shown higher rates of CAD, insulin resistance and MS among South Asian immigrants living in developed countries. The prevalence of CAD in South Asian immigrants was three times higher, even after adjustment for all conventional risk factors. It is predicted that more than one-half of the world's CAD burden will be borne by people from the Indian subcontinent in coming decades (WHO, 2010)

Furthermore, evidence has shown that MS is twice more common amongst South Asian immigrants living in the US compared to the native Caucasian population. Several studies have hinted at a possible genetic cause for this high prevalence of MS in South Asians. However, these surveys are either on hospital-based samples or confined only to a specific regional locality of each country and presently there are no nationally representative studies on the prevalence of MS from any of the South Asian countries. Presently there are no published studies on the prevalence of the metabolic syndrome in Sri Lankan. The present study aims to evaluate the prevalence of Metabolic Syndrome among Sri Lankan adults and investigates the relationships between MS and socio-demographic, clinical and biochemical parameters (Enguerran, et al., 2016).

2.5. Hypertension

Hypertension is also known to be blood pressure which can lead to severe complications and increases the risk of heart disease, stroke, and death.Therefore, hypertension and obesity are associated with a relationship between body's weight and blood pressure (BP), mainly causes cardio metabolic syndrome with enormous consequences to the global health and the economy. The connection between hypertension and obesity is a complex as well as for the etiology and it is not well explained (Enguerran, et al., 2016).

Since it is becoming a clear that the adipocyte is not simply an inactive organ for storage of energy but that it also secretes a host of factors that interact with each other and may result in higher blood pressure. Specific importance is the accepted role of leptin in the causation of hypertension through an activation of the sympathetic nervous system and a direct effect on the kidneys and resulting in increased sodium reabsorption leading to hypertension (Pasteur, 2002).

Obesity may have structural effects on the kidneys that may continue hypertension, leading to an increased rate of end-stage renal disease which would result in further hypertension. Adipose tissue might elaborate angiotens in from its own local renin-angiotens in system. The distribution of body fat is taken into consideration as important in the beginning of the obesity-hypertension syndrome. Weight loss is the keystone in the management of the obesity-hypertension syndrome, it can be achieved by diet, exercise, medications, and a combination of these actions (Pasteur, 2002).

Anti-obesity drugs which are currently undergoing clinical trials may play a role in the management of obesity and may also result in lowering of blood pressure. Antihypertensive are also considered as main components in the general approach to the management of this multifaceted issues (Pasteur, 2002).

For the study of the obesity related disease such as hypertension it is mentioned that 322 (61 %) males and 204 (39 %) females were recruited from consecutive admissions to the Institute of Cardiology, National Hospital, and Colombo, Sri Lanka. The nation grieves notably from obesity connected metabolic diseases such as diabetes, hypertension, and metabolic syndrome on an epidemic level (Pasteur. 2002).Data was collected by a trained medical officer and this study protocol was approved by the Ethical Review Committee of National Hospital of Sri Lanka (Jayawardena, *et al.*, 2016).

Therefore, patients were classified into four groups (Table 01) based on their measured BMI values and the cut-off values from Sri Lankan guidelines which were used for the tagging. Total number of patients enrolled were 526 (response rate 100 %), out of which 322 (61 %) were males. Mean age was 58.5 years (±12.0). Majority of the population were Sinhalese (n = 438, 83 %), whereas Muslims (n = 43, 8 %), Sri Lankan Tamils (n = 34, 7 %), Indian Tamils (n = 4, 1 %) and other ethnic groups (n = 7, 1 %) constituted the remainder of the group (Jayawardena, *et al.*, 2016).

Table 1. Classification of obesity according to the BMI (Jayawardena, *et al.*, 2016).

	Sri Lanka	Caucasians
Underweight	< 18.5	<18.5
Normal	18.5 – 22.9	18.5 – 24.9
Overweight	23 – 24.9	25 – 29.9
Obesity – class 1	25 – 30	30 – 34.9
Obesity – class 2	30 – 35	35 – 39.5
Obesity – class 3	≥35	≥40

*Adopted from available Asian data and modified by the Sri Lankan guideline committee.

2.6. Osteoarthritis

Osteoarthritis (OA) is the most common chronic condition of the joints, this can occur in many joints in the body, but most commonly this occur in knees,hips, lower back,neck, small joints and fingers. OA is a leading cause of disability and its incidence is rising due to increasing obesity and an ageing population. Risk factors can be divided into person-level factors. Most of the common the risk factor is obesity,it has been reported that subjects with a BMI>30 kg/m^2 were 6.8 times more likely to develop knee OA than normal-weight controls (Johnson, 2014).

A study has conducted by the University of Peradeniya and 102 patients have taken as subjects to this study and these patients have gone through a knee replacement, and out of these 102 subjects, 41 patients (40.1%) were in the overweight group and 38 patients (37.2%) were found to be in the obese group. Obesity as well as overweight are major risk factors for osteoarthritis specially knee osteoarthritis (Amaratunga, 2011).

Hence this expresses how obesity related to osteoarthritis, when there's an increased burden on the joint, leading to faster erosion of the cartilage. Increased fat content also renders the body more susceptible to inflammation. Patients who are obese can reduce the condition by reducing the weight helps to reduce the burden on weight-bearing joints like the knee, hip and spine. And also, there are other treatments available such as, surgeries, pharmacological treatment, physical and occupational therapy (Perera, 2017).

2.7. Nonalcoholic fatty acid liver disease

Obesity is an associated risk factor for nonalcoholic fatty acid liver disease (NAFLD), nonalcoholic fatty liver disorders was barely recognized in 1981.This can be defined as the accumulation of abnormal amounts of fat within the liver, when the liver has difficulty breaking down fats, the fat buildup in the liver tissue, when enough fat builds up, it will cause the liver to swell (Matteoni, et al., 1999).

There are four stages of nonalcoholic fatty acid liver, which includes:

1. Simple fatty liver
2. Nonalcoholic steatohepatitis
3. Fibrosis
4. Cirrhosis

Faculty of Medicine, University of Kelaniya, in association with Ragama, University Pediatric Unit, Colombo North Teaching Hospital (CNTH), has conducted a research in 2014 on prevalence of non-alcoholic fatty liver disease and its risk factors in an urban adolescent cohort in Sri Lanka. 508 subjects have taken to this research and, forty-six (18.8%) boys and 54 (20.5%) girls had a BMI above the equivalent of 25 kgm^2. having an elevated BMI, independently associated with NAFLD.so it can be said, the prevalence of NAFLD among adolescents in this urban Sri Lankan community is strongly associated with obesity (Rajindrajith, et al., 2015).

There are different types of treatments for NAFLD, in the initial stage this condition can be treated without any clinical intervention. Situation can be managed by modifying risk factors, especially because this disease related obesity weigh loss is the most effective method. In an advanced situation condition is treated with drugs, and there are researches carried out worldwide to find better and effective cures (Attygalle 2016).

3. Prevention and Treatments

It is less effective when someone is trying prevent obesity in the obesity-preventing environment therefore, it is difficult to treat. When it comes to preventing obesity, people should be more concern about their diet, they should avoid in taking high energyfood, alcohol, fast food. Instead of having a high energy diet they should take nutritional diet and

also inactive lifestyle which include sitting and watching TV, or using internet promote obesity, so getting into regular exercises can prevent obesity. Lifestyle mediationsarerecommended to take regular and simple exercisessuch as walking for 150 minutes per week to reduce a small amount of weight lossand other physical activities by also getting their weight checked regularly (Wirth, et al., 2016).

When it comes to treatments there are different methods, such as psychological therapies, pharmacological therapies, and if necessary for over obese patients there are surgeries as well. Psychological treatments, such as behavior therapy and cognitive behavior therapy is considered as more beneficial. Reducing stress and tension are considered as very important as psychological treatments. Currently there are only few approved drugs to obesity, and pharmacological treatments are less effective in a situation of poor weight control. In Sri Lanka, also worldwide, bariatric surgery is available for extremely obese patients. This surgery has been the far most effective treatment for morbid obesity (Wirth, et al., 2016).

As another method of preventing and controlling obesity, it is important take low calorie density food. As Sri Lankans, our main nutrient source is carbohydrates, so with replacing starch portion with more non-starch portion is important. Sugar and sweets should be limited, and also the population in Sri Lanka is more tend to have meals which include coconut milk and oil, which has more calories so it is important to avoid such diets and mange to have a healthy diet as a method of controlling obesity (Somasundaram, et al., 2014).

4. Conclusion

Obesity is a chronic metabolic disorder associated with cardio vascular diseases and the increased mortality and morbidity. However, a strong correlation was found with high blood pressure when BMI rates were used as obesity indicator. The prevalence of overweight or obesity among 8 to 12 years of school children in Colombo are estimated to be 14-15%. It is also considered to examine how obesity affects the health condition mainly in Sri Lanka, whereas in the nation most of the hospitals contain weight loss centers which offer numbers of clinical advices and treatments for obese patients by ensuring the regular follow up and guidance which is to be maintained for their weight loss (Segula, 2014).

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