

The gallbladder  
disease, and certain  
types of



**ASSIGN  
BUSTER**

The excess weight of the enlarged adipose tissue mass together with the metabolic changes of obesity can induce serious health problems and increase the risk for many diseases. 101 The progressive increases in health risks accompanied obesity are related, not only to the total amount of body fat, but also to the pattern of fat distribution, especially in the abdominal region. Increased abdominal adiposity is tightly correlated with magnified metabolic risk factors as increased systolic blood pressure, atherogenic dyslipidemia and glucose intolerance.

102 Furthermore; subjects with abdominal obesity are more prone to develop T2DM, coronary heart disease, gallbladder disease, and certain types of cancer. 103 Fat cells are not only merely energy stores, but are busy secretory organs. Under normal situations; they secrete pro-inflammatory and anti-inflammatory cytokines, which regulate responses to infection, immune reactions, inflammation and trauma. But increased visceral adiposity is associated with reduced adiponectin levels; leading to increased cardiometabolic disorders risk. 104 and accelerated atherosclerosis, elevated platelet counts with chronic inflammation and increased cardiovascular death rates.

105, 106 Functional limitations and disabilities are frequently encountered in obese subjects, 10, 11, 107 since elevated obesity indices are closely associated with impaired physical performance as well as functional disability 108, 109 in young and elderly subjects. 110 Obesity is commonly associated with pathological consequences that result in functional limitations 112 and end in disabilities that remains for a prolonged period. 113 Obesity-related functional limitations are clearly manifested in reduced

performance level of simple daily living activities (ADLs) 114, 115 as well as instrumental activities of daily living (IADLs) 116 Obesity is also associated with compromised lung function, manifested in reduced pulmonary volumes, reduced respiratory muscles strength and endurance, reduced diaphragmatic mobility with increased respiratory work. These alterations are proportionally correlated with both BMI and abdominal adiposity. 28, 29, 117 In addition, progressively ongoing inflammatory and metabolic disturbances secondary to existence of adiposity status also attenuate lung function.

28 The health risks associated with obesity, including its effects on respiratory function, are linked not only to the presence of overall obesity but mainly to the increased abdominal adiposity that restricts and debilitates vital capacity (VC). Obese subjects are commonly encountered with respiratory complications post anesthesia. 118 Obesity has direct impact on normal lung physiology. Dysfunction in chest wall compliance secondary to obesity is manifested in reduced VC, functional residual capacity (FRC), expiratory reserve volume (ERV) and total lung capacity (TLC) and is associated with increased work of breathing, the situation that possess the obese patient to suffer from exaggerated exertional dyspnea sensation.

119 Changes in lung volume can occur at early stages of obesity which can be associated with loss of basal lung volume, resulting in reduced functional residual capacity and expiratory reserve volume. The deterioration in respiratory parameters and mechanics is magnified with the presence of abdominal obesity and increased WC. Abdominal adiposity is inversely correlates with forced vital capacity (FVC) and forced expiratory volume in

one second (FEV1).<sup>94</sup> Each one cm increase in WC is associated with a 13ml reduction in FVC and 11 ml reduction in FEV1.

120 Obesity-related lung function impairment is more than airflow limitation; it may be a marker of premature death as pulmonary function impairment is predictive of increased cardiovascular morbidity and mortality, independent of smoking.<sup>121</sup> Increasing BMI as well is also associated with a reduction in FEV1, FVC, functional residual capacity, and expiratory reserve volume.<sup>122</sup> It was estimated that there are reduction of 26 ml in FVC and 23 ml in FEV, in men, and 14 ml and 9 ml respectively in adult women in response to a gain of a kilogram of weight above normal weight.<sup>120</sup> So, Obesity has direct effect on respiratory well-being, even in the absence of specific respiratory disease. Obesity increase the cost of breathing (oxygen consumption and carbon dioxide production), and leads to increased mechanical work required for breathing,<sup>123</sup> and finally obesity causes restrictive ventilatory disorder, manifested by normal or higher FEV1/FVC (typically > 80%) with a reduction in both FEV1 and FVC.<sup>124</sup> With established obesity; FEV1 drops at a much lower rate than FVC. The association between an increase in BMI and reduction in FVC is stronger than with FEV1.<sup>121</sup> Pulmonary function alteration in obese persons is in line with increased the level of obesity, and the compromise increases as weight increases.<sup>125</sup> Weight gain and subsequent reduction in chest compliance and airway resistance increase tend to be accompanied by an obvious decrease in ventilatory function (decrease in vital capacity " VC" and forced expiratory volume in first second " FEV1") and expiratory reserve volume (ERV) among adults.

Altered pulmonary function in obese patients is in line with increased the level of obesity and is directly related to abdominal and chest fat accumulation. 126 In addition to affecting lung functions; Obesity is also associated with reduction in functional capacity, physical exercise performance and oxygen consumption 127 which are also decline in proportion with BMI increase. 128, 129 The poor functional capacity observed in obese subjects can be attributed to the cardiovascular dysfunction 130 and improper muscular performance secondary to low skeletal muscle oxidative capacity. 131, 132 The six minute walk test (6MWT) has been prescribed to evaluate the functional capacity of these patients, since it can be performed even by severely debilitated individuals, and those who do not tolerate other functional evaluations.

133 Usually, obese subjects are characterized with poor submaximal exercise testing performance and shorter 6MWT walked distance. 134, 135 Obesity is the sedentary lifestyle outcome. Obesity reduce one's interest in being active, and hence reducing the physical activities, and making the activities to be uncomfortable, which fosters the development of a vicious cycle. 136 obesity also affects gait parameters, a state in which obese subject is stucked to lower gait speed and shorter stride lengths gait pattern secondary to impaired functional capacity and obesity-related musculoskeletal disorders. 137 Obesity hinders the subject from being active and reduces his ability to walk.

Obesity is associated with relative reduction in skeletal muscle strength, 138 reduced cardiopulmonary function, 139 and increased prevalence of co-morbid conditions interfering with subject's ability to ambulate normally, 140

so a large percentage of obese subjects fail to continue the prescribed exercise training treatment program. Obesity-associated impairments are evaluated through common subjective measures (health-related quality of life “ HRQoL”, instrumental and daily living activities questionnaires) and objective measures (muscle strength, chair stand test, gait speed tests). 141, 142, 143, 145 Evaluating the ability to walk for a distance is a quick and inexpensive measure of physical function and functional capacity, 140, 146 six-minute walking test (6MWT) can clarify the cardio-respiratory and motor functions limitations in obese subjects. 127, 139 The 6MWT is used frequently to evaluate walking capacity or physical performance as it is well-tolerated by obese subjects.