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Physical Disability and Obesity

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Nearly 20% of US citizens are disabled. Epidemiologic studies have shown that people with physical disabilities have a 1.2- to 3.9-fold increase in obesity prevalence. Obesity is becoming a serious problem in disabled individuals. The mechanisms by which obesity occurs in people with physical disabilities is not clear, but pathophysiological changes of body composition and energy metabolism, physical inactivity, and muscle atrophy all favor the development of obesity. Health professionals should identify disabled patients at risk and provide early prevention guidance. Research is needed to help generate detailed clinical guidelines to promote weight control among people with physical disabilities.

Key words: Physical disability, obesity, body composition, energy metabolism, secondary condition

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INTRODUCTION

An estimated 48.9 million people, or 19.4%, of non-institutionalized US citizens currently live with a disability.[1-4] Physical disability is the most common, comprising about 75% of all disabilities.[4] In the last two decades, the concept of health care for people with disabilities has shifted from disease and disability prevention to prevention of secondary conditions.[5-8] People with disabilities are at risk for "secondary conditions," which are preventable medical, emotional, or social problems resulting directly or indirectly from an initial disabling condition.[5,9] The prevention of secondary conditions should be a major component of health care for people with disabilities.[7]

Among these secondary conditions, obesity is often neglected compared with other more acute conditions such as pneumonia, urinary tract infection, and joint pain. However, obesity has been associated with a number of diseases and metabolic abnormalities with high morbidity and mortality,[10] and can also contribute to secondary conditions such as pressure sores, physical inactivity, feelings of depression, and fatigue, all of which interfere with performance of daily activities. For people with physical disabilities, obesity is doubly disturbing. It is not only linked to an increase in potentially disabling chronic conditions, but when paired with existing functional limitations, may also limit a person's ability to engage in physical activity and participate in social events and community activities. Obesity can make wheelchair transfers or ambulating with other assistive devices more difficult for people with moderate to severe mobility impairments, and can interfere with their ability to care for themselves and eventually diminish their quality of life.[11]

Similar to the growing trend in the general population,[12,13] obesity is also now a serious problem among people with physical disabilities. Indeed, the Third National Health and Nutrition Examination Survey (NHANES III 1988–1994) indicated that 30% of people with disabilities are obese compared with 23% of people without disabilities. Healthy People 2010, a comprehensive, nationwide health promotion and disease prevention agenda, ranked obesity as one of the top 10 leading health indicators and aimed at a reduction of the prevalence of obesity among people with disabilities from 30% to 15%.[9]

Conversely, published articles indicate that obesity leads to an increased risk of physical disabilities through a range of mechanisms, including skeletal stress and atherogenesis,[14-18] so there is a vicious cycle between obesity and physical disabilities. For example, people with osteoarthritis of the knee tend to become obese and obesity exaggerates their symptoms. Preventing and controlling obesity may be the key step to breaking this vicious cycle. The purpose of this review is to provide an overview of prevalence, pathophysiologic changes, pos-

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sible mechanisms, and consequences of obesity among people with physical disabilities.

METHODS

Data Sources

A broad search of the English-language literature was performed incorporating both electronic and manual components. The electronic search was performed using Medline (range 1966–2004, cutoff date 11/1/04), Cumulative Index to Nursing and Allied Health Literature (CINAHL) Information Systems, and Evidence-Based Medicine reviews. This review was designed to seek information regarding the prevalence of obesity and pathophysiological changes among people with physical disabilities. In retrieving epidemiologic studies, the following key word search terms were used: "obesity and disability," "obesity and impairment," "obesity and handicap," "weight problems and disability." In order to search for the articles on each disabling condition, search terms employed to delimit the population of interest included: spinal cord dysfunction, poliomyelitis, neuromuscular disease, cerebrovascular accidents, muscular atrophy, muscular dystrophies, multiple sclerosis, brain injuries, and nervous system disease. Each of the terms was crossed with obesity, body composition, energy expenditure, and secondary conditions.

Literature Screening

All abstracts were reviewed for the following exclusion criteria: publication of abstracts only, case reports, letters, comments, and language other than English. Because this review article focuses on the relationship between physical disabilities and obesity, all articles concerning solely mental, social, or emotional disabilities were excluded. Furthermore, a number of articles studying obesity as a risk factor for disability were also excluded because they did not address the goal of this review. Full articles were then obtained for all studies meeting our conditions.

Definitions

Disability

According to the terminology of the World Health Organization's International Classification of Impairments, Disabilities, and Handicaps, a disability is an inability to perform an activity in the manner or range considered normal for that individual.[3,19] In most of these epidemiologic studies, disability was defined based on a qualifying response to designed questions. For example, in Behavioral Risk Factor Surveillance System (BRFSS) surveys, both of these questions were used: "are you limited in any way in any activities because of an impairment or health problem?" and "if you use special equipment or help from others to get around, what type do you use?" Subjects were classified as disabled if they answered yes to one or both of these questions. Disability is differentiated from impairment and handicap in that impairment is related to any loss or abnormality of psychological, physiologic, or anatomic structure or function, whereas handicap is a disadvantage that limits or prevents the fulfillment of a role that is normal (depending on age, sex, and social and cultural factors) for that individual.

Physical Disability

Four main categories of function are defined: physical, mental, social, and emotional. Physical disability was defined as a congenital disease, acquired illness, or trauma that leaves a person with a physical limitation that lasts at least 1 year. Mental retardation, emotional disorders, and impairments related to drug or alcohol abuse were excluded from the present study. The cause of physical disabilities can be grouped using the Uniform Data Set for Medical Rehabilitation as the following: neurological conditions such as multiple sclerosis and cerebral palsy; neuromuscular disorders such as polio, transverse myelitis, and muscular dystrophy; brain dysfunction such as traumatic brain injury and cerebrovascular accident; spinal cord dysfunction such as spinal cord injury and spina bifida; sensory disabilities such as blindness and deafness; arthritic and orthopedic conditions; and other conditions.[5,20]

Obesity

The World Health Organization defines obesity as a body mass index (BMI) of 30 kg/m^2 or higher.[21]

EPIDEMIOLOGIC STUDIES

Large-scale studies of the prevalence of obesity among people with disabilities were included in statewide or nationwide surveys such as NHANES, BRFSS, and the National Health Interview Survey (NHIS) (Table 1). As mentioned earlier, the Centers for Disease Control and Prevention (CDC) initially included the disability survey in NHANES III and found that the prevalence of obesity was 30% among people with disabilities and 23% among people without.[9,22] Weil et al.[23] analyzed the pooled data from the 1994–1995 NHIS, the 1994–1995 Disability Supplement to the NHIS (NHIS-D), and the

Table 1. Epidemiologic Studies on the Prevalence of Obesity in People with Disabilities

Study	Data Source	Disability	Findings
Weil[23]	NHIS, NHIS-D, HP2000S (n = 25,626)	Any type Blindness Extremities	Odds ratio: 1.9 Odds ratio: 1.5 Odds ratio: 1.5–2.5
Havercamp[25]	NC BRFSS, NCNIC (n = 6902)	Any type	Odds ratio: 1.2
Jones[24]	NHIS (n = 30,526)	Mild to severe	Odds ratio: 2.2–3.7
Coyle[5]	Three organizations (n = 165)	Women with PD	54% overweight or obese
Kinne[6]	Washington State BRFSS (n = 545)	Any type	Odds ratio: 2.96
CDC[22]	BRFSS in eight states and DC (n = 52,037)	Any type	Higher percentage of obesity in disabled persons (27.4%) than in controls (16.5%)
Jenkins[16]	HRS (n = 19,018)	Physical disability	Higher percentage of obesity in disabled persons (36.3%) than in controls (22.4%)

NHIS = National Health Interview Survey; NHIS-D = Disability Supplement to the National Health Interview Survey; HP2000S = Healthy People 2000 supplement; NC BRFSS = North Carolina Behavioral Risk Factor Surveillance System; HRS = Health and Retirement Study; PD = physical disability.

1995 Healthy People 2000 supplement, and showed that people with extremity disabilities have a higher probability of being obese, with an adjusted odds ratio of 1.5 to 2.5 compared with people not reporting disability. In addition, people with lower extremity mobility disabilities are 2.5 times more likely to be obese than those without such disabilities.

CDC reported 1998 and 1999 BRFSS data in eight states and the District of Columbia concerning the obesity prevalence among people with any kind of disability, and showed that a higher rate (27.4%) of obesity was found in people with disabilities compared with people without (16.5%).[22] Among those with a disability, a larger percent of women than men tended to report obesity, and women with any disability were found to have almost twice the risk of developing obesity than women without disability.

Jones et al.[24] analyzed the data from the 1997 and 1998 NHIS and compared the relationship between level of disability and health-risk behaviors among women with and without disabilities. The data showed that women with disabilities had significantly higher odds of being physically inactive and obese (adjusted odds ratio = 2.2, 2.8, and 3.7 for mild, moderate, and severe limitation, respectively). Havercamp et al.[25] analyzed the data from the 2001 North Carolina BRFSS and the North Carolina National Core Indicators Survey, and compared the health disparities among adults with disabilities and adults not reporting disabilities in North Carolina. The results revealed that people with disabilities are more likely to be sedentary (36.8% compared with 22.5%) and overweight or obese (adjusted odds ratio = 1.2) and have a higher likelihood of developing chronic health problems such as high blood pressure, cardiovascular disease, arthritis, diabetes, and chronic pain. In the most recently published study, Kinne et al.[6] analyzed data from 2075 respondents to the disability supplement of the 2001 Washington State BRFSS to describe the prevalence of secondary conditions among people with disabilities. The prevalence of weight or eating problems was higher in the disability group compared with people without disabilities (adjusted odds ratio = 2.96).

There are limitations in these epidemiologic studies. First of all, body height and weight were self-reported and may be inaccurate.[23] Indeed, people tend to underreport their body weight[26] and people with physical disabilities often have difficulty in checking their body weight and height, especially those unable to stand. Secondly, the definition of disabilities varies among studies. The subjects were defined as having a disability by their answers to questions, and the different ways the questions were formulated from one survey to the next could create a bias in the outcomes, the definition, and the prevalence of disability. Finally, these studies are mostly cross-sectional rather than longitudinal, which provides less information on the causality of disability and obesity. Despite the above limitations, these epidemiologic studies show convincing and coherent data indicating a higher prevalence of obesity among people with disabilities.

PATHOPHYSIOLOGICAL CHANGES

People with physical disabilities undergo numerous pathophysiological changes in body composition and energy expenditure as a result of their injury or disease, and these changes may play a role in the early development of obesity. Some of the changes in body composition could themselves affect energy requirements. Similarly, alterations in energy expenditure might affect body composition.[27]

Changes in Body Composition

Body mass can be viewed at five separate levels: atomic, molecular, cellular, tissue system, and whole body.[28] While reviewing previous publications on body composition methodology, the two-component molecular level model, consisting of fat mass and fat-free mass, is the most widely applied model. Only a few studies have utilized the cellular level.[29]

There are several publications focusing on the body composition among people with physical disabilities (Table 2).[27,29-41] In these studies, spinal cord injury has been studied the most extensively. Spinal cord injury is a devastating and life-threatening event that causes long-term paraplegia or quadriplegia. The process of physical disabilities and physiological changes in individuals with spinal cord injury can be used as a model for the study of all physical disabilities. Spungen et al.[39] studied body composition in 12 male subjects with spinal cord injury by total body potassium and found that the fat-free mass was 34% below that expected for body height and age. Nuhlicek et al.[42] noted that the average body fatness (estimated from body weight and tritiated water) of men in high paraplegic (lesions from T10–T2), low quadriplegic (lesions from T1–C6), and high quadriplegic (lesions above C6) groups was 30.1%, 35.7%, and 35.3%, respectively. These values are more than double the average body fat level (15% body fat) of men without disabilities.

Studies by Jones,[31] Bauman,[43,44] Maggioni,[32] and Spungen[39,45] looked at body composition changes among individuals with spinal cord injury using dual-energy x-ray absorptiometry (DEXA), and all found increases in total fat mass and percentage body fat, as well as a decrease of fat-free mass compared with controls matched for age and BMI. In addition, in the Jones study,[30] the authors state that because of the increase in the body fat percentage among people with physical disabilities, the usual clinical measures of body weight or BMI might underestimate the degree of adiposity. Because BMI may mask excessive adiposity in this population, it has been suggested that the BMI level for obesity be lowered among people with physical disabilities.

In a study of subjects with cerebral palsy,[46] 61 children 2 to 18 years of age with spastic quadriplegic cerebral palsy were enrolled and further divided into two sub-groups: a low-fat-store group indicating a poor nutrition status and an adequate-fat-store group indicating adequate current nutrition status determined by skinfold-thickness measurements at the triceps. Body composition was determined using the deuterium dilution technique, and it was found that fat-free mass was not significantly different from that of the healthy control group. Fat mass and percentage of body fat were found to be significantly higher in the adequate-fat-store group. Another study, however, found increases in body fat percentage and fat mass and decreases in the fat-free mass in subjects with cerebral palsy.[27]

Among children with Duchenne muscular dystrophy (DMD), 44% to 54% are obese by the age of 13. Little is known about the genesis of obesity in this disease. Zanardi[33] found that obese DMD children had a low fat-free mass and very high body fat percentage (51.3%). Hankard et al.[35] studied 13 boys with DMD using the 3-day creatinine excretion method and indirect calorimetry, and showed a 71% fat-free mass loss associated with a 13% decline in resting energy expenditure (REE). Leroy-Willig et al.[41] found an increased fat mass, especially in the intramuscular compartment, as measured by magnetic resonance imaging, in individuals with DMD. Ryan et al.[36] studied 60 chronic hemiparetic stroke patients using computed tomography, and found a decrease of lean tissue mass and an increase of fat deposition within the hemiparetic limb compared with the sound side limb. However, using whole-body plethysmography, Lambert[37] compared 17 ambulatory patients with multiple sclerosis with 12 controls and found no statistical difference in body composition; however, this may have been due to the small sample size or the fact that ambulatory subjects have less functional limitation.

The changes in body composition among people with physical disabilities may include a decrease of fat-free mass and an increase of fat mass. However, the increase of fat mass is not found in severe cases of undernutrition.[33,38]

Alterations of Energy Expenditure

Total daily energy expenditure (TEE) comprises REE, thermic effect of food (TEF), and thermic effect of physical activity. TEE has been found to be lower among people with physical disabilities.[47] The changes associated with each component of energy expenditure are discussed below.

Resting Energy Expenditure

REE in individuals without disabilities accounts for approximately 65% of TEE and is largely determined by body size and composition. Fat-free mass and body cell mass are considered the actively metabolizing component at the molecular and cellular levels of body com-

Table 2. Studies of Body Composition in People with Physical Disabilities

	Disability (*n*)	Methods	Findings*
Jones[30]	Spinal cord injury (19)	Dual energy x-ray absorptiometry	• Decreased fat-free mass • Increased fat mass in legs and trunk
Maggioni[32]	Spinal cord injury (13)	Dual energy x-ray absorptiometry	• Decreased fat-free mass in total body • Increased fat mass in legs and trunk
Jones[31]	Spinal cord injury (5)	Dual energy x-ray absorptiometry	• 16% decrease in fat-free mass • 12% decrease in bone mineral content • 47% increase in fat mass
Spungen[39]	Spinal cord injury (12)	Dual photon x-ray absorptiometry, total body potassium	34% decrease in fat-free mass (predicted)
Buchholz[29]	Spinal cord injury (28)	Deuterium dilution, sodium bromide	Decreased • Total body water • Fat-free mass • Intracellular water • Body cell mass Increased • Fat mass • Extracellular water
Bandini[27]	Cerebral palsy (13), muscular dystrophy (16)	Doubly labeled water, sodium bromide	• Decreased fat-free mass with cerebral palsy and muscular dystrophy • Increased fat mass with muscular dystrophy
Stallings[46]	Cerebral palsy (61)	Doubly labeled water	Increased fat mass in adequate-fat-store group
Zanardi[33]	Duchenne muscular dystrophy (9)	Magnetic resonance imaging	Decreased fat-free mass
Palmieri[34]	Duchenne muscular dystrophy (19)	Dual energy x-ray absorptiometry	• Increased fat mass • Decreased fat-free mass
Hankard[35]	Duchenne muscular dystrophy (13)	Bioimpedance analysis, 3-day urinary creatine	71% decrease in muscle mass
Leroy-Willig[41]	Duchenne muscular dystrophy (8), spinal muscular atrophy (3)	Magnetic resonance imaging	• Increased fat mass • Decreased fat-free mass
Ryan[36]	Cerebrovascular accident (60)	Dual energy x-ray absorptiometry, computed tomography	• Increased fat mass • Decreased fat-free mass in hemiparetic limb
Lambert[37]	Multiple sclerosis (17)	Plethysmography	No change in body fat percentage or fat-free mass
McCrory[40]	Neuromuscular disease (26)	Plethysmography	• Increased fat mass in women • Decreased fat-free mass

*Compared with controls.

Table 3. Studies of Energy Expenditure in People with Physical Disabilities

Study	Subjects (*n*)	Methods	Findings*
Buchholz[29]	Spinal cord injury (28)	Indirect calorimetry	• Decreased REE • No change in REE adjusted for fat-free mass and body cell mass • No change in TEF
Buchholz[52]	Spinal cord injury (54)	Indirect calorimetry, heart rate monitor	Decreased TEE
Monroe[47]	Spinal cord injury (10)	Respiratory chamber	Decreased TEE, REE, TEF, EEPa
Spungen[39]	Spinal cord injury (12)	Indirect calorimetry	Decreased REE
McCrory[40]	Neuromuscular disease (26)	Heart rate monitor	• Decreased REE, TEE, EEPa, physical activity level • No change in REE adjusted for fat-free mass
Finestone[53]	Cerebrovascular accident (91)	Indirect calorimetry	No change in REE
Stallings[46]	Cerebral palsy (61)	Indirect calorimetry, doubly labeled water	• Decreased TEE, REE • No change in REE adjusted for fat-free mass
Bandini[27]	Cerebral palsy (13) muscular dystrophy (16)	Doubly labeled water	Decreased REE, TEE
Zanardi[33]	Duchenne muscular dystrophy (9)	Indirect calorimetry	• No change in REE • Increased REE adjusted for fat-free mass
Hankard[35]	Duchenne muscular dystrophy (13)	Indirect calorimetry	• 13% decrease in REE • Increased REE adjusted for fat-free mass

*Compared with controls.
REE = resting energy expenditure; TEF = thermic effect of food; TEE = total daily energy expenditure; EEPa = energy expenditure of physical activity.

position, respectively. It has been shown that fat-free mass explains 25% to 85% of the variation in REE, and the loss of fat-free mass is associated with a reduction of REE.[35,39,48,49] Most studies indicate that people with physical disabilities have low absolute REE (Table 3).[27,29,33,35,39,40,46,47,50-53] However, there is controversy as to whether REE is lower in people with physical disabilities after being adjusted for fat-free mass or body cell mass. One study found that REE adjusted for fat-free mass, fat mass, and age was 678 kJ/d lower in spinal cord injury patients than in subjects without disabilities.[47] In other studies, REE was lower in persons with paraplegia, but not different from that of persons without disabilities when adjusted for fat-free mass, fat-free mass and fat mass, or body cell mass. This suggests that the metabolic activity of the fat-free mass and body cell mass in paraplegic subjects is similar to that of control subjects.[29,39]

Another study showed that a loss of muscle mass in boys with DMD was not associated with a reduction in REE, and was even higher than that of controls when expressed per kilogram of fat-free mass.[33] One possible explanation for this result is that there is an increase in the ratio of visceral organs to muscular tissue in the composition of fat-free mass, and it is well known that metabolic activity of organs is about 20 times greater than that of muscle tissue.[54] It is also possible that obesity in children with DMD is not primarily due to a decreased REE, but to other causes such as a reduction in physical activity or overfeeding.

Thermic Effect of Food

TEF accounts for about 10% of TEE and may play a role in the development and maintenance of obesity. A few studies have investigated TEF in people with physical disabilities. One found that TEF (expressed as a percentage of total daily energy intake) in male spinal cord injury subjects was lower than that of control subjects.[47] Another study found no differences in TEF when expressed as a percentage of either test energy intake or resting metabolic rate.[55] Buchholz[29] found that paraplegia did not have an apparent effect on TEF.

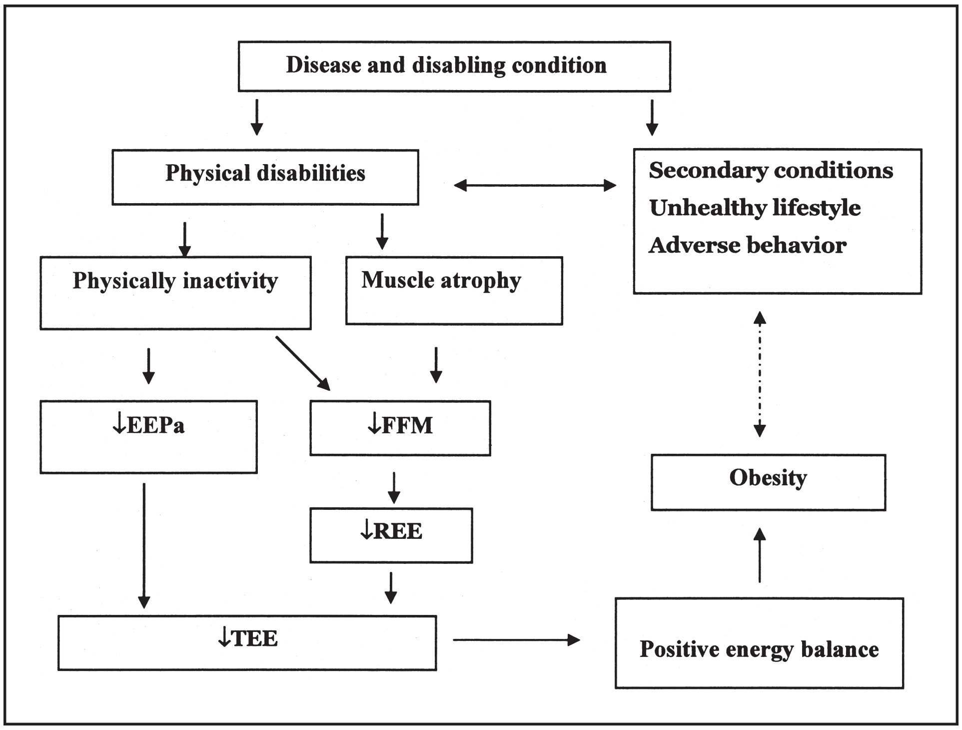

Figure 1. Possible mechanism of obesity development in people with physical disabilities. ↓ = decrease; REE = resting energy expenditure; TEE = total daily energy expenditure; FFM = fat-free mass; EEPa = energy expenditure of physical activity.

Energy Expenditure of Physical Activity

According to some studies, energy consumption during physical activity is higher for people with physical disabilities.[56] However, the effect is diluted by the marked decrease in physical activity due to a sedentary lifestyle. People with physical disabilities tend to lack physical activity both at work and in leisure.[47,52,57] Approximately 75% of people with disabilities are either entirely sedentary or are not active enough to achieve activity-related health benefits. The high rate of inactivity among people with physical disabilities is associated with the high prevalence of obesity in this population.

POSSIBLE MECHANISMS AND ASSOCIATED FACTORS

The genesis of obesity among people with physical disabilities is unclear. Longitudinal studies are needed to identify each risk factor. Current published studies do not allow for clear conclusions. There are several risk factors considered to be important in obesity development among people with physical disabilities, including type of disabling condition, severity and duration of disease, and gender and age.[22] For example, about 50% of individuals with DMD develop obesity in adolescence.[33] Individuals with higher levels of spinal cord injury have a higher percentage of body fat than those with lower-level injuries.[42] Furthermore, in people with physical disabilities, a larger percentage of women than men report obesity.[22]

Physical inactivity and muscle atrophy are two other risk factors for obesity, and both are common among people with physical disabilities. Physical inactivity is associated with a decrease of energy expenditure, and muscle atrophy also results in a reduction of REE. Therefore, a reduction in TEE may predispose people with physical disabilities to gain weight by inducing a positive energy balance, with energy intake exceeding energy expenditure (Figure 1).[47,58]

Apart from physical inactivity and muscle atrophy, other factors associated with weight gain among people with physical disabilities are secondary conditions associated with the primary disability,[5-9] unhealthy lifestyle,[24] and disparity of medical utilization.[25] People with physical disabilities often have more than one secondary condition. The NHIS data showed that a variety of secondary conditions among people with physical disabilities co-occurred more frequently than expected.[24] The most common secondary conditions among people with physical disabilities are fatigue, depression, chronic pain, anxiety, bowel dysfunction, urinary tract infections, pressure sores, respiratory infections, contractures, autonomic dysreflexia, and seizures. Among this list of secondary conditions, there are several that are also associated with obesity: depression,[59] chronic pain,[60] mobility problems,[61] physical deconditioning,[61] poor fitness, and arthritis.[15] All of these may contribute to obesity development among people with physical disabilities.

Few studies have investigated the effect of adverse behaviors such as smoking and alcohol consumption among people with physical disabilities. The NHIS study found that women with severe limitations had the highest risk for heavy cigarette smoking and were also more likely to meet the BMI criterion for obesity.[24] Furthermore, people with physical disabilities confront environmental and disability-specific barriers, such as availability of accessible facilities and transportation and disparity of medical utilization.[25] Fewer consultations with physicians and difficulty in accessing exercise facilities often prevent people with physical disabilities from exercising more.[23]

CONSEQUENCES OF OBESITY

Obesity has been associated with a number of diseases and metabolic abnormalities, many of which have a high morbidity and mortality. These include hyperinsulinemia, insulin resistance, type 2 diabetes, hypertension, dyslipidemia, coronary heart disease, gallbladder disease, and certain cancers.[10,62] Obesity also results in other problems specific to people with physical disabilities. While there have been several studies reporting on the relationship between physical disabilities and metabolic abnormalities, most of these focused on subjects with spinal cord injury, and few addressed the additional impact of obesity on this population. It seems safe to say that if obesity develops in people with physical disabilities, they are at greater risk for metabolic abnormalities such as diabetes mellitus and coronary heart disease.

Type 2 Diabetes Mellitus

There is evidence that spinal cord injury is strongly associated with an increased incidence of type 2 diabetes mellitus and coronary heart disease.[63-65] Cross-sectional studies have found an increased prevalence of disorders of carbohydrate metabolism in those with spinal cord injury.[66,67] The hyperinsulinemia of obesity is due partly to a decreased response of peripheral tissues to insulin.[68] Muscle paralysis and prolonged inactivity result in decreases in the quantity and quality of muscle mass, which leads to insulin resistance and diabetes mellitus.[43,64,67,69]

Coronary Heart Disease

In addition to type 2 diabetes mellitus, the relatively high prevalence of obesity in people with physical disabilities places this population at risk for coronary heart disease.[70] Coronary heart disease has become a leading cause of death in persons with spinal cord injury,[71,72] who were also found to have a low level of HDL and a high level of LDL,[73,74] both of which are risk factors for coronary heart disease. Immobilization and obesity are also risk factors for the development of coronary heart disease. One study found a 228% increase of mortality rate from coronary heart disease in sedentary individuals with physical disabilities compared with age- and sex-matched controls.[75]

Worsening of Disability

Obesity increases the burden of muscle wasting, accentuates skeletal deformity, and endangers the results of orthopedic surgery in people with physical disabilities. Moreover, obesity can worsen pulmonary function. When patients lose their independence, obesity can become an additional difficulty for their caregivers, particularly in maintaining daily hygiene. Additionally, excess body weight may predispose individuals who are confined to wheelchairs or beds to pressure sores and reduce their independence in transfer activities as well as in other activities of daily living.

CONCLUSION

Physical inactivity and changes in body composition and energy expenditure increase the risk of development of obesity and metabolic abnormalities among people with physical disabilities. Based upon epidemiologic studies, it is clear that the prevalence of obesity among people with physical disabilities is higher than that of those who are not disabled. There is evidence that people with physical disabilities are at greater risk of coronary heart disease and diabetes mellitus. Moreover, obesity increases the burden of disabilities and the number of secondary conditions. Eventually, patients become more dependent and have a poorer quality of life.[11]

Physicians should recognize that patients with physical disabilities face an increased risk for developing obesity and metabolic abnormalities, and should therefore address their weight concerns. Public health messages and interventions should be targeted to persons with physical disabilities who are likely to become obese and to obese persons who are likely to become disabled. Additional studies on the prevention and treatment of obesity need to be conducted in this at-risk population to help develop clinical guidelines for screening and treating children and adults with physical disabilities.

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