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Musculoskeletal Diseases, Overweight and Obesity, and Aging Workforce: How to Encounter the Problem

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Musculoskeletal diseases (MSD) often put a significant amount of stress and strain on the load bearing joints. Some of the risk factors associated with MSD are age, gender, sedentary lifestyle (i.e., lack of physical activity), and anthropometry, such as body weight [1,2]. Age is considered a major driver of MSD prevalence due to age-related degeneration of tissue surrounding the joints [1]. Furthermore, loss of muscle strength increases the severity of surrounding soft tissue damage and provide less support for the load bearing joints, leading to more debilitating MSD [1].

Based on the World Health Organization, one in every two adults has reported MSD conditions. This rate is twice the rate of chronic circulatory or respiratory conditions. More than 30% of Americans require some types of health care due to MSD [2]. Knee and hip pain account for a great deal of activity limitation, especially in overweight older adults. Knee osteoarthritis is a common comorbid condition associated with aging and obesity and over time can lead to pain, stiffness, immobility, and possible joint replacement therapy [3]. Increase in body weight puts a significant amount of stress and strain on the weight bearing joints, especially lower back, hip, and knee, thus increasing the severity of MSD in older adults. Obese individuals are also at higher risk for injuries to other joints, such as shoulders and wrist, due to biomechanical compromises linked with higher body weight while performing daily activities [4]. In a major study, Andersen et al. [4] compared the relationship between body mass index (BMI) to knee and hip pain in elderly adults, 60 years and older. They reported the prevalence for knee, hip, and back pain as 21%, 14%, and 22%, respectively, with an increase associated with higher BMI values [4].

Consequently, in recent years, MSD has become an increasingly chronic health risk, especially in overweight and obese individuals [5-10]. In 2008, the estimated health care costs related to obesity were $147 billion [11,12].

Physical inactivity also plays a major role in the development of MSD. Lack of physical activity combined with increased weight can increase the likelihood of developing improper movement and alignment of the bones and muscles [2], increasing the risk for osteoarthritis [13] as well as increasing susceptibility to joint injury [1].

With the aging workforce and significant increases in the number of overweight and obese in the U.S., there is a concern regarding increased healthcare utilization by employees. Health care utilization has been reported to be significantly higher for overweight and obese, compared to normal weight individuals (in average of 10% to 36% higher) [14]. In a study by Gates et al. [15], employees with a BMI of 35 or higher had greater limitations at work and displayed less ability to perform normal work than those with a BMI of less than 30 [15]. Same employees (BMI > 35) were less likely to be productive at work, compared to normal weight employees, and had an annual $506.00 worth of lost work per employee, per year.

Recent literature suggests a weight loss of at least 3-5% will improve the health and prevent the development of many chronic diseases related to obesity [16]. Weight reduction and proper body mechanics may prevent or delay the onset and duration of the MSD problem [1]. Messier et al. [6,7] reported in a weight loss intervention for older obese adults with knee osteoarthritis (OA) that exercise, combined with weight loss decreased pain, disability, and improved performance. Participants also reported significant improvements for self-reported physical function, six-minute walk distance, stair climb, and knee pain ($p<0.05$). In another study, Roffey et al. [17] evaluated the effects of a 12-month non-surgical weight loss and exercise promotion program in a group of individuals with the mean BMI of 44.7 ± 7.6 who reported recent low back pain (LBP) of any duration (acute, sub-acute, or chronic) within the past 12 months. After the program's completion, participants who lost weight reported significant reduction in pain severity [17]. They concluded that additional weight might put extra load on the musculoskeletal system, causing a loss of alignment and requiring an increased effort to accomplish everyday tasks. Losing weight may also reduce the strain on the musculoskeletal system and may have reduced the associated pain and disability [17].

Workplace may also contribute to the increases in the prevalence of MSD and obesity in older adults due to, for instance, lack of job control, increases in job demand in some occupations, and lack of healthy environment. Physical inactivity at worksite (i.e., decreased energy expenditure) and consumption and availability of abundant unhealthy food choices (i.e., increased energy intake) can lead to a positive energy balance, which will eventually result in overweight. Furthermore, stress and burnout put individuals at an even higher risk for unhealthy weight-gain, musculoskeletal disease, and other chronic diseases, such as diabetes and heart disease. The reported health care cost associated with these comorbid conditions with obesity exceeded $92 billion [18] due to increased sick days, decreased productivity, and limitation in mobility [19]. Oddly, many adults with MSD continue to work and perform work-related tasks under significant pain and discomfort. This may contribute to the higher reports of absenteeism and loss of workdays for this population. Studies have shown direct relationship between MSD, disability leave, and absenteeism [15,20,21]. According to the National Institute of Occupational Safety and Health (NIOSH), the prevalence with of upper back and extremity discomfort, in adults aged 45-65, due to musculoskeletal pain was 29% and 8% among those with lower back and extremity pain [22]. Luime et al. [23] reported that an increase in body weight and excess body fat in as little as one year can lead to a quicker onset of neck and shoulder pain in worksite settings, where unhealthy dietary practices and obligatory shift work is present [23]. Nilsen et al. [24] found similar results in a longitudinal

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study comparing 30,000 participants in the Nord-Trøndelag Health Study (Norway), in which physical inactivity and higher BMI resulted in increased risk of chronic low back pain.

While there are many ways to target the obesity epidemic and high MSD prevalence, recent research has found supporting evidence that workplace is an ideal setting to address overweight and obesity and related MSD [25]. Worksite weight management programs have shown success due to having all employees' access to a controlled environment, similar social and communication networks, and possibility for policy and environmental change. Larsson et al. [9] evaluated MSD-reported pain after a 64-week weight reduction program at a workplace setting. Of the participants who lost at least 5% of their body weight, functional limitations and perceived pain from MSD improved significantly [9]. Proper techniques and improvements in MSD prevention can provide additional benefits including decreased staff turnover, sick days, administrative costs, all resulting in a more productive workforce. In another study by Kotowski and Davis [26] reported significant trends in weight loss and pain reduction in which the weight bearing regions of the body such as lower back, hip, and knee had greater reductions in reported pain after weight loss. Following a 12-week weight loss program in 35 overweight women, participants reported reduction in pain in low back, knee, lower leg and foot, hips, shoulders, and upper back [26].

While workplace weight management programs are effective, the beneficial impacts will be significantly improved if they are tailored to the specific needs of the employees, types of job, and organizational characteristics that increase participation and employees' engagement in the program. A program that tailors to the needs of the individual have shown to positively influence the involvement of the participant in the program. Faghri et al. [27] instituted a walking program at workplace, encouraging employees to increase the number of steps they take while at work. They reported reduction in body weight as well as other risk factors [27,28]. Briley et al. [29] found that worksite health promotion programs involving health educators, such as registered dietitians, can improve weight reductions and other related conditions in employees at high-stress occupations. These programs can be beneficial in maintaining a positive atmosphere and attitudes, as well as increasing productivity in the workplace and overall improvements in a healthy lifestyle [29].

In conclusion, Individuals' behaviors are determined not only by conscious choices, but also by unconscious processes or habits. Increasing knowledge (e.g., by education or worksite counseling) on the advantages of healthy eating, increasing physical activity and managing a healthy weight will influence an individual's conscious choices. Weight management programs with active employees' participation in planning, implementation, decision-making, and problem solving would be more successful. This is especially important for employees who are overweight or obese and at high risk for MSD. Programs that take into account employees' inputs and their limitations, and serve the needs of participants, will provide better results. Preventing or treating overweight and obesity may also reduce the MSD related disorders and improve the quality of life for employees.

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