Review Article
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Obesity and falls injuries risk: Is there a relevant connection in older adults?

Abstract

Obesity, which is on the rise, is a risk factor for, as well as a possible negative outcome mediator of multiple health issues, including bone mineral losses, cardiovascular impairments, and falls injuries and fractures among many in the older adult population and others. This brief examines what we know about obesity and falls injuries as applied to the older adult, a topic that is arguably of high import, but not always stressed in the obesity literature. Using the **PUBMED and GOOGLE SCHOLAR** data bases relevant data on this topic were sought. These data bases show that it is possible some older adults who exhibit excess body mass indicators may be prone to falling and sustaining injuries that may reinforce their tendency towards debility or increase this. Even if not applicable to all older adults, advocating for optimal body weight, and regular physical activity bouts across the lifespan may prove helpful in abating the disability observed due to the presence of an obesity state plus any associated single or multiple injurious falls in later life.

Keywords: falls, falls injuries, fractures, obesity, older adults, overweight, prevention

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Introduction

Obesity, deemed by many mainstream health providers to be a serious health condition, currently affects many citizens of all ages, including the elderly. While quite well understood as a factor in raising the risk for cardiovascular disease, as well as depression, osteoporosis, and osteoarthritis, the topic is less well understood as a possible potent bone fracture determinant due to a potentially heightened falls risk. Previously believed to protect against fractures, and that possibly older adults would tend to me more on the frail side than the overweight side, both beliefs have been dispelled to some degree of late in several spheres, but what the trends show in 2024 in this regard are unclear.

Review aims

- To ascertain whether more emphasis should be placed on the importance of reducing obesity across the lifespan as well as in the higher age ranges bearing in mind the limited role anti-obesity medication alone may have over the course of the lifespan when a high percent of aging adults are predicted to be obese by 2030.[1]
- A sub goal was to ascertain if adults with disabling obesity might benefit in any way from weight loss recommendations and exercise programs in the context of attempts to minimize bone and joint structural injuries.
- A third aim was to examine what could go wrong if passive means of weight loss alone are the primary mode of obesity reduction, but careful follow up is neglected, for example are these sufficient to reduce the risk of potentially debilitating falls injuries and possible fractures and their adverse health impacts in the older obese adult population.

Rationale

Many older adults currently desire to live in the community and those who do must be able to function safely at any body size. While not all health risk events can be foreseen or prevented, factors other than aging may prove risky.

Methods

To examine relevant materials concerning excess body weight and falls injuries as this applies to aging adults who wish to live in the community, the data sources **PUBMED, GOOGLE SCHOLAR** and **PubMed Central** were employed. Data pertaining to the specific aims of this commentary and review were sought regardless of year of origin. No formal analysis was attempted however, and interested readers are urged to pursue one or more of these lines of inquiry posted in the current reference section in more depth. Excluded were detailed intervention studies, as well as surgical and drug weight management reports for offsetting obesity in adults. A strong focus was placed however, on examining obesity impacts on falls and possible fall injuries that commonly impair mobility as well as health and may yet increase any overweight problem. Older community dwelling adults with an obesity diagnosis were the population of specific interest, regardless of how this was defined. The term obesity was used to describe the presence of excess body fat mass relative to height or distribution and composition, and regardless of how this was assessed in the different articles. The term sarcopenic obesity, was used as in the literature to describe or refer to an age associated muscle mass and strength decline potentially exaggerated in the obese older adult. The term falls referred to any unintentional or unplanned uncontrollable change in body position from any upright state to a horizontal state, and which may differ in its impact among individuals as well as within individuals who fall recurrently or in cases where body weight changes are replicated in bone and muscle health status. Falls locations and health status were not considered despite their potential explanatory power.

Results

General findings

Even if one accepts there are many gaps in the literature concerning any consensus as to whether older obese adults are at excess risk for injurious falls, a cursory review of the prevailing 300 articles posted on PUBMED regarding obesity and falls injuries, shows no shortage

of peer reviewed articles, and alluding to the high ongoing interest in this topic. While clearly not inclusive of all sources of information, many that are available tend to demonstrate a generally negative association between the presence of excess body fat relative to stature, and a possible high risk of falling[2–5] and/or sustaining a possible fracture,[6–8] even if somewhat discounted by others.[9–11]

Additional observations

In addition to observing both men and women to be at an increased risk for sustaining certain types of fractures but not others when compared to non-obese controls, the authors suggested this finding may apply to cases deemed obese who may be less likely to receive bone protective treatments for various reasons, such as bone vulnerability[1] and cannot be readily protected sufficiently by any fat 'cushioning' effect.[11] In addition, even in the absence of a fracture, certain falls and their sudden impacts may still produce considerable pain and swelling as well as bruising in the impacted tissues of vulnerable older adults. At the same time, the impact of body weight on a vulnerable bone along with a weakened muscle state, may explain the observed tendency for older obese adults to sustain a bone fracture.[12] Those who have fallen and fractured a bone may also exhibit longer hospital stays, a possible slow recovery rate, and overtime a lower quality of life than non-obese older adults if they also suffer from one or more chronic health conditions, impaired mobility, or asthma, among other obesity associated health challenges[12–14] in addition to bone geometry,[14] bone and concurrent age associated muscle mass losses a potent health determinant termed 'osteosarcopenia'.[14]

As well as a possible influence on premature mortality,[15] the further mediating role of obesity on diabetes, dizziness/balance issues and cardiovascular health issues in the falls injury cycle may prove highly costly as well as challenging to mitigate or combat. In addition, the use of psychotropic medications by depressed obese older adult sufferers and its potential impact on sleep deprivation and slowing of reaction time may further increase any tendency towards falling thus fostering an increased injury rate over time if nothing is done to counter this possible cycle of adverse interactions.[16–18] Alternately, based on a panel study drawn drawn from the available data housed in the 2012 and 2014 United States Health and Retirement Study, where the standardized differing categories of obesity defined by body mass index [BMI] from mild, moderate, or severe were computed along with a measure of central obesity status and reported fall and fall injuries 35 percent of the sample reportedly fell in the two year period. Falls rates were higher in the presence of central obesity, as were falls injury rates. Although, the subgroup representing the severe obese BMI category showed fewer falls injuries over the two year period, this finding was difficult to interpret without assurance that the obese older adult subgroups were comparable at baseline on falls injury factors and others such as daily activity levels, nature of these activities, and health status and survey data were valid falls injury indicators.

As per Berarducci et al.[19] it does appear that regardless of BMI status, careful attention to optimizing bone health and reducing any possible falls risk due to muscle weakness is crucial for aging adults who are obese or overweight even after bariatric surgery and successful weight loss. Hooker et al.[20] did find obesity was independently and specifically associated with higher fall rates in a group of 5384 men ages 65 to 80 years who had walking activity related balance deficits, that are well established falls risk factors. This finding was present in cases 80 years of age or younger and where falls incidents tended to increase from 24% at baseline to 92% in men. Support for assessing balance in the obese older adult as a precaution as well as support for efforts to foster balance performance among the overweight elderly in the community-based setting has thus been duly recommended.[21]

Additionally, to break any cycle of obesity and reinforcing sedentary practices, and their combined effect on chronic health problems of the older adult that may have a bearing on future bone injuries due to injurious falls, it also appears physical activity participation is strongly indicated.[22,23] To reduce the chances of an obese older adult sustaining a fracture,[8] those with evidence of sarcopenic obesity should be specifically targeted in this regard.[1,24] In particular, attention to muscle strength training is of particular import and of high relevance in this regard, because coupled with abdominal obesity, the presence of dynapenia or muscle strength losses tends to significantly increase the risk for incurring a fall in the older adult population,[25,26] especially in the face of hypovitaminosis D and bone fragility[1] and even after bariatric surgery in those with signs of dynapenia[27] who may fall independent of obesity, and fall repeatedly. Alternately, in the absence of recognition, as with sarcopenic obesity in older adults[7,8] those with dynapenia, abdominal obesity, and a high waist circumference may be at high risk for falls during walking activities and others.[28] This is partially because of the dual impact of obesity and muscle weakness on the effectiveness of timely compensatory stepping responses in the face of sudden **or** large postural disturbances[29] and poor balance capacity.[30] Medications that heighten falls risk should also be carefully monitored for similar reasons.[5]

As outlined above, even if inconsistent to some degree with others[10] it can be assumed that due to its possible negative impact on walking mechanisms as well as postural stability, a tendency to falls is likely to emerge over time in some adults aged 60 years and older if they suffer from concurrent muscle strength losses or sarcopenic obesity. Moreover, despite some controversy, as identified in 2007 by Finkelstein et al.[4] there is a consistent association between BMI and the probability of sustaining an injury related to a fall, and thereafter possible health issues due to sprains/and strains, lower extremity fractures, and joint dislocations. These may induce more challenges than not and that can result in weight gain or decreased ability to exercise, plus exacerbated cardiovascular stressors[31] and are likely to increase as the prevalence of any obesity tendency, rather than control this. At the same time, Ensrud et al.[32] note frailty, an independent predictor of adverse health outcomes in older women, including very elderly women, is also of clinical import in older obese women as a result of its impact on bone attrition processes. Moreover, older adults who employ alpha-blockers, benzodiazepines and beta-blockers, as well as those with prior fractures, and who exhibit a high body mass index are more likely to fall than those who are not overweight or on medication regimens, especially in adults older than 60 years of age with abdominal obesity who have a higher prevalence of falls than those of healthy weight age matched adults.[33,34] As affirmed by Mitchell et al.[5] older obese individuals have an increased risk of falls and obese fallers have a higher prevalence of pain and inactivity than fallers of a healthy weight.

Additionally, Wu et al.[35] found that having an increased waist circumference, hip circumference, or BMI were significantly associated with an increased risk of falls. It was also noted that those exhibiting an increased falls risk also tended to incur an increased fracture risk, among other negative health outcomes. The further finding of a possibly causative as well as a reactionary role for insomnia before and after a fall respectively, and an ensuing heightened risk for fracture, was relatively novel and could be helpful to explore in the future. Moreover, as outlined by Scott[36] it appears that body composition as well as muscle function have important implications for falls and fractures in older adults, including a dual impact on bone

health. This group who examined a cohort of 1486 men aged ≥70 years at baseline (2005-2007), as well as a 2-year follow-up (2007-2009; n = 1238), and 5-year follow-up (2010-2013; n = 861), obese cases categorized as being sarcopenic at baseline showed this did appear to be associated with a significantly higher 2-year fall rate, and an increased 5 year fracture risk. This finding however, depended on how the end point was measured and examined statistically but seems to parallel another study of older diverse women[37] where sarcopenic obesity was associated with an increased risk of falls among women aged 50–64 years, plus those aged 65–79 years. Although older adults were not studied, the observed sarcopenic obesity related fall risk was found to be notably higher in Hispanic/Latina women than the Non-Hispanic White women and may be a factor to investigate further in the future especially where the literature is unclear or divergent.[38,39]

Rosenblatt et al.[40] who conducted a laboratory study using older adults found that after grouping participants by waist-to-hip ratio, those with high ratios tended to show more variation in a toe clearance test. Another finding was that trip recovery was associated with hip circumference, thigh circumference, fat mass index, and total fat. Following grouping of the men and women participants according to a fat mass index, those with high index tended to show less favorable trunk kinematics following a laboratory-induced trip. It was concluded that the measures of waist-to-hip ratio and fat mass index may more closely relate to trip-induced fall risk than BMI measures among community-dwelling older adults, thus explaining some discrepancies in what is observed in some studies, but not others. Yi et al.[41] did note though that obesity was associated with a greater risk of recurrent falls in women, whereas being underweight seemed to be associated with a greater risk of falls in men. Another study found general obesity among women to yield a differing falls/fracture risk profile than that attained with measures of central obesity.[42] However, among middle age women with a high BMI, was consistent evidence of an increased falls risk that was magnified in the presence of sarcopenic obesity and depression,[43] but again another study revealed the impact of body mass on falls fracture risk was non uniform and depended on measurement definition and approach.[8] It is also observed that body mass index measures and balance deficits may not follow the same trajectory in men and women,[44] thus explaining the unexpected or null findings in some posted peer reviewed research studies. In the interim, it is hard to ignore the fact that a falls prevalence of approximately 10 percent appears well correlated with the presence of dynapenic abdominal obesity,[45] and with a slightly greater percentage of recurrent falls in this group. Moreover, even if an injury is not incurred in the face of a fall among all older obese persons, those who exhibit sarcopenia can still potentially increase their risk of acquiring undesirable mobility risks and daily living deficits if remedial factors persist and no imperative prevails to intervene preemptively.[17,46,47]

Discussion

As the global society ages, the immense problem of adult obesity persists even among those in the higher age ranges, including morbid obesity, and despite years of study and preventive attempts to counter this.[48] In addition, the costs of failing to contain obesity in particular are well established, even if falls associated costs are not factored in and remain a realm of public health where very little emphasis has been placed on the added costs of debility that may ensue if an older adult who is excessively overweight falls, and falls repeatedly and does incur one or more injuries requiring medical attention. Far from being less vulnerable to body injuries if an older adult is deemed obese, this sub group of adults may prove more vulnerable than younger adults as a whole to both falls, as well as bone injuries due to poor bone health, and muscle atrophy, among other factors. In combination with an increased fat mass in muscles and a tendency to be sedentary, older obese adults who encounter obstacles when walking or slip or trip unexpectedly may respond more slowly than a healthy normal weight adult of a similar age, who may fall but with less trauma or damage to on the underlying joint and bone tissues. Indeed, this combination could prove lethal as well as costly if bone as well as joint health are already compromised, and result in a hip fracture for example.[49,50]

Consequently, even though this field of investigation is quite novel and inconclusive or comprehensive, and the current review was a scoping one, rather than an in depth quantitative analysis of all publications and design examination, it appears a health topic of value to carefully pursue. The serious nature of this health determinant in aging adults may also be underrepresented if many ethnic groups have not been sought for study. The possible further role of limited samples, dubious measures in some cases, and a lack of follow up over extended time periods of cohorts with more extensive baseline and outcome assessment approaches may also be obscuring the extent of this possible health determinant.

Nonetheless, as this brief overview indicates, the excessively overweight aging adult should not be neglected in programs designed to prevent home based falls, and especially that they should receive therapies to boost or ensure their bone health is optimized as indicated. While those who do fall over time and who may choose to be less active and thus do not appear to incur any undue injury risk or injurious joint impact over time, efforts to encourage rather than discourage muscle strength training and controlled activities are strongly indicated. In addition, tailoring is highly indicated given the variability in obese manifestations as well as personal and environmental falls risk factors. Those with one or more chromic health conditions, morbid obesity, and/or cognitive challenges should be preferentially targeted. In addition, clinical practice efforts to contain weight excess via medication/injection may also need to be coupled to efforts to avert bone mass losses as well as muscle mass losses, muscle strength deficits, underlying neural or joint dysfunction, and painful joints. Balance deficits, dizziness, and other correlates of falls may also not be resolved by passive weight loss mechanisms, thus weight loss may not prevent a possible bone fracture in all overweight cases. Also worthy of consideration are those that can foster sound nutrition and mental health and remove obstacles to physical activity participation and functional overall efficiency.[46] The prevalence of this problem might also be reduced by informed efforts to encourage health policy makers and funders to collectively address this.

To this end, more comprehensive studies on this topic as a whole including whether obese older adult might encounter more intense problems immediately following a fall than healthy weight controls, for example, if they cannot move ably or are too heavy to be lifted easily without undue stress as well as any tissue damage should be examined. Why differential study results prevail in the current sphere, and whether this occurs because falls and fracture risk vary in older obese men versus women may also provide novel insights of far reaching import.[51] In the interim, it appears safe to conclude that screening to detect early signs of bone loss, postural instability, gait problems, vitamin D deficiencies, and muscle weakness in aging adults who are obese or overweight plus early treatment to minimize any observed deficit can predictably help to minimize multiple preventable disabling costly life negating experiences due to the convergence of age and muscle, mobility, and bone strength declines that may induce an injurious fall.[47] At the same time, as in other realms of aging and health promotion studies, efforts to garner an improved understandings of aging, obesity, muscle, bone, and falling correlates

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and their interactions with gender and ethnicity over the passage of time will undoubtedly open new doors of knowledge as well as treatment and mitigation opportunities for many aspiring to age independently in the community. In both falls prevention as well as obesity prevention realms the role of physical activity is probably of higher import than weight reduction efforts alone at this point in time.

However, in absence of any concerted public health effort to draw attention to this possible underestimated health issue, the rates of obesity and falls injuries related health complication and care costs will likely tend to increase over time, and prove greater in terms of costs among those in the higher obesity classes.[29,51–55] In particular, it can be expected an overweight older adult who sustains bone or joint trauma or both may become more overweight if they cease to move due to fear of further injury and falling, immense pain, plus a declining willingness to exercise in the face of pain or anxiety. It may be very hard both physically and emotionally moreover to visit a practitioner if we consider the travel challenges, potential biases and stigma against obese adults as well as older adults, as well as discomfort in traditional medical settings, for example waiting rooms with standard seating, without some thoughtful dedicated efforts to embrace the older high weight adult empathetically and holistically, including their mental as well as their physical health challenges, thus failing to address their needs for safety and injury prevention. Other potential remedial efforts include the provision of support for:

- Personalized/group activities that foster balance, social wellbeing, and functional stability
- Home safety and adaptive device inspections
- Behavioral modification approaches
- Falls prevention education and resources
- Nutrition interventions as indicated
- Medication assessments and monitoring

Conclusion

Despite the lack of sound support for a falls injury obesity link in the older adult population, some compelling past and emerging evidence points in our view to several observations.

1. Excess body weight is not beneficial physiologically at any age, and older adults rather than becoming frail are also becoming or remaining in the obese BMI category at high and increasing rates even in the higher age groups.
2. Associated with decreased physical activity and poor diet, weight normalization in early childhood as well as adulthood, while not readily attainable in the widespread obesogenic environment may prove more beneficial than a failure to do so.
3. At the same time, while the impacts of obesity on health status are well documented, the possible impact of obesity on falls and injuries such as fractures seems underrepresented in the aging literature, despite its apparent salience.
4. To ensure aging adults can live 'in place' safely, optimal musculoskeletal health across the lifespan, as well as health in general can help to markedly counter most negative impacts of excess fat at any age.
5. Obesity, which has reached epidemic proportions worldwide is not only a major contributor to the global burden of chronic disease, but to mobility and overall life quality due to largely preventable trauma based bone and soft tissue injuries post falling should not go unheeded, especially in those who are in the higher age ranges and demonstrate muscle strength and bone declines.
6. Influencing premature suffering, poor life quality, dependence and an array of psychosocial problems, the combined costs of older adult obesity and falls risk especially in those with muscle weakness and gait challenges should be urgently addressed to avert many preventable serious and costly health outcomes.

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Conflicts of interest

The author declares that there is no conflicts of interest.

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