The association between depression and widowhood and nutritional status in older adults

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A B S T R A C T

This study aimed to investigate the association of depression and widowhood on the nutritional status of older adults. A cross-sectional study of community-dwelling older adults in the rural United States was conducted. Dietary intake was measured via questionnaires. Depression status was classified by asking participants if they have ever been diagnosed with the condition, or by review of medical records. The final sample consisted of 1065 participants with 141 (13.2%) depressed, 384 (36.1%) widowed, and 67 (6.3%) both depressed and widowed. Mean caloric intake for total study population was low; widows and widowers had the lowest energy consumption among all groups. Greater intake of several nutrients was observed in depressed and/or widowed subjects. Nutritional services, such as congregate and home delivered meal programs, were not identified as significant contributors to the nutritional intake in older adults who were depressed, widowed, or both. Health care professionals may contribute to meal-based nutrition programs by offering their assistance in aspects of nutritional education and counseling for the promotion of healthy aging.

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Introduction

Depression among older adults is a public health concern. In the United States, it is a condition that affects nearly 7 million older individuals over the age of 65.1 A landmark report on mental health by the U.S. Surgeon General estimated that 8–20% of community-dwelling older persons suffer from depressive symptoms.2 If left untreated, depression in later life poses a serious threat to the overall health of the aging population. Depression has been associated with several chronic diseases such as diabetes,3 cancer,4 and coronary heart disease.5 It has also been associated with increased functional impairment,6 morbidity,7 mortality,8 and usage of health services.8 Geriatric depression may also negatively impact nutritional status amongst aged persons. Depression is a leading cause of loss of appetite, refusal to eat, and weight loss in older adults.9,10 Additionally, depression may influence unhealthy food choices. Individuals with depressive symptoms have been reported to have a greater preference for sweet foods11 and lower intake of fruits or vegetables12 than those without the condition. In turn, poor dietary habits may also position older adults at greater vulnerability for developing depression.13 Several nutrient deficiencies have been associated with depression. Low levels of folate, zinc, omega-3 fatty acids, selenium, vitamin B12, vitamin D, and iron may increase the risk of depression.14–16 However, interventional studies that investigate the supplementation of certain micronutrients for the treatment of depression have demonstrated inconsistent results. For instance, some trials have shown the improvement of depressive symptoms through supplementation of omega-3 fatty acids17,21 and selenium,9,23 while others have found no difference.24,25 Nonetheless, the deficiency of certain nutrients, such as folate, may reduce the effectiveness of antidepressants.18 Thus, supplementing the intake of deficient nutrients has been employed as an adjuvant therapy to anti-depression medication to alleviate symptoms.19

Late-life conjugal loss and spousal bereavement places older adults at risk for depression.20 Widowhood drastically alters the social environment of the surviving spouse, which prompts modifications to daily routines surrounding food practices that may adversely affect nutritional status. Widowed persons have reported loneliness, diminished enjoyment, and loss of appetite at meal times.26 In comparison to peers who were married, widowed individuals are also more likely to consume fewer vegetables, ingest foods that are non-nutritious, and less likely to prepare homemade meals.27–30 The consequences of widowhood on one’s motivation to acquire, cook, and eat food may lead to a negative impact on weight status within the aged population. Widowed people are more likely to have lower body mass indices (BMI) and to have...
greater weight loss. Unintentional weight loss in older adults is associated with heightened morbidity and mortality. In particular, men may be more likely to suffer the adverse effects of widowhood in regards to food intake and preparation. A historic study reported that dietary patterns are more strongly associated with type of living arrangement in older men in comparison to women, whereby men with low income and not living with a spouse were at highest risk of consuming inadequate diets. More specifically, widowhood in men has been associated with greater alcohol intake and lower vegetable consumption.

Food and nutrition programs, such as congregate or home delivery meal services, offer older people an alternative channel of achieving their energy and nutrient requirements. For instance, the Elderly Nutrition Program (ENP) is a program that focuses on preventive nutrition targeted at older Americans via providing congregate and home delivered meals along with other related services. Evaluation of the ENP has demonstrated its effectiveness. ENP recipients were found to be better nourished with mean daily intakes of essential nutrients approximately 4–31% higher than individuals not receiving assistance from ENP. Specifically, meals provided by ENP supplied participants with 30–50% of their total nutrient intake per day. However, it has been estimated that ENP services only reaches 7% of the nation’s aging population in the United States.

As the number of older adults in the United States increases, the promotion of health in older adults will become increasingly important. Nutrition plays an essential role in the process of healthy aging. Malnutrition has been associated with impaired wound healing, poor immune function, anemia, decreased cognitive function, reduced bone mass, decreased muscle function and mortality in aged persons. Awareness of the risk factors that may position older adults at greater chances of become malnourished will support healthy aging within this population by identifying those in need of assistance.

Since depression and widowhood are two factors that may negatively influence the dietary intake of older adults, we hypothesized that the presence of both variables will place older individuals at heighten nutritional risk as compared to those who are not depressed and/or not widowed. More specifically, the study analysis was designed to test the following hypotheses: (1) older adults who were depressed or widowed would have lower caloric intake than their non-affected counterparts, but older individuals who were both depressed and widowed would have the lowest caloric consumption of them all; (2) older persons who were depressed or widowed would have lower intakes of folate, zinc, omega-3 fatty acids, selenium, vitamin B12, vitamin D, and iron than their non-depressed or widowed peers, but older adults who were both depressed and widowed would have the lowest nutrient intake of all groups; and (3) congregate and/or home delivered meals would be a major contributor to the nutrient intake in the diets of members of the aged population who are depressed, widowed, or both.

Methods

A cross-sectional study of community-dwelling older adults was conducted in the rural United States. Since our study involved human subjects, approval from the Human Subjects Board was obtained in addition to that from the Institutional Review Board at the primary institution where the research took place.

Sample and setting

One thousand one hundred older adults participated in the study and were recruited via convenience sampling techniques. Recruitment of subjects occurred through word of mouth, advertisements, flyers, and through community organizations whose membership included older adults. Specific types of organizations approached included the Commission on Aging, senior centers, Kiwanis, Red Hat Society, VWR (veteran foundation), Guilds, and outpatient clinics. Informed consent was obtained from each individual. Inclusion criteria was comprised of (1) ability to provide informed consent, (2) ability to reliably answer questions regarding demographics, lifestyle, diet, and health, and (3) age 60 years or older. Individuals were excluded if they were not willing to complete at least 25% of all the questions administered. Participation in the study was voluntary and no compensation was provided. Non-respondents included (1) participants who dropped out after completing one or more of the surveys, (2) people who refused participation but who consented to providing demographic information, and (3) individuals who consented and participated in the interviews, but did not wish to have their data incorporated into the analysis.

Measurements

All questionnaires were administered by trained interviewers in person at community organizations. At the beginning of the study, inter-rater reliability was determined by asking the same subjects (n = 21) identical questions by different interviewers on varying days. Respondents’ reliability was also rated by interviewers on a scale of 1–5. In addition, third party verification of the information was acquired from the community organization where data were collected from family members, caregivers, or staff when available. Due to financial and time constraints, third party verification was not mandatory.

Participants were asked regarding marital status and chose from the following options: married, divorced, widowed, single, or other. Dietary information was collected via three sources. First, the Block Full Length Food Frequency (FFQ), a 160 item questionnaire with multiple responses with a reliability coefficient of 0.77 was administered to subjects. Second, a 24 h Food Intake Recall (24 HR), an open ended intake method whose average reliability of 0.80 with trained interviewers was performed. Lastly, the Mini Nutritional Assessment (MNA) was obtained. In additional to dietary assessment, subjects were asked whether or not they participated in a congregate or home delivered meal programs. Classification of depression was determined by asking if the respondent had a diagnosis of depression, review of the medical record, and/or verification by a third party.

Statistical analysis

Data were coded and cleaned within Microsoft Excel (Microsoft XP); dichotomous variables were coded as 1, 0 or 1, 2. Subsequently, data were transferred and analyzed using SPSS for Windows (version 19.0; SPSS Inc, Chicago). Descriptive statistics were computed to summarize characteristics of the study sample. For binary data, logistic regressions were performed to determine the contributions of several factors to outcome. Additional statistical analysis consisted of the assessment of normally distributed data with t-tests and the association between variables by Spearman correlation coefficients. Statistical significance was defined as p < 0.05, unless otherwise specified.

Results

Of the initial 1100 participants recruited, 35 individuals failed to provide at least 25% of the information requested on demographics and health and were excluded from analysis. Missing data were
coded as such, but not removed from analyses. According to t-test comparisons, there were no statistically significant differences between respondents compared to non-respondents on available demographic characteristics. Hence, the final sample of participants satisfying the inclusion criteria consisted of 1065 rural older adults. Due to the study location of the rural United States, 94% of the participants’ ethnicity was Caucasian. Additional demographic characteristics of these participants are detailed in Table 1. Out of the 1065 participants, 141 (13.2%) were depressed, 384 (36.1%) were widowed, and 67 (6.3%) were both. Groups differed on demographic variables of age and gender. Age of the subjects ranged from 60 to 103 years old with a mean age of 75.5 ± 8.4 years. Participants reporting depression and those who were widowed were significantly different in age (77.5 ± 9.6 and 80.6 ± 8.4 years old respectively) with a p-value < 0.00. There were twice as many female subjects as males within the study. No significant difference in level of education was observed between those who were depressed compared to those who were widowed. Body mass index (BMI) was not significantly different between older persons with depression and without (26.0 ± 5.9 and 26.2 ± 5.2 kg/m² respectively).

Inter-rater reliability was determined by a sub-sample (n = 21) of the population to be high at levels of 0.93. Approximately 23% of participants interviewed had their information verified by third party members. According to t-test analysis, there were no differences observed between self-reported information provided by respondents and data obtained from third parties.

The mean energy intake within the total study population was 1733.8 ± 3949 calories/day. In those individuals who reported depressive symptoms, the average calories consumed was 1733.8 ± 3949 as compared to 1766.6 ± 717.7 calories/day in those who were not depressed. There was no significant difference between the two groups (p < 0.60). However, older adults who were widowed had a significantly lower caloric intake relative to peers who were not (1687.5 ± 658.9 and 1792.8 ± 656.2 calories/day respectively) with a p-value < 0.02. No significant differences were seen in the daily calories consumed between individuals who were both depressed and widowed versus those who were neither (1665.6 ± 601.5 and 1803.8 ± 670.7 calories/day respectively; p < 0.14).

Several significant associations were observed between nutrients and the two variables investigated within this study. In subjects who were depressed or widowed, intake of vitamin D was significantly higher than peers who were not depressed or widowed (p < 0.05). Individuals who were both depressed and widowed had higher intakes of vitamin D, zinc, and selenium as compared to those who were neither depressed nor widowed. Results of two-tailed t-tests are shown in Table 2 and nutrient densities of participants as compared to dietary recommendations are outlined in Table 3.

Frequency of congregate and/or home delivered meal usage was 19% in depressed, 30% in widowed, and 25% in those who were both depressed and widowed. Regression analysis used to assess the contribution of congregate and/or home delivered meals to nutrient intake were found to be non-significant.

Discussion

The prevalence of depression was observed in 13.2% of the participants within this study, which is similar to the percentage of older adults with depressive symptoms previously documented within the community setting. Although the presence of depressive symptoms within older persons has been associated with reduced appetite, results from this study found no significant difference between the mean energy intakes within individuals who reported being depressed as compared to the remainder of the study population. Similarly, being both depressed and widowed also did not appear to significantly impact the average calories consumed relative to those who were neither within this study. Overall, the mean caloric intake for the total study population was below the United States Department of Agriculture’s recommendations for Adequate Intake for energy within this age group. In particular, widows and widowers within this study were determined to have significantly lower energy consumption than their peers, which may suggest that this

Table 1
Demographic characteristics of participants (n = 1065).

<table>
<thead>
<tr>
<th>Demographic characteristics</th>
<th>Total study</th>
<th>Depressed</th>
<th>Widowed</th>
<th>Depressed and widowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of subjects</td>
<td>1065</td>
<td>141 (13.2%)</td>
<td>384 (36.1%)</td>
<td>67 (6.3%)</td>
</tr>
<tr>
<td>Age, years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>368 (34.5%)</td>
<td>34 (24.1%)</td>
<td>70 (18.2%)</td>
<td>61 (91.0%)</td>
</tr>
<tr>
<td>Female</td>
<td>697 (65.4%)</td>
<td>107 (75.9%)</td>
<td>314 (81.8%)</td>
<td>6 (9.0%)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None listed</td>
<td>8 (0.8%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Married</td>
<td>482 (45.3%)</td>
<td>40 (28.4%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Divorced</td>
<td>86 (8.1%)</td>
<td>19 (13.5%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Widowed</td>
<td>384 (36.1%)</td>
<td>68 (48.2%)</td>
<td>348 (100.0%)</td>
<td>67 (100.0%)</td>
</tr>
<tr>
<td>Single</td>
<td>62 (5.8%)</td>
<td>8 (5.7%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Other</td>
<td>43 (4.0%)</td>
<td>4 (3.4%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;H.S. education</td>
<td>197 (18.5%)</td>
<td>30 (21.3%)</td>
<td>49 (12.8%)</td>
<td>14 (20.9%)</td>
</tr>
<tr>
<td>H.S. education</td>
<td>423 (39.7%)</td>
<td>61 (43.3%)</td>
<td>194 (50.5%)</td>
<td>28 (41.8%)</td>
</tr>
<tr>
<td>College</td>
<td>323 (30.3%)</td>
<td>34 (24.1%)</td>
<td>88 (22.9%)</td>
<td>18 (26.9%)</td>
</tr>
<tr>
<td>Post-graduate or higher</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>53 (5.0%)</td>
<td>10 (7.1%)</td>
<td>28 (7.3%)</td>
<td>7 (10.4%)</td>
</tr>
</tbody>
</table>

Table 2
t-Tests for depressed and widowed (N = 1065).

<table>
<thead>
<tr>
<th>Nutrient density</th>
<th>F</th>
<th>Significance</th>
<th>Mean difference</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linolenic acid (g)</td>
<td>6.10</td>
<td>0.04*</td>
<td>0.14</td>
<td>−0.02</td>
</tr>
<tr>
<td>Folate (µg)</td>
<td>0.12</td>
<td>0.57</td>
<td>9.45</td>
<td>−22.77</td>
</tr>
<tr>
<td>Vitamin B₁₂ (µg)</td>
<td>0.13</td>
<td>0.53</td>
<td>0.60</td>
<td>−1.29</td>
</tr>
<tr>
<td>Selenium (µg)</td>
<td>6.65</td>
<td>0.14*</td>
<td>3.53</td>
<td>−0.83</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>0.00</td>
<td>0.79</td>
<td>1.39</td>
<td>−0.92</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>3.74</td>
<td>0.02*</td>
<td>0.97</td>
<td>0.08</td>
</tr>
<tr>
<td>Linolenic acid (g)</td>
<td>0.13</td>
<td>0.71</td>
<td>−0.02</td>
<td>0.10</td>
</tr>
<tr>
<td>Vitamin D (IU)</td>
<td>3.27</td>
<td>0.02*</td>
<td>−17.36</td>
<td>−32.29</td>
</tr>
<tr>
<td>Folate (µg)</td>
<td>0.35</td>
<td>0.85</td>
<td>2.29</td>
<td>−21.33</td>
</tr>
<tr>
<td>Vitamin B₁₂ (µg)</td>
<td>2.41</td>
<td>0.26</td>
<td>0.79</td>
<td>−0.59</td>
</tr>
<tr>
<td>Selenium (µg)</td>
<td>2.68</td>
<td>0.09</td>
<td>−2.44</td>
<td>−5.26</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>0.49</td>
<td>0.52</td>
<td>−2.51</td>
<td>−10.19</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>0.00</td>
<td>0.85</td>
<td>−0.06</td>
<td>−0.62</td>
</tr>
<tr>
<td>Linolenic acid (g)</td>
<td>0.73</td>
<td>0.08</td>
<td>−0.14</td>
<td>−0.30</td>
</tr>
<tr>
<td>Vitamin D (IU)</td>
<td>0.52</td>
<td>0.00*</td>
<td>−45.94</td>
<td>−75.35</td>
</tr>
<tr>
<td>Folate (µg)</td>
<td>0.01</td>
<td>0.68</td>
<td>0.79</td>
<td>−70.87</td>
</tr>
<tr>
<td>Vitamin B₁₂ (µg)</td>
<td>0.06</td>
<td>0.63</td>
<td>−0.81</td>
<td>−4.09</td>
</tr>
<tr>
<td>Selenium (µg)</td>
<td>6.42</td>
<td>0.02*</td>
<td>−7.42</td>
<td>−13.76</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>0.47</td>
<td>0.45</td>
<td>−5.89</td>
<td>−21.04</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>1.30</td>
<td>0.01*</td>
<td>−1.40</td>
<td>−2.50</td>
</tr>
</tbody>
</table>

*p < 0.05.
* Equal variances not assumed.
subgroup is especially vulnerable to malnutrition. The negative effects of widowhood on eating behaviors and nutrient intakes in older adults have been previously highlighted.28

Insufficient caloric intake can have devastating effects on body weight. Both older adults with and without depression had BMI of approximately 26 kg/m² within this study. According to the World Health Organization, a BMI of 25.0–29.9 kg/m² is considered overweight.29 However, unlike the general population, being overweight as an older adult may actually be beneficial. It has been reported that older people who are overweight have a 13% lower risk of death than those with a normal weight.30 On the contrary, a BMI of <23 kg/m² in an older person has been associated with higher weight risk of mortality.41 Hence, in addition to monitoring nutrient intake, it appears important that weight status is also tracked among the aging population to allow for the timely action of modifiable causes of weight loss.

Diet is an amendable risk factor for both weight loss and chronic diseases. Previous studies have also found depression to be associated with lower intake of select nutrients, mainly folate, vitamin B₁₂, and omega-3 polyunsaturated fatty acids.42 This study observed no significant differences in the consumption of the above nutrients between individuals who were depressed versus non-depressed. All groups consumed less than the recommended levels for both folate and omega-3 polyunsaturated fatty acids (linoleic). By consuming insufficient amounts of these nutrients, older adults are putting their health at risk and not capitalizing on the possible benefits association with such nutrient intakes. From the perspective of general well-being, low folate status among the older population has been associated with impaired cognitive function and dementia.43 Moreover, adequate intake of linoleic has been found to be protective against coronary heart disease.44 In terms of depression, it has been reported that sufficient dietary intake of folate45 and omega-3 polyunsaturated fatty acid46 may lower risk. However, more investigation remains warranted on these topics.

Interestingly, significantly higher vitamin D intakes were seen in those who were depressed or widowed as compared to peers who were neither. Likewise, widows and widowers who were also depressed were found to have a significantly higher consumption level of several nutrients as compared to those who were neither depressed nor widowed within this study. Widows and widowers with depression reported significantly greater supplementation of vitamins compared to the rest of the study sample (data not shown). Hence, it is possible that the higher nutrient intake observed in older subjects who were both depressed and widowed within this study was associated with the greater intake of vitamin supplements.

Meal programs have been found to improve or maintain the nutritional risk of older adults experiencing accelerated aging.47 However, analysis of data on congregate and home delivered meals within this study revealed that these types of services did not appear to improved nutrient intake in older persons who were depressed, widowed, or both relative to the remaining sample within this study. Despite improving the intake of food, past findings have demonstrated that meal-based nutrition programs are insufficient at resolving nutrition deficient and older adults at high nutritional risk may require additional diet counseling and nutritional supplementation.48,49

Limited information is available when it comes to the actual amount of food being eaten by service recipients. In a quasi-experimental study, it was established that a Quebec meal delivery program increased energy intake by 120 kcal/day.49 Another study found that older men consumed a significantly greater amount of the delivered meals relative to their female counterparts, but the percentage of meal utilized decreased with increasing age for both sex groups.50 Even when meals offered are taken in by older adults, the quality of food ingested is often unknown. Meals prepared by services such as ENP might meet a certain nutrient requirement at the time of preparation,51 but research is lacking on the nutritional content of the end product consumed by the aging population after being held in warming trays for an extended period of time or reheated. Future studies should examine the nutrient content of meals given to the end users and address shortcoming as needed.

For more than a decade, participation in congregate meal programs have been on the decline.51 It is time that nutrition services targeted toward older adults be updated and marketed to increase the socialization, nutritional status, and health and well-being of older persons who might benefit from their use. Moreover, further research should explore value added services that can be incorporated into congregate and home delivered meal programs to attract older customers and aid in the prevention of malnutrition within the aging sector of our society. For instance, one study of older adults receiving nutrition education and counseling with congregate meals versus older individuals receiving nutrition handouts and telephone counseling with home delivered meals, demonstrated the benefits of nutrition education and counseling on improving the nutritional risk factors among those in the congregate meal group.52 The American Dietetic Association, American Society for Nutrition, and Society for Nutrition Education states that food and nutrition programs should ensure more healthful aging by encompassing nutrition education, screening, assessment, counseling, therapy, and monitoring.53 Health care professionals can promote the universal access and integrate food and nutrition programs into the home- and community-based services. Thus, nurses and dietitians working in food and nutrition stand to play pertinent roles in executing meal programs that encompass aspects of education and counseling for health

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**Table 3**

Nutrient densities of participants as compared to average DRIs for people 65 years and older using values determined from dietary analysis.

<table>
<thead>
<tr>
<th>DRIs (RDA/AI)</th>
<th>Depressed Mean ± SD</th>
<th>Widowed Mean ± SD</th>
<th>Depressed &amp; widowed Mean ± SD</th>
<th>Neither depressed nor widowed Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kcal)</td>
<td>2027</td>
<td>1733.79 ± 660.50</td>
<td>1687.46 ± 668.90</td>
<td>1665.64 ± 601.53</td>
</tr>
<tr>
<td>Linoleic acid (g)</td>
<td>1.35</td>
<td>3.05 ± 0.92</td>
<td>0.94 ± 0.52</td>
<td>1.05 ± 0.73</td>
</tr>
<tr>
<td>Vitamin D (ug)</td>
<td>12.5</td>
<td>4.02 ± 2.99</td>
<td>3.73 ± 3.00</td>
<td>4.58 ± 3.00</td>
</tr>
<tr>
<td>Folate (ug)</td>
<td>400</td>
<td>292.5± ± 161.76</td>
<td>283.47 ± 150.06</td>
<td>304.29 ± 180.55</td>
</tr>
<tr>
<td>Vitamin B₁₂ (ug)</td>
<td>2.4</td>
<td>6.17 ± 8.43</td>
<td>5.16 ± 6.24</td>
<td>6.77 ± 11.28</td>
</tr>
<tr>
<td>Selenium (ug)</td>
<td>55</td>
<td>46.43 ± 25.19</td>
<td>44.73 ± 23.45</td>
<td>49.82 ± 25.30</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>8</td>
<td>17.92 ± 31.56</td>
<td>18.40 ± 61.24</td>
<td>21.79 ± 45.29</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>9.5</td>
<td>10.21 ± 5.15</td>
<td>9.40 ± 4.52</td>
<td>10.67 ± 5.29</td>
</tr>
</tbody>
</table>

DRIs, Dietary Reference Intakes; RDA, Recommended Dietary Allowance; AI, Adequate Intake; AMDR, Acceptable Macronutrient Distribution Range. Bold refers to significantly different intakes vs. DRI at p < 0.01. RDA and AI compiled by the National Policy and Resource Center on Nutrition and Aging, Florida International University, 2004. URL: http://www2.fi.edu/~nutreldr/SubjectList/D/DRI_RDA.htm. Accessed 21.01.14.
promotion, risk reduction, and disease management within the aging population.53

Regardless, interpretation of this study’s findings must be considered in light of its limitations. Recruitment of participants involved convenience sampling. In addition, there was a high probability of response bias as well as homogeneity of race, ethnicity, religion, and geographical location. Nutritional analysis of diet may have been influenced by memory impairment and recall difficulties of food items eaten, resulting in what seems to be nutrient deficiencies within this population. Moreover, information that was collected on medical conditions and medications that may impact overall nutritional status were not analyzed to determine their associations with the primary variables of interest. These were too numerous and too few subjects were available in each category or combination of categories to provide a meaningful analysis. Finally, since the nature of this study was cross-sectional of a non-randomized sample, future investigation is needed to verify findings.

Conclusion

In conclusion, results from this study highlight the nutritional status aberrations associated with depression and widowhood among a group of community-dwelling older adults in the rural United States. Greater intakes of several nutrients were seen in older individuals who were depressed, widowed, or both, but the majority of these nutrient levels along with caloric intake remain below the amounts recommended by national dietary guidelines. Findings from our study suggest that participation in congregational and home delivered meals does not significantly contribute to improved nutritional intake in older adults. Food and nutrition practitioners should consider collaborating with meal programs to offer value added services, such as nutrition education and counseling, which may carry the potential to improve the nutritional status of older people beyond just the physical aspect of food.

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References


