Geriatric malnutrition and depression: Evidence from elderly home care population in Bangladesh

Mohammad Rahanur Alam [a,*], Sushmita Karmokar [a], Sompa Reza [b], Md. Ruhul Kabir [a], Susmita Ghosh [a], Md. Abdullah Al Mamun [a]

[a] Department of Food Technology and Nutrition Science, Noakhali Science and Technology University, Bangladesh
[b] Institute of Nutrition and Food Science, University of Dhaka, Bangladesh

ABSTRACT

Malnutrition is the root of numerous complications ranging from physical disability to mental health problems like depression. Depending on the intensity, depression can lead to emotional fluctuations, even suicidal attempts. Geriatric health in a country like Bangladesh is often ignored, although they are a growing segment of society. This community-based cross-sectional study aimed to determine the prevalence and severity of depression and malnutrition in the elderly to evaluate the relationship between depression and malnutrition. Mini Nutritional Assessment (MNA) was used to determine nutritional status, and Geriatric Depression Scale (GDS) was used to assess depression. About 84% of the participants showed a different array of depression symptoms. The rate of malnutrition and depression is higher among the male participants. Being malnourished (OR: 4.05, 95% CI: 2.79–5.87) and people are at risk of malnutrition (OR:1.67, 95% CI:1.24–2.24) had a significantly higher risk of suffering from depression. Maintaining a good physical state, a healthy lifestyle, and a supportive family environment are among the factors that can reduce depression in the elderly population. Therefore, to fight depression, specific programs and targeted interventions focusing on physical and mental stability for the elderly at the community level can enhance awareness at the individual and family levels.

1. Introduction:

Aging is a biological process that continues throughout life, and humans have no control over that (Payahoo, 2013). The elderly population is generally defined as people over 65 years of age (Weiner et al., 2010). According to the United Nations Population Division, the current world geriatric population is 674 million, representing 8.9% of the world population (UNDESA, World Population Prospects, 2019). This figure is forecasted to reach 2.1 billion by 2050 (UNDESA, World Population Ageing, 2017). It is anticipated that there will be 42.2 million older people living in Bangladesh by 2050 (Haque et al., 2014). The geriatric period is associated with different physiological problems such as swallowing or chewing difficulties, gastrointestinal disorders, decreased taste or smell, reduced appetite, inability to move, inflammatory conditions, chronic diseases, and cognitive disorders, especially depression (Vafaei, 2013). Geriatric depression is a mental disorder affecting older adults, which reduces the quality of life and increases the tendency of suicide (Ahmadi, 2013). Human body weight, intake, and appetite for food are mainly affected by depression. In depression, the biological and psychopharmacological show mechanisms of change in appetite. In depressed elderly, depressed mood, change in appetite and sleep habits, somatic manifestations, and cognitive disturbances are seen due to low levels of serotonin and alteration in dopamine, which release in the prefrontal cortex, hypothalamic-pituitary axis, hippocampi, thalami, and amygdala. (Krishnan and Nestler, 2008). The unwillingness of old individuals to report their symptoms and the misjudgment of the psychological aspect among many of the clinicians make geriatric depression more challenging to diagnose (Cabrera et al., 2007).

Malnutrition is a common problem all over the world. As a developing country, Bangladesh is one of the worst sufferers of it. Up to 50% of older adults are malnourished, and the estimated prevalence varies due to population consideration and healthcare setting. In nursing-home residents, 30–50% of them have low body weight, substandard mid-arm muscle circumference, and low serum albumin levels (Weiner et al., 2010; Volkert et al., 2010; Marshall et al., 2016). Overall, 5–19% elderly

community has reported the incidence of weight loss (Kaiser et al., 2010; Gündüz, 2015). Geriatric malnutrition is poorly diagnosed, reduced functional capacity, and increased the rate of morbidity and mortality in elder persons (Ahmadi, 2013). Appetite and weight loss are the two predominant factors that conciliate the correlation between malnutrition and depression (Cabrera et al., 2007). Atrophic inflammation of the gastrointestinal tract is associated with the aging process that leads to malabsorption, decreased appetite, and consequently malnutrition. For a better quality of life in geriatric patients, early and consequent treatment of malnutrition is a must, leading to a decreased neurological disease progression (Prell and Perner, 2018). Ensuring both physical and mental health for people of all ages is an important target to achieve sustainable development goals (SDG) (WHO, World health statistics, 2016). Despite success in attaining the other SDG targets within the expected time, Bangladesh has not yet shown mentionable promise with geriatric physical and mental health issues. Geriatric mental health is one of the lowest priority issues in Bangladesh (Mazumder et al., 2020).

This study aimed to investigate the prevalence of malnutrition and depression symptoms, as well as the associated factors between depression and malnutrition in the selected community living elderly population of Bangladesh.

2. Materials and methods

A total of 400 participants were included in this present community-based cross-sectional study by convenience sampling method. Older people who were living in any institution, i.e., hospital, the nursing home, or old home and patients with fatal diseases as well as mental retardation, were excluded from the study (Fig. 1). The sample size was calculated using Epi Info software (Version 7.2.3), considering a 99% confidence interval and a design effect of 2.0. The study was conducted in four districts of Bangladesh: Chattogram, Cumilla, Jashore, and Noakhali.

The study was conducted in accordance with the declaration of Helsinki. Ethical approval was obtained from the Ethics committee of Noakhali Science and Technology University. Data was collected by the android based mobile phone using KoBoCollect (version 1.23.3 k) application and stored in the cloud server. Participants were interviewed face to face using a carefully formulated pretested questionnaire in the local language (the English version of the questionnaire is attached as supplementary data). The older adults living with their families were included in the study. The participants and their guardians were asked to provide written informed consent. Geriatric depression scale (GDS) questionnaires were used to assess depression among elderly persons, which contained 15 questions on satisfaction with life in various aspects:

hopelessness, helplessness, etc. On a scale of 15, 12–15 were categorized as "severe depression," 9–11 as "moderate depression," 5–8 as "mild depression, and 0–4 as "normal" or no depression (Sheikh and Yesavage, 1986).

Mini nutritional assessment (MNA) questionnaires were used to assess geriatric nutritional status. MNA was composed of 18 questions about anthropometric measurements such as Body Mass Index (BMI), Mid Upper Arm Circumference (MUAC) and weight loss and gain, self-evaluation regarding health and nutrition, lifestyle, mobility, and medication. Mid-upper-arm circumference (MUAC) was measured with a non-stretchable circumference measuring tape. A weight machine was used to measure body weight, and height was measured using a portable stadiometer. Out of 30, a score of<17 represented malnutrition, 17–23 defined risk of malnutrition, and more than 23 indicated normal nutritional status (Roque et al., 2013).

Questionnaire pretesting was done on 30 participants (15 male and 15 female participants). Internal reliability was measured using Cronbach's alpha. Cronbach's alpha was 0.73 for the MNA section, and 0.83 was for GDS. Overall internal reliability was 0.78, which is acceptable for field assessment (Taber, 2018).

From the server, the data were imported to the Statistical Package for Social Sciences (SPSS) Version 23.0. The data were analyzed for descriptive statistics. Categorical data were presented as frequency and percentage, and the Chi-square test was performed to measure the association between them. Continuous variables were presented as mean and standard deviation, and one-way ANOVA was done to compare the means. Logistic regression was performed to measure the risk of depression among malnourished people. $P < 0.05$ was considered statistically significant.

3. Result

The average age of the study population was 72.1 ± 7.0 years, and the number of female and male participants was equal. The majority of the elderly population (83.75%) showed different degrees of depression symptoms. Only 10% of the male and 22.5% of the female participants did not show any depression symptoms. A significant chi-square test confirmed the association between gender and depression. There was a significant association between depression symptoms and various anthropometric parameters, such as Weight, Height, BMI, and MUAC. On the other hand, no significant difference in age was observed among the depression group (Table 1).

The overall malnutrition rate was 25.5%, and more than half of the elderly population was at risk of malnutrition. The prevalence of malnutrition was higher in the male participants.

Malnourished people had a substantially higher average GDS score (11.4 ± 2.8) compared to the people with optimum nutritional status (6.5 ± 2.9) (Table 2).

People with severe malnutrition had a lower MNA score. The MNA score was improved with the decline of the depression symptoms (Fig. 2).

The risk of depression was significantly higher for people with malnutrition (OR:4.05; 95% CI: 2.79–5.87) and at risk of malnutrition (OR:1.67; 95% CI: 1.24–2.24) than individuals with normal nutritional status according to logistic regression (Table 3).

4. Discussion

This study determined the relationship between nutritional status and depression symptoms among the Bangladeshi geriatric population. MNA provided a reliable screening to detect malnutrition of aged persons living independently without any kind of biochemical test (Hudgens and Langkamp-Henken, 2004). The geriatric depression scale was formulated exclusively to identify depression among older adults, excluding other psychological disorders (Andrew et al., 2016). The sensitivity and specificity of the 15 items GDS were proven in terms of
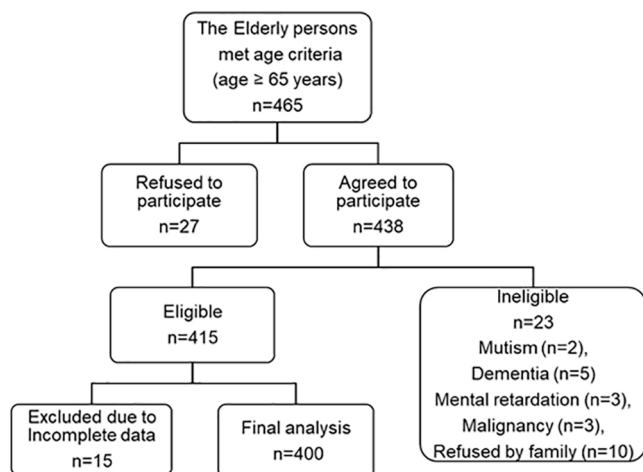

Fig. 1. Schematic diagram of the study design.

Table 1
Subject characteristics according to depression symptom.

Variable	Normal	Mild depression	Moderate depression	Severe depression	Total	χ^2
Gender	**n = 65**	**n = 120**	**n = 95**	**n = 120**	**n = 400**	
Female (%)	45 (22.5)	56 (28.0)	39 (19.5)	60 (30.0)	200 (50.0)	13.191**
Male (%)	20 (10.0)	64 (32.0)	56 (28.0)	60 (30.0)	200 (50.0)	
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**F**
Age (year)	72.3 ± 8.1	72.5 ± 7.5	72.1 ± 6.8	71.6 ± 6.0	72.1 ± 7.0	0.372†
Weight (cm)	62.3 ± 11.2	55.8 ± 11.0	53.1 ± 11.0	54.2 ± 10.4	55.7 ± 11.2	10.587***
Height (cm)	157.7 ± 8.7	152.7 ± 10.1	153.3 ± 10.1	156.2 ± 9.3	154.7 ± 9.8	5.417***
BMI (kg/m^2)	25.0 ± 3.5	23.8 ± 3.7	22.5 ± 3.6	22.1 ± 3.4	23.2 ± 3.7	11.449***
MUAC (cm)	27.4 ± 3.5	25.8 ± 3.2	25.4 ± 3.3	25.4 ± 3.2	25.8 ± 3.3	6.465***
MNA (points)	22.4 ± 2.9	21.1 ± 3.7	19.2 ± 4.8	16.8 ± 4.2	19.6 ± 4.5	42.086†***

†Asymptotically F distributed; therefore, robust tests of equality of means were performed.
***($p < 0.001$); **($p < 0.01$).
MNA, Mini nutritional assessment.
MUAC, Mid-upper arm circumference.

Table 2
Subject characteristics according to nutritional status.

Variable	Normal	At-risk	Malnourished	Total	χ^2
Gender	**n = 63**	**n = 235**	**n = 102**	**n = 400**	
Female (%)	41 (20.5)	114 (57.0)	45 (22.5)	200 (50.0)	7.35*
Male (%)	22 (11.0)	121 (60.5)	57 (28.5)	200 (50.0)	
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**F**
Age (year)	72.3 ± 6.9	72.5 ± 7.5	71.1 ± 5.6	72.1 ± 7.0	1.369
Weight (kg)	59.7 ± 11.9	57.1 ± 10.9	50.1 ± 9.6	55.7 ± 11.2	20.171***
Height (cm)	154.4 ± 10.0	155.5 ± 9.4	153.0 ± 10.5	154.7 ± 9.8	2.279
BMI (kg/m^2)	24.9 ± 3.6	23.5 ± 3.5	21.4 ± 3.4	23.2 ± 3.7	21.905***
MUAC (cm)	27.3 ± 3.2	26.2 ± 3.0	23.9 ± 3.3	25.8 ± 3.3	28.151***
GDS (points)	6.5 ± 2.9	8.4 ± 3.8	11.4 ± 2.8	8.9 ± 3.8	64.696***

*($p < 0.05$); **($p < 0.001$).
Asymptotically F distributed; therefore, robust tests of equality of means were performed.
GDS, Geriatric depression scale.
SD, Standard deviation.

community living elderly population, and it provided a time and cost-effective approach for measuring depression (Marc et al., 2008). Because of the questionable efficacy of GDS among demented individuals (Lichtenberg et al., 1992), people with dementia were excluded.

In our study, the prevalence of malnutrition and depression both were high and strongly correlated, which is similar to the literature (Boyanagari et al., 2018; Turkbeyler, 2020). Older adults had a higher rate of depression since they had higher expectations from family, and most of their desired activities were not fulfilled. Therefore, they had a feeling of emptiness and were less enthusiastic about enjoying daily life. We found that the prevalence of depression was higher among males than females, which contradicted the study of De Rezende, Coelho, et al., (Alves De Rezende et al., 2009). In a patriarchal society like Bangladesh, where people tend to live in a joint family, males are the breadwinners and decision-makers (Selim, 2010). However, the decline of his financial capabilities with the age and generation of nuclear families reduces his household authority. Among different parameters of depression, the feeling of helplessness and hopelessness was significantly higher among male participants. Moreover, all the physical parameters (e.g., height, weight, BMI, MUAC) were found to be positively associated with malnutrition, and consequently, increasing physical deprivation affects depression at various scales. Physical debilitation due to poor nutrition

in the elderly can induce different illnesses, anxiety, sleep disorders, and psychological vulnerability, triggering depression (Velázquez-Alva et al., 2020).

The prevalence of malnutrition and people at risk of malnutrition was about 26% and 59%, which was almost similar to two different studies conducted in a similar setting in Bangladesh (Ferdous et al., 2009; Kabir et al., 2006). The risk of depression was significantly higher in patients with malnutrition than in individuals with normal nutritional status. A depressed individual tends to have less healthy meals, such as a high amount of refined sugar or a low amount of fruits and vegetables (Grases et al., 2019). Increased fish (Kalmijn et al., 1997), fruits, and vegetable consumption (Gehlich et al., 2019, 2020) have shown a positive association with cognitive function and mental health. A diversified healthier diet with balanced nutrition can reduce the risk of depression (Li et al., 2017). Furthermore, malnutrition among the elderly can lead to physical frailty, which can rise depression symptoms (Bickford et al., 2021).

There were several limitations to this study. Since both MNA and GDS were reliant on self-reported data, there might be a possibility of over or underestimating malnutrition and depression. Moreover, no data were collected concerning the antidepressant medication use that could jeopardize the outcome. Here, we have collected data from only four districts out of sixty-four districts of Bangladesh. A better survey coverage could portray a better picture. A convenience sampling technique was employed, which is prone to bias due to the lack of randomization.

Furthermore, the cross-sectional study only provided a snapshot of the situation rather than explaining the causal relationship between depression and malnutrition. A randomized longitudinal study would be more appropriate for addressing this issue. Nevertheless, an additional dietary assessment would be more helpful to explain the association between depression and malnutrition.

5. Conclusion

The results indicate a strong association between depression and malnutrition in the elderly population, although there is an ambiguity regarding their causality. Therefore, specific programs to address geriatric malnutrition should be incorporated into the existing healthcare policy to mitigate depression-related mental health problems.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
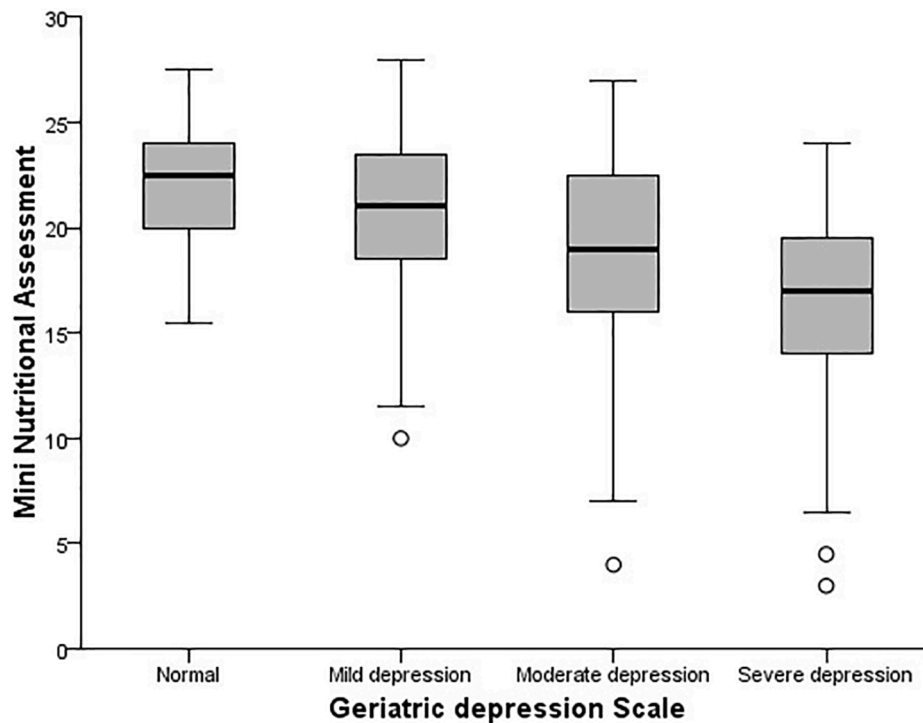
Fig. 2. Comparison of MNA scores among groups with different magnitude of depression. The box plots indicate the minimum, the maximum, and the 25th, 50th, and 75th percentiles.

Table 3
Relationship between nutritional status and geriatric depression.

Category of MNA	Category of Geriatric depression scale				χ^2	Odds ratio (95% Confidence interval)
	Normal (%)	Mild depression (%)	Moderate depression (%)	Severe depression (%)		
Normal (%)	17 (26.2)	28 (23.4)	17 (17.9)	1 (0.8)	75.134***	1 (Reference)
At risk (%)	45 (69.2)	79 (65.8)	49 (51.6)	62 (51.7)		1.67*** (1.24–2.24)
Malnourished (%)	3 (4.6)	13 (10.8)	29 (30.5)	57 (47.5)		4.05*** (2.79–5.87)

***($p < 0.001$).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2021.101478.

References

Payahoo, L., et al., 2013. Assessment of nutritional and depression status in free-living elderly in Tabriz, Northwest Iran. Health Promotion Perspectives 3 (2), 288.

Weiner, S.D., Rabbani, L., 2010. Cardiac intensive care unit admission criteria. In: Jeremias, A., Brown, D.L. (Eds.), Cardiac Intensive Care, 2nd Edition. Saunders Elsevier, Philadelphia, pp. 25–32.

UNDESA, World Population Prospects 2019: Data Booklet. 2019, United Nations Department for Economic Social Affairs.

UNDESA, World Population Ageing 2017-Highlights. 2017.

Haque, M.M., Uddin, A.K.M.M., Abu Naser, M., Khan, M.Z.H., Roy, S.K., Arafat, Y., 2014. Health and Nutritional Status of aged people. Chattagram Maa-O-Shishu Hospital Medical College Journal 13 (3), 30–34.

Vafaei, Z., et al., 2013. Malnutrition is associated with depression in rural elderly population. J. Res. Med. Sci.: the Official Journal of Isfahan University of Medical Sciences 18 (Suppl 1), S15.

Ahmadi, S.M., et al., 2013. Dependence of the geriatric depression on nutritional status and anthropometric indices in elderly population. Iran. J. Psychiatry 8 (2), 92.

Krishnan, V., Nestler, E.J., 2008. The molecular neurobiology of depression. Nature 455 (7215), 894–902.

Cabrera, M.A.S., Mesas, A.E., Garcia, A.R.L., de Andrade, S.M., 2007. Malnutrition and depression among community-dwelling elderly people. J. Am. Med. Dir. Assoc. 8 (9), 582–584.

Volkert, D., Saeglitz, C., Gueldenzoph, H., Sieber, C.C., Stehle, P., 2010. Undiagnosed malnutrition and nutrition-related problems in geriatric patients. J. Nutr. Health Aging 14 (5), 387–392.

Marshall, S., Young, A., Bauer, J., Isenring, E., 2016. Malnutrition in geriatric rehabilitation: prevalence, patient outcomes, and criterion validity of the scored patient-generated subjective global assessment and the mini nutritional assessment. J. Acad. Nutr. Diet. 116 (5), 785–794.

Kaiser, M.J., et al., 2010. Frequency of malnutrition in older adults: a multinational perspective using the mini nutritional assessment. J. Am. Geriatr. Soc. 58 (9), 1734–1738.

Gündüz, E., et al., 2015. Malnutrition in community-dwelling elderly in Turkey: a multicenter, cross-sectional study. Med. Sci. Monit. 21, 2750.

Prell, T., Perner, C., 2018. Disease specific aspects of malnutrition in neurogeriatric patients. Front. Aging Neurosci. 10, 80.

WHO, World health statistics 2016: monitoring health for the SDGs sustainable development goals. 2016, World Health Organization.

Mazumder, H., Murshid, M.-E., Faizah, F., Hossain, M.M., 2020. Geriatric mental health in Bangladesh: a call for action. Int. Psychogeriatr. 32 (5), 667–668.

Sheikh, J.I., Yesavage, J.A., 1986. Geriatric Depression Scale (GDS): recent evidence and development of a shorter version. Clin. Gerontol.: The Journal of Aging and Mental Health.

Roque, M., Salva, A., Vellas, B., 2013. Malnutrition in community-dwelling adults with dementia (NutriAlz Trial). J. Nutr. Health Aging 17 (4), 295–299.

Taber, K.S., 2018. The use of cronbach's alpha when developing and reporting research instruments in science education. Res. Sci. Educ. 48 (6), 1273–1296.

Hudgens, J., Langkamp-Henken, B., 2004. The Mini Nutritional Assessment as an assessment tool in long-term care. Nutr. Clin. Pract. 19 (5), 463–470.

Andrew, E., M. Budson, and P. Solomon, Memory Loss, Alzheimer's Disease, and Dementia. 2016, Elsevier Inc.

Marc, L.G., Raue, P.J., Bruce, M.L., 2008. Screening performance of the 15-item geriatric depression scale in a diverse elderly home care population. Am. J. Geriatr. Psychiatry 16 (11), 914–921.

Lichtenberg, P.A., Steiner, D.A., Marcopulos, B.A., Tabscott, J.A., 1992. Comparison of the Hamilton Depression Rating Scale and the Geriatric Depression Scale: detection of depression in dementia patients. Psychol. Rep. 70 (2), 515–521.

Boyanagari, V.K., Panda, P., Boyanagari, M., Panda, S., 2018. Assessment of nutritional status, psychological depression, and functional ability of elderly population in South India. Archives of Mental Health 19 (2), 150. https://doi.org/10.4103/AMH. AMH_15_18.

Turkbeyler, I.H., et al., 2020. Strong association between malnutrition, inflammation, and depression in elderly patients. A new novel geriatric complex based on malnutrition; MID complex? Prog. Nutr. 22 (1), 30–35.

Alves De Rezende, C.H., Coelho, L.M., Oliveira, L.M., Penha-Silva, N., 2009. Dependence of the geriatric depression scores on age, nutritional status, and haematologic variables in elderly institutionalized patients. JNHA-The Journal of Nutrition, Health and Aging 13 (7), 617–621.

Selim, N., 2010. Cultural dimensions of depression in Bangladesh: a qualitative study in two villages of Matlab. J. Health Popul. Nutr. 28 (1), 95–106.

Velázquez-Alva, M.C., Irigoyen-Camacho, M.E., Cabrer-Rosales, M.F., Lazarevich, I., Arrieta-Cruz, I., Gutiérrez-Juárez, R., Zepeda-Zepeda, M.A., 2020. Prevalence of Malnutrition and Depression in Older Adults Living in Nursing Homes in Mexico City. Nutrients 12 (8), 2429. https://doi.org/10.3390/nu12082429.

Ferdous, T., Kabir, Z.N., Wahlin, Å., Streatfield, K., Cederholm, T., 2009. The multidimensional background of malnutrition among rural older individuals in Bangladesh–a challenge for the Millennium Development Goal. Public Health Nutr. 12 (12), 2270–2278.

Kabir, Z.N., Ferdous, T., Cederholm, T., Khanam, M.A., Streatfied, K., Wahlin, Å., 2006. Mini Nutritional Assessment of rural elderly people in Bangladesh: the impact of demographic, socio-economic and health factors. Public Health Nutr. 9 (8), 968–974.

Grases, G., Colom, M.A., Sanchis, P., Grases, F., 2019. Possible relation between consumption of different food groups and depression. BMC psychology 7 (1). https://doi.org/10.1186/s40359-019-0292-1.

Kalmijn, S., Launer, L.J., Ott, A., Witteman, J.C.M., Hofman, A., Breteler, M.M.B., 1997. Dietary fat intake and the risk of incident dementia in the Rotterdam Study. Ann Neurol 42 (5), 776–782.

Gehlich, K.H., Beller, J., Lange-Asschenfeldt, B., Köcher, W., Meinke, M.C., Lademann, J., 2019. Fruit and vegetable consumption is associated with improved mental and cognitive health in older adults from non-Western developing countries. Public Health Nutr 22 (4), 689–696.

Gehlich, K.H., Beller, J., Lange-Asschenfeldt, B., Köcher, W., Meinke, M.C., Lademann, J., 2020. Consumption of fruits and vegetables: improved physical health, mental health, physical functioning and cognitive health in older adults from 11 European countries. Aging & Mental Health 24 (4), 634–641.

Li, Y.e., Lv, M.-R., Wei, Y.-J., Sun, L., Zhang, J.-X., Zhang, H.-G., Li, B., 2017. Dietary patterns and depression risk: a meta-analysis. Psychiatry Res. 253, 373–382.

Bickford, D., Morin, R.T., Woodworth, C., Verduzco, E., Khan, M., Burns, E., Nelson, J.C., Mackin, R.S., 2021. The relationship of frailty and disability with suicidal ideation in late life depression. Aging & Mental Health 25 (3), 439–444.