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Article in *Educational Gerontology* · November 2019

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To cite this article: Manal Badrasawi, Kamal Badrasawi, May Hamdan & Alma A. Irshaid (2019): Malnutrition and its association with functional, cognitive and psychological status among Palestinian older adults in long-term care houses, Educational Gerontology, DOI: [10.1080/03601277.2019.1690282](https://doi.org/10.1080/03601277.2019.1690282)

To link to this article: <https://doi.org/10.1080/03601277.2019.1690282>



Published online: 11 Nov 2019.



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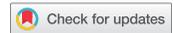


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ARTICLE



Malnutrition and its association with functional, cognitive and psychological status among Palestinian older adults in long-term care houses

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ABSTRACT

Older adults often suffer from psychological, functional and health-related diseases. Literature has documented the relationship between, malnutrition with adverse health outcomes. This study aims to examine the relationship between malnutrition with the cognitive, functional and psychological status of older adults living in long-term care houses. The study employed a cross-sectional approach in which 99 participants were included from seven nursing homes in six different cities across the West Bank, Palestine. The nutritional status of older adults was assessed using anthropometric measurements and meal patterns. Malnutrition risk was assessed using Mini Nutritional Assessment; the cognitive function using Mini Mental Status Examination; the functional status using the Activity of Daily Living.

Results: A total of 99 participants (45.5%) men and (54.5%) women were included in the final data analysis. The results revealed 47% of the participants were at risk of malnutrition, while 23% were malnourished. Variables that were significantly associated with malnutrition; male gender, higher score of depressive symptoms, and impaired cognitive function, $p < .05$ using chi square test. However, number of meals and hours of overnight fasting were not associated with being malnourished. Greater dependency level was associated with high risk of malnutrition, $p < .05$ using One Way ANOVA test. **Conclusion:** Risk of malnutrition was common among the study sample, and it was associated with impaired cognitive, psychological and functional status. Hence, there is a need to provide older adults living in long-term care houses with health programs to enhance their overall health and decrease the level of dependency. These findings are important to design educational programs targeting the stakeholders in the long-term care facilities to improve the residents' nutritional and functional status.

Introduction

Older adults are defined as people of chronological age of 60 years and beyond according to the (WHO, 2015). This age group is particularly important for different reasons, one of which that the number of worldwide aging population has been on the rise over the past decades; in 2012, there were around 810 million older adults aged ≥ 60 in the world, and expected to reach more than two billion by the year 2050. This demographic shift can be regarded to the improvements in medical care leading to reduction in mortality rate due to communicable diseases and increase in life expectancies, in addition to lower fertility rates worldwide (WHO, 2015).

Many changes are associated with the aging process that affect both molecular level and physiological functions manifested as hyper-inflammation, neuromuscular and immune dysfunction, endocrine dysregulation and abnormalities in energy metabolism (Crentsil, 2010) which can lead to clinical outcomes presented as slowness, weakness, weight-loss, low activity and fatigue (Walston et al., 2006).

Aging is also considered as a major risk factor for a wide spectrum of clinical conditions, including cardiovascular diseases, cognitive dysfunction, and physical disabilities. Hence, maintaining physical and mental function in advanced age has become a clinical and a public health priority (Sourdet, Rouge-Bugat, Vellas, & Forette, 2012). It was reported that 23% of the total world burden of disease is related to disorders in people aged ≥ 60 years (Prince et al., 2015).

In Europe, more than 20% of the older adults have functional limitations and around 30% need assistance in activities of daily living; a considerable percentage of them receive long-term care in an institution and about 30% receive formal care at home (Prince et al., 2015). Alongside of functional impairment, depressive symptoms and poor quality of life were found to be highly prevalent among this population; with no significant differences between men and women (Doumit, Nasser, & Hanna, 2014). But although developed countries have higher percentage of an aging population, the highest proportion of disabilities is recorded in low and middle-income countries (Prince et al., 2015).

It has been well documented that risk of malnutrition increases with age, as it is one of the most pertinent conditions with adverse health effects on older adults (Kaiser, Bandinelli, & Lunenfeld, 2009). Despite noteworthy medical advances, malnutrition remains a significant and highly prevalent public health issue in both developed and developing countries and is associated with morbidity and mortality compromising the outcome of other underlying conditions and diseases leading to delay recovery and prolonged hospitalization and impeding quality of life which result in increasing medical costs (Guyonnet & Rolland, 2015). Malnutrition is prevalent among older adults in Long Term Care Houses (LTC). For example, malnutrition and risk of malnutrition has been estimated to be 15.9% and 53.6%, respectively, of LTC residents in Turkey (Ulger et al., 2013) with similar trends documented in other nearby countries that are comparable to Palestine in terms of demographics, culture and economy like Lebanon and Iran ranging from 3.2%-10.3% for malnutrition and 27.6–70% for risk of malnutrition (Doumit et al., 2014); this rate was associated with negative consequences on health, well-being, and quality of life (Cowan, Roberts, Fitzpatrick, While, & Baldwin, 2004).

This high prevalence of malnutrition is due to many factors including multiple comorbid diseases like; cardiovascular diseases, malignant neoplasm, COPD, musculoskeletal diseases and mental disorders (Guyonnet & Rolland, 2015) in addition to reduction in food intake, changes in hormonal levels caused by aging, loss of appetite and risk of acute diseases (Pezzana et al., 2015).

It was documented that malnutrition can lead to cognitive impairment and functional status deterioration (Van Lancker et al., 2012). In addition to depression, higher infection rates, longer hospital stays, higher costs of care (Van Lancker et al., 2012) and mortality; the major sequel of malnutrition among LTC residents (Bell, Lee, & Tamura, 2015).

Unfortunately, developing countries are facing many challenges in health and nutritional care of older adults due to limited economical resources and underdeveloped health-care systems (Saxena, 2008). There is a need to explore the prevalence and risk of malnutrition and its implications on cognitive and functional status among institutionalized older adults worldwide, with a focus on developing countries because of the higher burden.

According to the Palestinian Central Bureau of Statistics [PCBS] (2017), older adults made up 4.6% of the total Palestinian population; 5.1% being in the West Bank and 3.9% in Gaza Strip with a clear increase in life expectancy for both males and females from 67 years in 1992 to 72.3 and 75.4 in 2017, and it is projected to reach 72.8 and 75.7 years in males and females, respectively, in 2020, with a similar trend seen in other surrounding Arab countries (PCBS, 2017). As a result, the number of older population suffering from physical, functional or mental disabilities has been on the rise, which has in turn raised the necessity of long-term nursing houses in many cases (Furuta et al., 2013).

In Palestine, research in the field of nutrition is generally sparse, and especially in the field of geriatrics because it is a small population size. The current study is the first attempt to determine the

nutritional status and malnutrition risk and its correlation with cognitive, functional and psychological status among the Palestinian elderly living in LTC houses in West Bank, Palestine. The results of this study will provide the baseline data for further interventional studies to improve the health and nutritional status amongst the Palestinian older adults and pave the way to further research in geriatric and gerontology in Palestine and other similar low-middle income countries around.

Material and methods

This is a quantitative cross-sectional study, conducted in seven LTC houses (one ran by the Palestinian Authority and six by Non-Governmental Organizations) in six different cities in the West Bank, namely Jericho, Bethlehem, Ramallah, Tulkarem, Jenin and Nablus covering different areas North, mid and south of Westbank. The sample size was calculated using Cochran and Chambers (1965) formula for prevalence studies with a power of 80%, and 0.05 level of confidence was assumed. The calculated sample size was 110 participants. The convenience sampling procedures were applied to select participants from the aforesaid nursing homes based on the following inclusion criteria; participants stayed in the LTC house minimum of six months; had acceptable cognitive function (i.e., scored MMSE more than 18); were able to communicate with the research team; and were with no history of psychiatric disorders and severe vision or hearing problems, giving a total number of 125 residents.

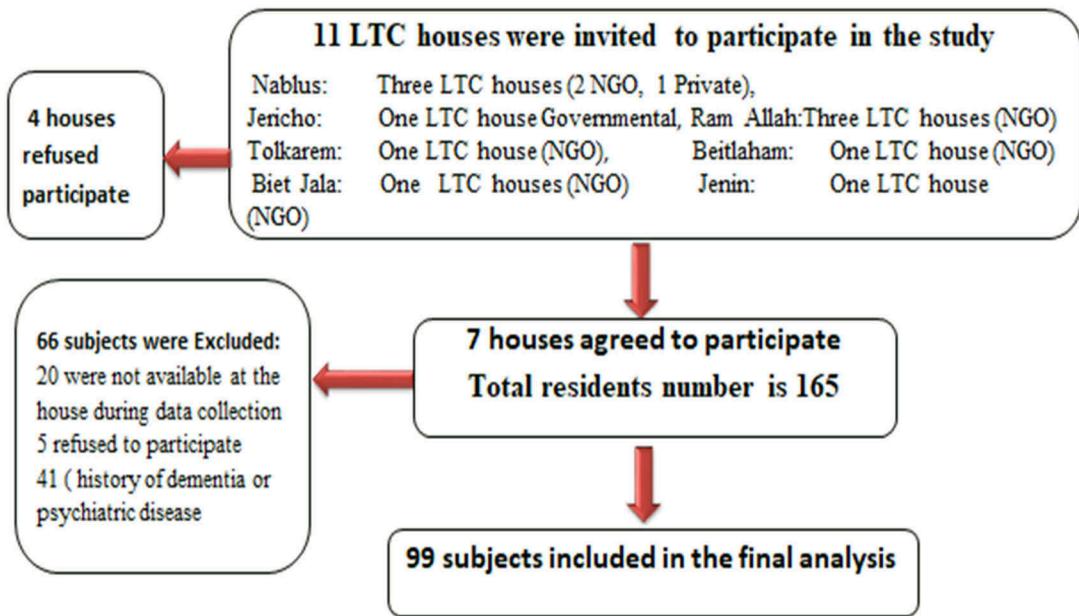
In the final analysis, only remainder 99 subjects were included of the 165, and the remaining ($n = 41$) were excluded due to their very low score in MMSE ($n = 5$), refused to participate, and ($n = 20$) were not available at time of collection, as shown in Figure 1. A pretested structured questionnaire was used to collect the data from the participants. Each subject was interviewed to fill out the socio-demographic data. Subjects' comorbidities were assessed using a self-reported medical history dichotomous questionnaire; nutritional status was assessed using anthropometric measurements including weight, height, mid upper arm circumference (MUAC) and calf circumference (CC); weight was measured to the nearest 0.1 kg using a BC-418 Segmental Body Composition Analyzer (Tanita Corporation, Tokyo, Japan). Height was measured to the nearest 0.1 cm using a Seca 213-stadiometer (Seca, Hamburg, Germany). All measurements were taken twice using a standard method of anthropometric assessment reported in (Lee, 2007).

Number of main meals and snacks, eating alone or with company, in addition to the period of overnight fasting was all used to assess subjects' dietary habits. Food sufficiency was determined by asking each subject about the sufficiency of the food served in institutions. Malnutrition and risk of malnutrition were assessed using the Mini Nutritional Assessment-Short Form (MNA-SF), a widely used validated tool for nutritional screening in older adults; the psychometric properties of this tool were recorded as; the sensitivity was 96% and specificity was 98% (Vellas et al., 1999). The cut-off points used for categorizing the participants were 12 points and above (normal nutritional status); 8–11 points (at risk of malnutrition); and 0–7 points (malnourished). Cognitive status was assessed using the validated Arabic version of Mini Mental Status Examination MMSE. The acceptable cognitive function was 18 points and above following the cutoff points reported in (Albanna et al., 2017).

Presence of depressive symptoms was assessed using the validated Arabic version of Geriatric Depression Scale – 15 items (Chaaya et al., 2008). The activity of daily living was assessed using the six-item validated Arabic version of ADL (Nasser & Doumit, 2009).

Prior to the commencement of the research, the researchers got the approval on the research protocol from the Deanship of Scientific Research Ethical Committee at Palestine Polytechnic University; verbal consents from the principles of residential houses; and written consent from all the participants.

The Statistical Package for the Social Sciences (SPSS), version 22 was used to analyze the collected data. Descriptive statistics were used to determine the prevalence of chronic diseases, cognitive impairment and depressive symptoms. The association between risk of malnutrition with the categorical independent variables was done using Chi-square test. One-way Anova test was conducted to determine the mean differences between groups in continuous variables.



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Figure 1. Subjects' recruitment flow chart.

Results

Demographic information

Table 1 shows the demographic characteristics of the Ninety-nine (99) subjects included in the final analysis. Women were more likely to be single, compared to men $p < .05$ while men had a significant higher educational level compared to women and higher percentage of being either smokers or x-smokers with p -values of $< .05$ and $< .01$, respectively.

Medical history of the participants

Figure 2 shows the prevalence of medical conditions distributed by gender among the participants. The most commonly reported diseases were osteoarthritis (43.5%) followed by hypertension (35.4%) and then visionary problems (29.3%).

Nutritional status of the participants

It was found that 63% of the participants were overweight or obese as indicated by a BMI of $>25 \text{ kg/m}^2$. Obesity was more prevalent in women compared to men; while normal weight was more prevalent in men $p < .05$.

Number of meals (3 main meals and 2 snacks) was consistent in all subjects, following the meal schedule in the LTC; and the overnight fasting ranged from 12 to 14 hours. All participants reported that food was always sufficient in terms of amounts provided. The majority of the participants (74.5%) took their meals with company. Self-reported loss of appetite was 21.7% of decrease among 21% of the participants both males and females.

Table 1. Subjects' characteristics according to gender [presented as number (%)].

Parameter	Men (n = 45)		Women (n = 54)		Total (n = 99)		P-value
Age							
<70 years	36	(80)	29	(54)	65	(65.7)	.01*
>70 years	9	(20)	25	(46)	34	(34.3)	
Marital Status							
Single	21	(46.7)	25	(46.3)	46	(46.5)	.01*
Married	14	(31.1)	6	(11.1)	20	(20.2)	
Divorced	5	(11.1)	4	(7.4)	9	(9.1)	
Widow/widower	5	(11.1)	19	(35.5)	24	(24.2)	
Level of Education							
No formal education	2	(4.4)	16	(29.7)	18	(19.5)	.026*
Primary School	25	(55.6)	23	(42.6)	48	(42.9)	
Secondary school	8	(17.8)	8	(14.8)	16	(10.8)	
Diploma	1	(2.2)	3	(3.7)	4	(5.7)	
University degree	9	(20)	4	(7.4)	13	(3.80)	
Others							
Ability to read							
Yes	37	(82.2)	31	(57.4)	68	(68.7)	.009*
No	8	(17.8)	23	(42.6)	31	(31.3)	
Ability to write							
Yes	35	(77.8)	30	(55.6)	65	(65.6)	.039*
No	10	(22.2)	24	(44.4)	34	(34.3)	

*significant, at $p < 0.05$ using Chi Square test.

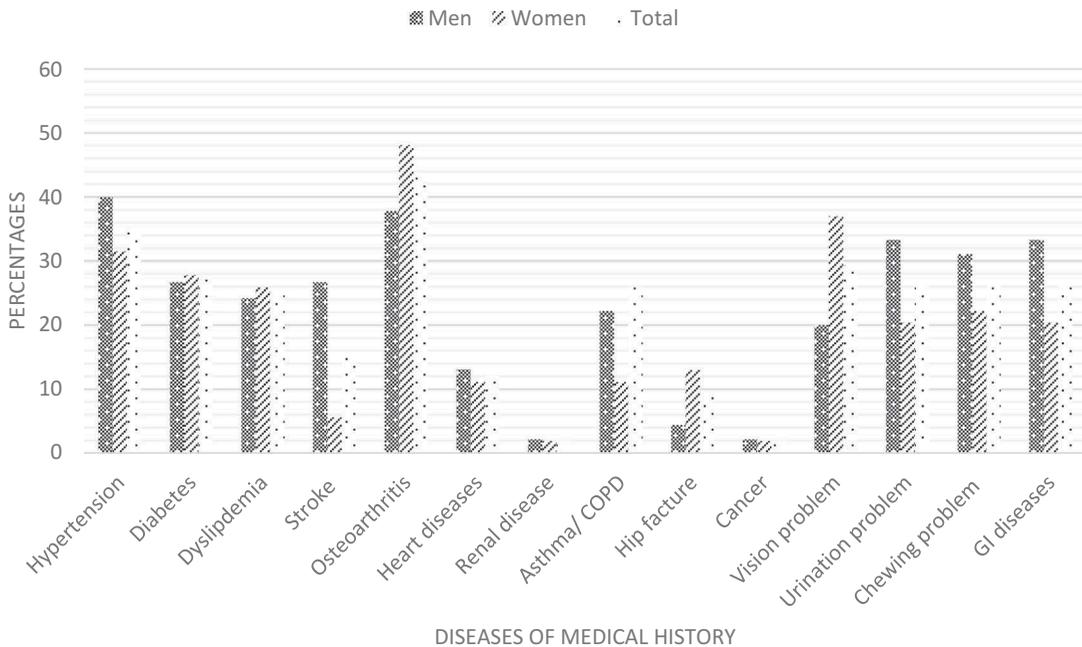


Figure 2. Medical history of the participants according to gender presented in percentage.

*Significant, $p < .05$ using Chi Square test.

According to the mini nutritional assessment MNA, 23.2% of the participants were malnourished, while 47.5% were at risk of malnutrition and 25.3% were normal. Being malnourished was significantly higher in men compared to women, $p < .05$.

Cognitive, depression and functional status of the participants

Table 2 shows the cognitive function, psychological status and functional status of the participants according to gender, presented in mean \pm sd, men showed a significantly (p -value $< .05$) higher score on MMSE test.

Relationship between malnutrition and other variables

According to MNA, Table 3 shows that the malnutrition score was significantly associated with the presence of depressive symptoms and decline in cognitive function ($p < .01$ and $< .05$) respectively. The same trend was observed between malnutrition and functional disability. Among the socio-demographic variables, malnutrition was associated with female gender and eating alone as shown in Table 4.

Discussion

Malnutrition risk prevalence

Different researches reported variation in levels of malnutrition prevalence among older adults in developed and developing countries due to various factors including age, sex, morbidity and care dependency as well as infection, physical disabilities and polypharmacy (van Nie-visser et al., 2014). Furthermore, the tools used to define malnutrition, cutoff values and the study population influence the malnutrition prevalence rates (Pauly, Stehle, & Volkert, 2007). The current study found that 23.2% of the participants were malnourished and 49.5% were at risk of malnutrition, much higher than what is reported in a neighboring Arab country with similar demographic and culture, Lebanon with levels of (3.2% and 27.6%, respectively) (Doumit et al., 2014). In Iran, the prevalence of malnutrition was 10.3% of the older adults residents in 16 nursing homes with 66.4% of males and 70.8% of females being at risk of malnutrition (Nazemi et al., 2015). The global numbers were allocated within a range of 2% to 38% for malnutrition and 37% to 62% for risk of malnutrition. In 37% to 62% in a review study included 17 researches used mini nutritional assessment MNA to determine the prevalence of the malnutrition (Pauly et al., 2007). In combined databases from 12 countries, the prevalence of malnutrition was found to be 22.8% in a sample of around 5000 older adults from different settings “Hospitals, rehabilitation, nursing homes and community” and the prevalence of malnutrition risk was 46.2% (Kaiser et al., 2009).

In this study, prevalence of malnutrition in men was (33.3%), significantly higher than women (14.8%). The literature reported controversial results regarding the gender disparities in malnutrition provenances, for example, in Lebanon, the malnutrition was not significantly associated with gender (Doumit et al., 2014), while in Iran it was higher in women compared to men (Nazemi et al., 2015).

Table 2. Cognitive, psychological status of the participants according to gender.

Parameter	Total	Men	Women	<i>P</i> -value
MMSE (score)	19.2 \pm 4.5	20.1 \pm 5.4	18.3 \pm 3.4	.028*
GDS-15 (score)	6.5 \pm 3.2	6.6 \pm 2.9	6.4 \pm 3.4	.71
ADL (score)	4.3 \pm 1.9	4.4 \pm 1.7	4.3 \pm 2.1	.91
Age (years)	70.7 \pm 8.6	69.1 \pm 8.5	72.1 \pm 8.5	.088

*Significant, $p < .05$ using independent *t*-test.

Abbreviations: MMSE: Mini Mental Status Examination, GDS: Geriatric Depression Scale 15, ADL: Activity of Daily Living.

Table 3. Depressive symptoms, cognitive function, and functional status according to MNA categories.

	Well-nourished (n = 25)	At risk of malnutrition (n = 46)	Malnourished (n = 23)	P-value
GDS	4.9 ± 3.1	6.9 ± 3.1	8.0 ± 2.7	.002*
MMSE	20.7 ± 6.1	19.4 ± 6.8	16.4 ± 6.8	.02*
ADL	5.2 ± 1.0	4.3 ± 1.9	3.4 ± 2.1	.002*

*Significant, $p < 0.05$ using one-way Anova test.

Abbreviations: MNA: Mini Nutritional Assessment, GDS: Geriatric Depression Scale 15, MMSE: Mini Mental Status Examination, ADL: Activity of Daily Living.

Table 4. Socio demographic characteristics of the participants according to MNA categories presented in (%).

Socio-demographic variables		Well-nourished	At risk of Malnutrition	Malnourished	P-value
Gender	Men	14 (31.1)	16 (35.5)	15 (33.3)	.03*
	Women	13 (24)	33 (61.1)	8 (14.8)	
Age	>70 year	18 (25.8)	33 (51.6)	14 (22.6)	.821
	<70 year	9 (27.2)	16 (45.5)	9 (27.2)	
Marital status	Single	13 (28.2)	25 (54.3)	8 (17.3)	.321
	Married	4 (20)	7 (35)	9 (45)	
	Divorced	3 (33.3)	5 (55.5)	1 (11.1)	
	Widow/widower	7 (29.1)	12 (50)	5 (20.8)	
Level of education	No Formal Education	4 (22.2)	12 (66.6)	2 (11.1)	.287
	Primary School	13 (27)	23 (47.9)	12 (25)	
	Secondary school	7 (43.7)	7 (43.7)	2 (12.5)	
	Diploma	0 (0)	2 (66.6)	1 (33.3)	
	University degree	3 (23.1)	5 (38.5)	5 (38.5)	
	Others (master/phd)	1 (100)	0 (0)	0 (0)	
Ability to read	Yes	20 (29.4)	30 (44.1)	18 (26.5)	.249
	No	7 (22.6)	19 (61.3)	5 (16.1)	
Ability to write	Yes	19 (29.7)	28 (43.7)	17 (26.6)	.162
	No	8 (22.6)	21 (60)	6 (17.1)	
Food sufficiency	Always sufficient	23 (28.4)	43 (53)	15 (18.5)	.220
	Sometimes sufficient	2 (18.1)	3 (27.3)	6 (54.5)	
	Insufficient	2 (28.6)	3 (42.6)	2 (28.6)	
Eating with company	Alone	2 (7.7)	16 (61.5)	8 (30.1)	.031*
	With friends	25 (34.7)	32 (44.4)	15 (20.8)	
Number of meals	≥3 main meals+ snack	22 (28.6)	39 (50.6)	16 (20.7)	.453
	<3 main meals + snack	4 (19)	10 (47.6)	7 (33.3)	

*significant, at $p < 0.05$ using Chi Square test.

Abbreviations: MNA: Mini Nutritional Assessment.

These differences may be attributed to the differences in period of stay at long-term houses; therefore, gender may not be a contributing factor to malnutrition as other factors like morbidities, length of stay at the long-term care houses, food satisfaction and poor nutritional practices in these houses (Suominen et al., 2005).

It is necessary to stress that to outline the malnutrition issue among older adults in nursing houses in cross country setting, a consistent definition, standard measurement, and standardized inclusion criteria are needed.

Malnutrition and cognitive function

This study found a significant relationship between malnutrition and impaired cognitive function. This finding is consistent with other studies. For instance, Saka et al. (2010) concluded that the decline in nutritional status in older adults is associated with decline in the physiological, psychological and social status (Saka, Kaya, Ozturk, Erten, & Karan, 2010). In Egypt, Khater et al. (2011) reported similar significant higher prevalence of cognitive impairment among malnourished older adults using the same tools (Khater & Abouelezz, 2011). In China, significant relationship between nutritional status and cognitive function was reported but using different parameters (Song, 2016).

The same findings were also reported in other studies conducted in western countries (Fagerström, Palmqvist, Carlsson, & Hellström, 2011).

This relationship was also documented in other settings; i.e. hospitalized older adults and community-dwelling older people. It was found that geriatric patients with mild cognitive impairment and dementia had significant lower frequency to be well nourished and higher frequency of being malnourished or at risk of malnutrition (Orsitto et al., 2009). In community settings, being underweight is associated with higher prevalence of mild cognitive impairment (Lee & Hong, 2011).

Malnutrition and depressive symptoms

A significant relationship was reported among participants of higher score of depressive symptoms and being malnourished. Similar findings were found in two long-term care houses in both Sweden and Brazil, using similar assessment tools (Johansson, Bachrach-Lindström, Carstensen, & Ek, 2009). Having a higher depression score, higher number of co-morbidity, and lower perceived health status were significantly associated to a higher risk of becoming malnourished (Park & Suh, 2007). It is clear that depression and dementia are commonly seen in older adults and are major contributors to poor appetite and malnutrition (Smoliner et al., 2009).

Malnutrition and dependency

Higher level of dependency was reported among malnourished participants compared to those who are at risk of malnutrition. Nutritional status and malnutrition in the older population are important issues to behold. Malnutrition and unintentional weight loss contributed to progressive decline in health, quality of life, reduced physical and cognitive functional status, and increased utilization of health-care services (Evans, 2005). On the other hand, food pickiness which is common in elderlies, and especially more prevalent in nursing homes have been associated with malnutrition and increased the level of dependency (Maitre et al., 2014). Other than malnutrition, chronic diseases affected the level of dependency (Boult, Kane, Louis, Boult, & McCaffrey, 1994). The current study reported a considerable number of the participants who have chronic diseases with multiple morbidities. Therefore, malnutrition and chronic diseases combined may have the impact of the dependency level in the study sample.

Conclusion and recommendations

In this study, we have found that the prevalence of malnutrition among older adult population living in LTC houses in West Bank, Palestine, is higher than what other Arab neighboring countries have reported. However, this level is still comparable to the international range. The malnourished participants tended to have poor cognitive status, higher depressive symptoms and higher level of dependency. The results of this study are important to draw the attention of the researchers, community, and stakeholders to the health status of the institutionalized older people in West Bank, Palestine, by modulating educational programs targeting the long-term care staff to identify the opportunities to improve the nutrition and health policy for this particular population. It is important to provide the older people in LTC houses with supportive health and nutritional programs to enhance their overall well-being and decrease the level of dependency as well as improving their quality of life. There is a need for further research utilizing different study designs, longitudinal or cohort studies to determine causes and effects. Other clinical intervention studies are recommended to decrease the prevalence and risk of malnutrition, poor cognitive function, depression, and to enhance the level of independency among older adults in long-term care houses and thus reducing the burden of clinical health-care cost which can be major at those levels.

Findings of this study should be seen in the light of its limitations that could be addressed in future research. First, the cross-sectional survey design is often used to determine relationships, not

to determine cause and effect. Also, the study did not assess diet intake, food management system of these houses, nor performed any biochemical analysis. Second, not all LTCs in West Bank agreed to take part in the study leading to a limited sample size thus generalizability cannot be applied.

Acknowledgments

We would like to acknowledge the students who helped the researchers in the data collection; Alaa Jaradat, Razan Lahaleah, Zaheerah Khodour, Mohammed Khoudor, Raheeq Haj Hamad and Azza Hamad. We would like to express our gratitude to the Palestinian older adults who agreed to participate in this study. Thanks are also to all co-researchers and fieldworkers involved in this study.

Author Contributions

The authors contribute in the manuscript as the following; Manal badrasawi: principle investigator, proposal and protocol writing, draft the paper, Alma Irshaid: Data Management and Manuscript writing, Kamal Badrasawi: proposal writing and data analysis, May Hamdan: proposal writing, data collection management and partially contribute in paper draft writing and final approval of the manuscript.

Disclosure statement

No potential conflict of interest was reported by the authors.

Ethics approval and consent to participate

This project acquired an ethical approval from the Deanship of Scientific Research Ethical Committee at Palestine Polytechnic University. Also, the project has a signed agreement to use the MMSE Arabic version forms. Informed written and verbal consents were taken from all participants prior to data collection.

Funding

This study was funded by An-Najah National University – Scientific Research project number [ANNU-MoHE-1819-Sc0013].

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