

Factors associated with poor appetite among residents at selected long-term care facilities in Selangor, Malaysia

Duaa Al-junid¹, Chan Yoke Mun^{1,2,3*}, Siti Nur Asyura Adznam¹, Chin Yit Siew^{2,4}, Zailah Mohd Shariff⁴, Lim Poh Ying⁵, Sazlina Shariff-Ghazali⁶ & Tanti Irawati Rosli⁷

¹Department of Dietetics, Faculty of Medicine & Health Science, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia; ²Research Centre of Excellence Nutrition and Non-communicable Diseases, Faculty of Medicine & Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Malaysia; ³Malaysian Research Institute on Ageing, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia; ⁴Department of Nutrition, Faculty of Medicine & Health Science, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia; ⁵Department of Community Health, Faculty of Medicine & Health Science, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia; ⁶Department of Family Medicine, Faculty of Medicine & Health Science, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia; ⁷Department of Family Oral Health, Faculty of Dentistry, Universiti Kebangsaan Malaysia, 50300 Kuala Lumpur, Malaysia

ABSTRACT

Introduction: Poor appetite is prevalent among older adults and may negatively impact on their overall health. This is especially true for institutionalised residents. Despite this, there is a paucity of research on appetite and its associated factors among institutionalised residents, which signified the present study. **Methods:** A cross-sectional study was conducted among elderly residents at long-term care facilities in the state of Selangor, Malaysia to ascertain their appetite status and its associated factors. **Results:** A total of 97 residents with mean age of 74.2±8.4 years old were recruited. They comprised 61.9% females and 38.1% males. More than 50% had poor appetite with early satiety. There were 63.0%, 82.4%, and 94.8% who had poor oral health, poor sleep quality, and depression, respectively. Ethnicity ($OR=2.73$; 95% $CI=1.00-7.44$; $p=0.049$) was the only factor that predicted poor appetite among older adults in long-term care facilities, with Malay residents having poorer appetite than their Chinese and Indian counterparts. **Conclusion:** The prevalence of poor appetite was high among residents staying at long-term care facilities in Selangor, Malaysia, especially among Malays. This issue deserves further studies to identify the specific underlying factors contributing to poor appetite among older adults from different ethnicities. Acknowledging the high prevalence of poor appetite among older adults and its possible unfavourable outcomes, appropriate nutrition interventions are therefore needed to address this issue among institutionalised elderly.

Keywords: appetite, depressive, institutionalised residents, older adults, sleep quality

*Corresponding author: Chan Yoke Mun
Department of Dietetics, Faculty of Medicine & Health Science
Research Centre of Excellence Nutrition and Non-communicable Diseases,
Faculty of Medicine & Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Malaysia
Malaysian Research Institute on Ageing,
Universiti Putra Malaysia, 43400 Serdang, Malaysia
Tel: +603-97692433; Fax: +603-89426769; E-mail: cym@upm.edu.my
doi: <https://doi.org/10.31246/mjn-2023-0035>

INTRODUCTION

Globally, there has been a growth in both population size and the proportion of older adults. With one billion older adults aged ≥ 60 years and above in 2019, this number is expected to increase to 1.4 billion and 2.1 billion by 2030 and 2050, respectively. Approximately 80% of the world's older adults will live in low- and middle-income nations by 2050 (WHO, 2019). Like other countries, Malaysia is experiencing significant population ageing, with the percentage of older adults aged 65 years and above in Malaysia having increased from 7.0% to 7.4%, within a year from 2020 to 2021 (Department of Statistics Malaysia, 2021).

Older adults are susceptible to malnutrition, which may be attributed to a variety of mechanisms (Norman, Haß & Pirlich, 2021); with higher risk of malnutrition among institutionalised older adults as compared to community dwellers (Pigłowska, Guligowska & Kostka, 2020) due to frailty, poor cognitive status, polypharmacy, poor dentition, and swallowing difficulties (Dominguez Castro *et al.*, 2021). Notwithstanding the increasingly recognised health concerns, studies on malnutrition among institutionalised older adults are scarce as compared to community dwellers (Streicher *et al.*, 2018) due to the challenges of conducting research in long-term care facilities.

Although malnutrition has often been associated with morbidity, mortality, and cost of care among older adults, it often remains unaddressed among institutionalised elderly (Norman *et al.*, 2021). As malnutrition in older adults, especially among institutionalised residents, is often associated with considerable personal, social and financial distress, thus identifying its contributors is necessary to allow the formulation of appropriate interventions.

On the other hand, poor appetite is common in older adults leading to poor dietary quality (Nohan *et al.*, 2020) and represents a common predictor of malnutrition among older adults.

Aetiologies of poor appetite among older people can be multifaceted, including poor dentition and health status (Malafarina *et al.*, 2013), socio-demographic factors (Zukeran *et al.*, 2022), food preferences (van der Meij *et al.*, 2017), use of medications that suppress appetite, decreased taste sensation (Malafarina *et al.*, 2013), and depression (Suzana *et al.*, 2013). Nevertheless, most of the above studies were performed among community dwellers, which may limit their generalisation to institutionalised older adults. A better understanding of the factors associated with appetite in institutionalised older adults is therefore necessary to achieve early identification of declined food intake and mitigate its negative outcomes. Therefore, this study aimed to investigate the factors contributing to appetite among older adults in selected long-term care facilities.

MATERIALS AND METHODS

This cross-sectional study was conducted at five (5) selected long-term care facilities (LTCFs) in Selangor, Malaysia from 22 December 2020 till 16 August 2021. There are a total of 67 long-term care facilities distributed across the six districts in Selangor. Purposive sampling was applied for the selection of study location, with Petaling and Hulu Langat districts being selected due to the highest number of long-term care facilities located in these two districts. While study permissions were sought from all the long-term care facilities within Petaling and Hulu Langat districts, permissions were granted only from five long-term care facilities,

confirming the challenges of conducting studies in such setting, and this was especially true during the COVID-19 pandemic. Acknowledging the higher risk of severe course and mortality rate of COVID-19 among residents of long-term care facilities, the pandemic has also put unprecedented strain on long-term care facilities and restricted research engagement with residents.

In Malaysia, long-term care facilities are provided by public, private, non-governmental organisations (NGOs), as well as by churches and other religious groups. These long-term care facilities offer 24-hour room and board, as well as healthcare services, including basic and skilled nursing care, rehabilitation, and a full range of other therapies and treatments. The research was performed in accordance with the Declaration of Helsinki and the protocol was approved by the University Research Ethics Committee, Universiti Putra Malaysia (Ref: UPM/TNCPI/RMC/JKEUPM/1.4.18.2).

Data collection

Upon obtaining study permission from the institutions, arrangements were made with the respective institutions to obtain a list of residents that met the inclusion criteria. Study eligibility included residents aged ≥ 65 years, cognitively competent to consent, and able to self-feed. Residents who were fed enterally or parenterally on a modified texture diet and required assistance at mealtimes were excluded. Residents with cognitive impairment (scoring 5 or below on the abbreviated mental test) or communication problems were excluded. On the day of data collection, researchers approached potential residents either at the common area or at their dorms, depending on the setting of the institution and instructions given by the institution. Residents received a

comprehensive participant information sheet with details of the study, their rights regarding participation and withdrawal at any stage, and assurance of complete anonymity. Eligible and interested residents provided individual written informed consent before their study enrolment.

Measurements

A face-to-face interview was conducted to collect all data at long-term care facilities. A pre-tested structured questionnaire was used to ascertain socio-demographic characteristics, appetite level, perceived meal satisfaction, depression, functional status, oral health status, and sleep quality of the residents, with details as below.

Assessment of appetite status

Appetite of the residents was ascertained using the 4-item Simplified Nutritional Appetite Questionnaire (SNAQ). Partially based on the Appetite, Hunger and Sensory Perception Questionnaire, the SNAQ was developed to objectively evaluate poor appetite in older adults and has been validated in older adults living in nursing homes (Wilson *et al.*, 2005). SNAQ has sensitivity and specificity values of 69.7% and 62.7%, respectively, besides an acceptable reliability as assessed using Cronbach's alpha (0.58). SNAQ comprises ordinal scales consisting of four domains: appetite, feeling of fullness, taste of food, and the number of meals per day. The score for each item on SNAQ ranged from 1 (very poor, I feel full after eating only a few mouthfuls, very bad, and less than one meal a day) to 5 (very good, I hardly ever feel full, very good, and more than three meals a day). With a total score ranging from 4 to 20 points, a score of < 14 indicates poor appetite (Wilson *et al.*, 2005).

Assessment of meal satisfaction

Residents' self-perception of meal satisfaction was ascertained using the Mealtime Satisfaction Questionnaire (MSQ). The MSQ has high internal consistency (Cronbach's alpha 0.83) and test-retest reliability (intraclass coefficient = 0.91) (Pizzola *et al.*, 2013). The MSQ displayed moderate internal consistency (Cronbach's alpha = 0.75) in the present study.

Assessment of depression

The validated Malay version of Geriatric Depression Scale (M-GDS-14), a widely used screening tool for depression among older adults, was utilised in this study to assess depressive symptoms among the residents. The M-GDS-14 has good reliability (Cronbach's alpha = 0.84, test-retest reliability = 0.84) and validity (Spearman's rho = 0.68) in the Malaysian population.

Assessment of functional status

The validated Malay version of the Instrumental Activity Daily Living (IADL-MV) was used to determine functional status of the residents. With a Content Validity Index for four criteria ranging from 88.89 to 100.0 and a Cronbach's alpha coefficient for internal consistency of 0.84, the IADL-MV has outstanding reliability and validity for use with Malay speaking older persons in Malaysia. Cronbach's alpha for this study was 0.74.

Assessment of oral health status and medication use

Oral health status of the residents was determined using the Malay version of Geriatric Oral Health Assessment Index (GOHAI). The Malay version of GOHAI, which has acceptable validity and reliability with a Cronbach's alpha of 0.79, is an effective tool for measuring oral health-related quality of life among Malaysians. Medication use of

the residents was self-reported by the residents and cross-checked with staff nurses at the institutions.

Assessment of sleep quality

Sleep quality of the residents in the past one month was ascertained using the Malay version of Pittsburgh Sleep Quality Index (PSQI) (Buysse *et al.*, 1989). This universally recognised tool comprises seven components, namely subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, sleep medication use, and daytime dysfunction, with each component having a scale factor from 0 to 3, and collectively form a global score ranging from 0 to 21. A higher global PSQI score indicates lower sleep quality. A global PSQI score of ≤ 5 indicates satisfactory sleep quality, whereas a score of >6 indicates poor sleep quality. Cronbach's alpha for this index was 0.82, indicating that the instrument has acceptable internal consistency.

Statistical analysis

All data were analysed using IBM SPSS Statistics for Windows version 24.0 (IBM Corp., Armonk, New York, United States). Normality test was determined using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Categorical and numerical data were presented as frequency (%) or mean \pm standard deviation (SD), respectively. Chi-square test was used to compare the proportion of variables accounted for by age groups. Chi-square tests were also used to determine the association between categorical variables and appetite status. Further analysis using multivariate logistic analysis was performed to identify the contributing factors towards appetite. All variables with a $p < 0.25$ in the bivariate analyses were entered into the logistic regression model to delineate their contributions towards appetite status among older adults. For all analyses, a p -value of less

Table 1. Distribution of the respondents according to selected characteristics/factors and appetite status as stratified by age categories (n=97)

Characteristics	n (%)				χ^2	p-value
	Young-old (n=27)	Old-old (n=41)	Oldest (n=29)	All (n=97)		
Sex					4.810 ^a	0.090
Male	15 (55.6)	13 (31.7)	9 (31.0)	37 (38.1)		
Female	12 (44.4)	28 (68.3)	20 (69.0)	60 (61.9)		
Ethnicity					20.09 ^b	<0.001*
Malay	22 (81.5)	28 (68.3)	11 (37.9)	61 (62.9)		
Chinese	2 (7.4)	6 (14.6)	16 (55.2)	24 (24.7)		
Indian	3 (11.1)	5 (12.2)	2 (6.9)	10 (10.3)		
Others	0 (0.0)	2 (2.1)	0 (0.0)	2 (2.1)		
Duration of stay					8.299 ^b	0.075
1-5 years	22 (81.5)	26 (63.4)	15 (51.7)	63 (64.9)		
5-10 years	5 (18.5)	9 (22.0)	8 (27.6)	22 (22.7)		
10 years and more	0 (0.0)	6 (14.6)	6 (20.7)	12 (12.4)		
History of hospitalisation					1.006 ^a	0.605
Yes	18 (66.7)	23 (56.1)	19 (65.5)	60 (61.9)		
No	9 (33.3)	18 (43.9)	10 (34.5)	37 (38.1)		
Number of chronic diseases					6.179 ^b	0.360
None	10 (37.7)	11 (26.8)	7 (24.1)	28 (28.9)		
1-2 diseases	13 (48.1)	20 (48.8)	20 (69.0)	53 (54.6)		
3-4 diseases	3 (11.1)	9 (22.0)	2 (6.9)	14 (14.4)		
≥ 5 diseases	1 (3.7)	1 (2.4)	0 (0.0)	2 (2.1)		
Type of chronic diseases						
High blood pressure					2.685 ^a	0.261
Yes	11 (40.7)	25 (61.0)	15 (51.7)	51 (52.6)		
No	16 (59.3)	16 (39.0)	14 (48.3)	46 (47.4)		
Diabetes mellitus					7.136 ^a	0.028*
Yes	7 (25.9)	16 (39.0)	3 (10.3)	26 (26.8)		
No	20 (74.1)	25 (61.0)	26 (89.7)	71 (73.2)		
Hypercholesterolaemia					1.054 ^a	0.590
Yes	5 (18.5)	12 (29.3)	8 (27.6)	25 (25.8)		
No	22 (81.1)	29 (70.7)	21 (72.4)	72 (74.2)		
Cardiovascular disease					1.000 ^b	0.641
Yes	4 (14.8)	4 (9.8)	2 (6.9)	10 (10.3)		
No	23 (85.2)	37 (90.2)	27 (93.1)	87 (89.7)		
Arthritis					1.395 ^b	0.555
Yes	1 (33.7)	5 (12.2)	3 (10.3)	3 (10.3)		
No	26 (96.3)	36 (87.8)	26 (89.7)	26 (89.7)		
Others					1.988 ^a	0.738
Yes	4 (14.8)	3 (7.3)	2 (6.8)	9 (9.3)		
No	23 (85.2)	38 (92.7)	27 (93.1)	88 (90.7)		
Medication use					0.128 ^a	0.897
<5 medications	25 (92.6)	37 (90.2)	27 (93.1)	89 (91.8)		
≥5 medications	2 (7.4)	4 (9.8)	2 (6.9)	8 (8.2)		
Depressive symptoms					0.459 ^a	0.795
Normal	2 (7.4)	2 (4.9)	1 (3.4)	5 (5.2)		
Suggestive of depressive symptoms	25 (92.6)	39 (95.1)	28 (96.6)	92 (94.8)		
Functional status					9.721 ^a	0.008
Normal	8 (29.6)	10 (24.4)	0 (0.0)	18 (18.6)		
Functional disabled	19 (70.4)	31 (75.5)	29 (100.0)	79 (81.4)		
Self-perceived oral health					3.796 ^a	0.434
Poor	12 (44.4)	10 (24.4)	8 (27.6)	30 (30.9)		
Moderate	8 (29.6)	13 (31.7)	10 (34.5)	31 (32.0)		
Good	7 (25.9)	18 (43.9)	11 (37.9)	36 (37.1)		

Table 1. Distribution of the respondents according to selected characteristics/factors and appetite status as stratified by age categories (n=97) [Cont'd]

Characteristics	n (%)				χ^2	p-value
	Young-old (n=27)	Old-old (n=41)	Oldest (n=29)	All (n=97)		
Sleep quality					0.344 ^a	0.842
Poor	23 (85.2)	34 (82.9)	23 (79.3)	80 (82.5)		
Good	4 (23.5)	7 (17.1)	6 (20.7)	17 (17.5)		
Meal satisfaction					1.150 ^a	0.563
Temperature						
High satisfaction	19 (70.4)	24 (58.5)	17 (58.6)	60 (61.9)		
Low satisfaction	8 (29.6)	17 (41.5)	12 (41.4)	37 (38.1)		
Colour contrast					0.240 ^a	0.887
High satisfaction	11 (40.7)	16 (39.0)	13 (44.8)	40 (41.2)		
Low satisfaction	16 (59.3)	25 (61.0)	16 (55.2)	57 (58.8)		
Food choices					1.896 ^a	0.388
High satisfaction	10 (37.0)	11 (26.8)	6 (20.7)	27 (27.8)		
Low Satisfaction	17 (63.0)	30 (73.3)	23 (79.3)	70 (72.2)		
Appetite status					1.341	0.512
Good	15 (55.6)	17 (41.5)	13 (44.8)	45 (46.4)		
Poor	12 (44.4)	24 (58.5)	16 (55.2)	52 (53.6)		

^a Chi-square test of association

^b Fisher's exact test

Age classification categories: young-old, ages 65 to 74 years; old-old, 75 to 84 years; and oldest, ≥85 years.

than 0.05 was considered statistically significant.

RESULTS

Table 1 shows the distribution of residents according to their socio-demographic characteristics, clinical characteristics, oral health status, sleep quality, depressive symptoms, functional status, use of medication, and meal satisfaction. Mean age of the respondents was 74.2±8.4 years, ranging from 60 to 95 years old. More than 40% of residents were in the old-old age group, with approximately 30% in the oldest and young-old age groups, respectively. The study was dominated by females (60%). The major ethnic group composition consisted of Malays (62.9%), followed by Chinese (24.7%), and Indians (10.3%), which is comparable with the ethnic composition of Malaysia. The mean duration of stay among the residents was 3.9±4.3 years, ranging from 0.10 to

30 years, with approximately 20% and 10% having stayed at the institutions for 5-10 years and more than 10 years, respectively. While no significant differences were found between other socio-demographic characteristics and age groups, the proportion of Chinese respondents was significantly higher in the oldest category than other ethnicities ($\chi^2=20.09$, $p<0.001$), which was attributed to the higher mean age of Chinese respondents (79.9±8.9 years old) compared to Malay (74.4±6.9 years old) and Indian (71.9±7.4 years old) respondents (data not shown).

Hospitalisation was common; six in ten residents had at least one hospitalisation in the past one year. The presence of non-communicable diseases was evident, with slightly more than half of the respondents having 1-2 diseases (54.6%) and hypertension was the most prevalent. An increase in age was associated with a lower risk of diabetes

mellitus ($\chi^2 = 7.136$, $p < 0.05$). However, no significant differences were found between the history of hospitalisation, number of diseases, type of disease, and age group of the respondents.

About 95% of the respondents were classified as suggestive of depressive symptoms, but there was no significant association between the presence of depressive symptoms and the age of the respondents. More than 80% of older adults had functional disability. All residents in the oldest age group were functionally disabled, while more than 75% and 70% of the old-old and young-old respondents, respectively, were functionally disabled, which explains the significant association between functional status and age group ($\chi^2 = 9.721$, $p < 0.05$). The prevalence of polypharmacy, defined as taking

five or more types of medications, was 8.2%. The mean number of medication use among the residents was 0.9 ± 1.0 , ranging from 0 to 5 medications. Age did not influence the number of medications used by the residents ($\chi^2 = 0.218$, $p > 0.05$).

It is worth mentioning that more than 60% and 80% of the residents had poor oral health and were poor sleepers, respectively. A total of 61.9% of respondents were satisfied with the temperature of the foods served. Nevertheless, approximately 60% of the respondents were unsatisfied with the colour of the meals served, while more than 70% were unsatisfied with the food choices available at the institutions. There was no significant difference between meal satisfaction and age of the respondents.

Table 2. Distribution of respondents according to individual element of appetite assessment ($n=97$)

SNAQ items	n (%)
My appetite is:	
Very poor	1 (1.0)
Poor	6 (6.2)
Average	45 (46.4)
Good	31 (32.0)
Very good	14 (14.4)
When I eat	
I feel full after eating only a few mouthfuls	10 (10.3)
I feel full after eating about a third of a meal	11 (11.3)
I feel full after eating over half a meal	38 (39.2)
I feel full after eating most of the meal	37 (38.1)
I hardly ever feel full	1 (1.0)
Food tastes	
Very poor	1 (1.0)
Poor	8 (8.2)
Average	45 (46.4)
Good	39 (40.2)
Very good	4 (4.1)
Normally I eat	
Less than one meal a day	0 (0.0)
One meal a day	2 (2.1)
Two meals a day	18 (18.6)
Three meals a day	47 (48.5)
More than three meals a day	30 (30.9)

SNAQ: Simplified Nutritional Appetite Questionnaire

Appetite status

More than half of the residents had poor appetite, comprising 58.5% of the old-old, 55.2% of the oldest, and 44.4% of the young-old, respectively. There was no significant difference in appetite status between the age groups. Table 2 depicts the distribution of responses according to the elements of the appetite assessment. Of all the respondents, 46.4% perceived their appetite as average. While approximately 80% of the respondents had three or more meals per day, early satiety was common, with approximately 60% of the older adults unable to finish more than half of the meals served, which was accompanied by more than 50% feeling dissatisfied with the taste of the foods served.

Associations between appetite and selected factors

As depicted in Table 3, there were no significant associations between socio-demographic characteristics (age, sex, and duration of stay), clinical characteristics, medication use, meal satisfaction, functional status, presence of depressive symptoms, and perceived oral health among older adults with their appetite status. On the other hand, there was a significant association between ethnicity and appetite status, with older Malay adults having significantly poorer appetite than Chinese or Indian ethnicities ($\chi^2=0.008, p<0.05$). In addition, there was a significant association between sleep quality and appetite status ($\chi^2=4.852, p<0.05$), whereby respondents who had better sleep quality had better appetite.

Contribution of socio-demographic characteristics, clinical characteristics, depressive symptoms, and sleep quality towards appetite

Table 4 shows the predictive model for appetite status among residents. Variables

with a $p<0.25$ in the bivariate analyses, namely ethnicity, sleep quality, history of hospitalisation, number of diseases, arthritis, hypercholesterolaemia, meal satisfaction (colour contrast), and depressive symptoms, were included in the logistic regression model. Ethnicity was the only variable that significantly contributed to appetite among older adults. Logistic regression model showed that the Malay ethnicity had 2.73 times the odds of having poor appetite compared to other ethnicity groups ($\beta=1.005, OR=2.73, 95\% CI=1.004, 7.444, p=0.049$). The model explained 18.6% (Cox and Shell R-squared) and 24.8% (Nagelkerke R-squared) of the variance in appetite status.

DISCUSSION

The prevalence of poor appetite was evident in more than half of the older adults residing in long-term care facilities. Nevertheless, the prevalence was lower compared to previous local studies either among community dwellers (Suzana *et al.*, 2013; Syafinas *et al.*, 2018) or institutionalised older adults in Penang (Suzana & Charn, 2009). These discrepancies could be attributed to the lower mean age of the residents, shorter duration of stay at the institutions, and the use of different screening tools in the assessment of appetite across these studies. Notwithstanding, the prevalence of poor appetite was higher compared to community-dwelling older adults in other countries, including the United States (van der Meij *et al.*, 2017). The discrepancies between the present study findings and that of the above three studies were expected, as the earlier studies were conducted among community-dwelling older adults. The problem of appetite loss among the elderly at long-term care facilities cannot be disregarded; early identification of anorexia and correct nutritional

Table 3. Associations of selected characteristics/factors with appetite status among older adults ($n=97$)

Characteristics	n (%)		χ^2	p-value
	Poor appetite	Good appetite		
Age (years)			1.341	0.512
60-69	12 (23.1)	15 (33.3)		
70-79	24 (46.2)	17 (37.8)		
>80	16 (30.8)	13 (28.9)		
Sex			0.592	0.442
Male	18 (34.6)	19 (42.2)		
Female	34 (65.4)	26 (57.8)		
Ethnicity			7.047	0.008*
Malay	39 (75.0)	22 (48.9)		
Non-Malay	13 (25.0)	23 (51.1)		
Duration of stay			1.616	0.446
1-5 years	33 (63.5)	30 (66.7)		
5-10 years	14 (26.9)	8 (17.8)		
>10 years	5 (9.6)	7 (15.6)		
History of hospitalisation			1.412	0.235
Yes	35 (67.3)	25 (55.6)		
No	17 (32.7)	20 (44.4)		
Number of diseases			1.829	0.176
None	12 (23.1)	16 (35.6)		
≥1 disease	40 (76.9)	29 (64.4)		
Medication use			0.281	0.596
<5 medications	47 (90.4)	42 (93.3)		
>5 medications	5 (9.6)	22 (48.9)		
Meal satisfaction			0.238	0.625
Temperature	31 (59.6)	29 (64.4)		
High satisfaction	21 (40.4)	16 (35.6)		
Low satisfaction				
Colour contrast			2.028	0.154
High satisfaction	18 (34.6)	22 (48.9)		
Low satisfaction	34 (65.4)	23 (51.1)		
Food choices			0.480	0.488
High satisfaction	16 (30.8)	11 (24.4)		
Low satisfaction	36 (69.2)	34 (75.6)		
Sleep quality			4.852	0.028*
Poor sleep quality	47 (90.4)	33 (73.3)		
Good sleep quality	5 (9.6)	12 (26.7)		
Functional status			0.116	0.734
Normal	9 (17.3)	9 (20.0)		
Functionally disabled	43 (82.7)	36 (80.0)		
Perception of oral health			0.939	0.645
Good	17 (32.7)	19 (42.2)		
Moderate and poor	35 (67.3)	26 (57.8)		
Depressive symptoms			1.476	0.224
Normal	4 (7.7)	1 (26.7)		
Depressive	48 (92.3)	44 (47.8)		

Table 4. Multiple logistic regression analysis for factors predicting appetite among older adults (n=97)

Variables	B	SE	Wald	Df	Sig	Exp(B)	95% of CI For Exp(B)
Constant	-0.081	0.473	0.029	1	0.864	0.922	
Ethnicity (Malay)	1.005	0.511	3.869	1	0.049	2.733	1.004, 7.444
History of hospitalisation	-0.347	0.489	0.503	1	0.478	0.707	0.271, 1.845
Number of diseases	-0.642	0.600	1.144	1	0.285	0.526	0.162, 1.707
Arthritis	1.270	0.831	2.335	1	0.126	3.560	0.699,18.148
Hypercholesterolaemia	-0.888	0.595	2.228	1	0.136	0.411	0.128, 1.321
Meal satisfaction (colour contrast)	0.464	0.522	0.790	1	0.374	1.590	0.571, 4.426
Sleep quality	1.046	0.649	2.596	1	0.107	2.844	0.798, 10.142
Depressive symptoms	-1.116	1.201	0.865	1	0.352	0.327	0.031, 3.444

intervention are critical for improving their health and quality of life.

The high prevalence of depressive symptoms among institutionalised older adults is a warning sign and consistent with a recent study conducted among Jordanians living in residential care facilities (Al-Amer *et al.*, 2019). The rate of depression was however higher compared to previous local studies (Suzana & Charn, 2009; Normala *et al.*, 2014), as well as institutionalised residents in Asia, including China (Wang *et al.*, 2021), Japan (Haseda *et al.*, 2018), and Thailand (Charoensakulchai *et al.*, 2019). The finding discrepancy could be due to differences in sampling methodologies, demographics, and the use of different measures of depression (Wang *et al.*, 2021).

While poor sleep quality was expected among institutionalised residents, the abnormally high prevalence was alarming and consistent with an earlier local study (Rashid, Ong & Wong, 2012), as well as studies in Spain (Valenza *et al.*, 2013) and China (Zhu *et al.*, 2020). Sleep quality among the residents appeared to be significantly associated with their appetite in the bivariate analysis of the present study, but this association was no longer significant in the logistic model. The lack of heterogeneity in this sample may partially explain why the present study failed to document significant contributions towards

appetite. Our findings were not in line with an earlier study showing that appetite was significantly associated with increased sleep efficiency among older adults in Japan, whereby older adults with good appetite had better sleep quality (Yamamoto *et al.*, 2020). Serum leptin concentration, the *ob* gene product secreted by adipose tissue, declines gradually during ageing (Isidori *et al.*, 2000) and may lead to low-level expression of orexins, the appetite-stimulating peptides, which promote food intake in a dose-dependent manner (Sakurai *et al.*, 1998). Decrease of orexins with ageing has also been linked to reduced wakefulness and increased excessive daytime sleepiness, causing more nighttime arousals and awakenings, thus poor sleep quality (Lin, 2018). Figure 1 depicts the proposed putative mechanism between leptin, orexins, appetite and sleep. Notwithstanding the lack of significant contribution of sleep quality to appetite in this study, the co-existence of poor appetite and poor sleep quality among residents warrants more studies in these aspects.

Ethnicity was the only factor that predicted appetite among older adults in long-term care facilities in this study. Compared to Chinese and Indians, Malay residents had poorer appetite. Studies on the association between ethnicity and appetite are limited. A recent study conducted among community-

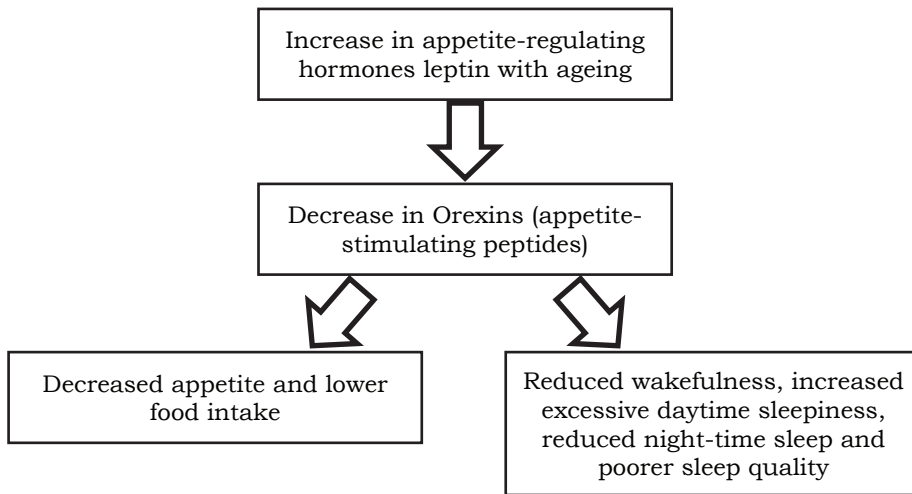


Figure 1. Proposed mechanisms of leptin, orexins, appetite, and sleep quality in older adults

dwelling older adults showed that non-white skin tone was independently and strongly correlated with poor appetite (Zukeran *et al.*, 2022). In Malaysia, limited studies have been conducted to determine the association between ethnicity and appetite regardless of age. Nevertheless, available local studies have consistently reported poorer diet quality among Malay respondents, be it young adults and children (Rezali *et al.*, 2015), middle-aged adults (Eng *et al.*, 2022) or community-dwelling older adults (Nohan *et al.*, 2020). The exact mechanism for this is unclear, with a past study suggesting distinct ethnic dietary pattern that may have been shaped by an individual's own socio-cultural entity in determining his/her food preferences (Nohan *et al.*, 2020). On the other hand, a recent study showed that in multicultural societies like Malaysia and Singapore, culture is often recreated and reconstructed as it interacts with different social elements that it is exposed to (Reddy & van Dam, 2020), narrowing food cultural differences and possibly the risk of poor appetite across different ethnicities. Acknowledging the

finding discrepancies, future studies are needed to delineate the relationship between ethnicity and appetite.

There are several limitations throughout the implementation of this study that should be acknowledged. Firstly, the study design was cross-sectional, in which the causal and effect relationship of poor appetite and its associated factors could not be determined. Secondly, this study was conducted during the COVID-19 pandemic, which restricted movement and data collection in long-term care institutions. Despite movement restrictions, the research team tried to reach out to all the long-term care facilities located in Petaling and Hulu Langat via personal contacts and networking to ensure that the data collection process adhered completely with the standard operation procedures set by the institutions, which allowed the present study to achieve 90% study power. Finally, it is important to note that the mean age of the older adults in our study was lower than that in previous studies. Therefore, these findings should be interpreted with caution.

Further research is needed to fully understand the interaction between factors associated with poor appetite. To discover the causes of disease and to identify relevant risk factors and health outcomes, cohort studies with larger sample sizes are warranted. Moreover, future research should examine appetite status in older adults using different instruments, which are required in many contexts. In addition, appropriate intervention programmes with the assistance of dietitians and other relevant parties should be implemented to improve residents' appetite, including the availability of more food varieties for the residents, meal preparation training for cooks, and modification of the meal environment.

CONCLUSION

This study revealed a high prevalence of poor appetite among residents of long-term care facilities. Nutritional interventions, such as quality and varieties of meals served, are warranted to mitigate the risk of poor appetite among residents. The higher risk of poor appetite among the Malay residents deserves more work in future studies.

Acknowledgement

The authors wish to thank the institutions and the respondents for their cooperation during data collection. This study was funded by Ajinomoto (Malaysia) Berhad. The funding body provided an unrestricted research grant and had no role in the design of the study, data collection, analysis and interpretation of data, and in writing the manuscript.

Authors' contributions

Duaa A, contributed to data collection, data analysis and interpretation, responsible for data curation and drafted the original manuscript; Chan YM, involved in the conception and study design, supervised the work, responsible for data curation and drafted the original manuscript; Siti Nur Asyura A, involved in the conception and study design and supervised the work; Chin

YS, Zalilah MS, Lim PY, Sazlina SG and Tanti IR; supervised the work; Lim PY, supervised the data interpretation. All authors reviewed and approved the final manuscript.

Conflict of interest

The authors declare no conflict of interest.

References

- Al-Amer R, Subih M, Aldaraawi H, Randall S, Othman WMM & Salamonsen Y (2019). Prevalence of Depression and Its Influence on the Quality of Life of Jordanians Living in Residential Care Facilities. *J Nurs Res* 27:e54.
- Buysse DJ, Reynolds CF III, Monk TH, Berman SR & Kupfer D (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res* 28(2):193–213.
- Charoensakulchai S, Usawachoke S, Kongbangpor W, Thanavirun P, Mitsiriswat A, Pinijnai O, Kaensingh S, Chaikyakham N, Chamnanmont C, Ninnakala N, Hiri-O-Tappa P, Ponginsee V, Atichatpongsuk V, Asawathepmetha EO, Thongprayoon C, Mao MA, Cheungpasitporn W, Varothai N & Kaewput W (2019). Prevalence and associated factors influencing depression in older adults living in rural Thailand: A cross-sectional study. *Geriatr Gerontol Int* 19(12):1248–1253.
- Department of Statistics of Malaysia (2021). *Current population estimates, Malaysia*. From <http://www.statistics.gov.my>. [Retrieved October 4, 2023].
- Dominguez Castro P, Reynolds C, Bizzaro MG, Kennelly S, Clyne B, Bury G, Bradley C, Finnigan K, McCullagh L, Murrin C, Perrotta C, Gibney ER & Corish CA (2021). Characteristics and determinants of high volume dispensing users in long-term oral nutritional supplement users in primary care: a secondary analysis. *BJGP Open* 5(2): BJGPO.2020.0131.
- Eng CW, Lim SC, Ngongo C, Sham ZH, Kataria I, Chandran A & Mustapha FI (2022). Dietary practices, food purchasing, and perceptions about healthy food availability and affordability: a cross-sectional study of low-income Malaysian adults. *BMC Public Health* 22(1):192.
- Haseda MA-O, Kondo NA-O, Ashida TA-OX, Tani YA-O, Takagi D & Kondo K (2018). Community social capital, built environment, and income-based inequality in depressive symptoms among older people in Japan: An ecological study from the JAGES project. *J Epidemiol* 28:108–116.

- Isidori AM, Strollo F, Morè M, Caprio M, Aversa A, Moretti C, Frajese G, Riondino G & Fabbri A (2000). Leptin and aging: correlation with endocrine changes in male and female healthy adult populations of different body weights. *J Clin Endocrinol Metab* 85(5):1954-62.
- Lin JN (2018). Correlates and influences of taking an afternoon nap on nocturnal sleep in Chinese elderly: A qualitative study. *Geriatr Nurs* 39(5):543-547.
- Malafarina V, Uriz-Otano F, Gil-Guerrero L & Iniesta R (2013). The anorexia of ageing: physiopathology, prevalence, associated comorbidity and mortality. A systematic review. *Maturitas* 74(4):293-302.
- Nohan AF, Adznam SN, Jamaluddin R & Norazman CW (2020). Diet quality and its associated factors among community dwelling older adults in urban district in Kuala Lumpur, Malaysia. *Mal J Med Health Sci* 16(6):153-162.
- Normala R, Azlini C, J. Nurul M & Lukman ZM (2014). The prevalence of depression and its risk factors among Malay elderly in residential care. *Am J Appl Sci* 11(9):1456-1462.
- Norman K, Haß U & Pirlich M (2021). Malnutrition in Older Adults-Recent Advances and Remaining Challenges. *Nutrients* 13(8):2764.
- Pigłowska M, Guligowska A & Kostka T (2020). Nutritional status plays more important role in determining functional state in older people living in the community than in nursing home residents. *Nutrients* 12(7):2042.
- Pizzola L, Martos Z, Pfisterer K, de Groot L, Keller H (2013). Construct validation and test-retest reliability of a mealtime satisfaction questionnaire for retirement home residents. *J Nutr Gerontol Geriatr* 32(4):343-359.
- Rashid A, Ong EK & Wong ESY (2012). Sleep quality among residents of an old folk's home in Malaysia. *Iran J Nurs Midwifery Res* 17(7):512-519.
- Reddy G & van Dam RM (2020). Food, culture, and identity in multicultural societies: Insights from Singapore. *Appetite* 1(149):104633.
- Rezali FW, Chin YS, Mohd Shariff Z, Mohd Yusof BN, Sanker K & Woon FC (2015). Evaluation of diet quality and its associated factors among adolescents in Kuala Lumpur, Malaysia. *Nutr Res Pract* 9(5):511-516.
- Sakurai T, Amemiya A, Ishii M, Matsuzaki I, Chemelli RM, Tanaka H, Williams SC, Richardson JA, Kozlowski GP, Wilson S, Arch JR, Buckingham RE, Haynes AC, Carr SA, Annan RS, McNulty DE, Liu WS, Terrett JA, Elshourbagy NA, Bergsma DJ & Yanagisawa M (1998). Orexins and orexin receptors: A family of hypothalamic neuropeptides and G protein-coupled receptors that regulate feeding behavior. *Cell* 92(5):1-696.
- Streicher M, van Zwiene-Pot J, Bardou L, Nagel G, The R, Meisinger C, Colombo M, Torbahn G, Kiesswetter E, Flechtner-Mors M, Denking M, Rothenbacher D, Thorand B, Ladwig KH, Corish CA, Clarke M, Kerse N, Muru-Lanning M, Gibney ER, O'Connor EM & MaNuEL consortium (2018). Determinants of Incident Malnutrition in Community-Dwelling Older Adults: A MaNuEL Multicohort Meta-Analysis. *J Am Geriatr Soc* 66(12):2335-2343.
- Suzana S, Boon PC, Chan PP & Normah CD (2013). Malnutrition risk and its association with appetite, functional and psychosocial status among elderly Malays in an agricultural settlement. *Malays J Nutr* 19(1):65-75.
- Suzana S & Charn YB (2009). Factors influencing appetite and depression among institutionalised elderly in Penang. *Mal J Health Sci* 7(2):73-88.
- Syafinas A, Siti Nur 'Asyura A, Chan YM, Zuriati I, Nasir Mohd TM & Nur Aqlili Riana H (2018). Quality of life among elderly: The view from appetite and anthropometry characteristic perspective. *Elder Health J* 4(1):4-10.
- Valenza MC, Cabrera-Martos I, Martín-Martín L, Pérez-Garzón VM, Velarde C & Valenza-Demet G (2013). Nursing homes: Impact of sleep disturbances on functionality. *Arch Gerontol Geriatr* 56(3):432-436.
- van der Meij BS, Wijnhoven HAH, Lee JS, Houston DK, Hue T, Harris TB, Kritchevsky SB, Newman AB & Visser M (2017). Poor appetite and dietary intake in community-dwelling older adults. *J Am Geriatr Soc* 65(10):2190-2197.
- Wang F, Liu S, Zhang Q, Ng CH, Cui X, Zhang D & Xiang YT (2021). Prevalence of depression in older nursing home residents in high and low altitude regions: A comparative study. *Front Psychiatry* 12:669234.

- Wilson MM, Thomas DR, Rubenstein LZ, Chibnall JT, Anderson S, Baxi A, Diebold MR & Morley JE (2005). Appetite assessment: Simple appetite questionnaire predicts weight loss in community-dwelling adults and nursing home residents. *Am J Clin Nutr* 82(5):1074-1081.
- WHO (2019). *Ageing*. World Health Organization. From https://www.who.int/health-topics/ageing#tab=tab_1. [Retrieved September 15 2023].
- Yamamoto K, Motokawa K, Yoshizaki T, Yano T, Hirano H, Ohara Y, Shirobe M, Inagaki H, Awata S, Shinkai S & Watanabe Y (2020). Association of dietary variety and appetite with sleep quality in urban-dwelling older Japanese adults. *J Nutr Health Aging* 24(2):152-159.
- Zhu X, Hu Z, Nie Y, Zhu T, Chiwanda Kaminga A, Yu Y & Xu H (2020). The prevalence of poor sleep quality and associated risk factors among Chinese elderly adults in nursing homes: A cross-sectional study. *PLoS One* 15(5):e0232834.
- Zukeran MS, Valentini Neto J, Romanini CV, Mingardi SV, Cipolli GC, Aprahamian I & Lima Ribeiro SM (2022). The association between appetite loss, frailty, and psychosocial factors in community-dwelling older adults. *Clin Nutr ESPEN* 47:194-198.