Correlation between general health toward nutritional and oral health status, and nutrition toward oral health status of elderly in a typical retirement community-house

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ABSTRACT

Introduction: Indonesia is in an aging population era marked by an increase in elderly population above 7%. An enhancement of elderly population presents health problems due to organ function deterioration and requires extraordinary attention. General health, nutrition, and oral health status are the most problems claimed by elderly, particularly retired. Objective of this study was to analyze the correlation between general health status toward nutrition status and oral health status, and the correlation nutrition status to oral health status in a typical retired community-house. **Methods:** Analytical descriptive research with cross sectional method was carried out on 36 respondents in Paguyuban Purnabakti, Patrang, Jember, East Java Province. The sampling was done by purposive sampling. Information was obtained from the questionnaire and research form. General health observation, it comprised smoking status, routine general health observation, presence of systemic diseases, blood pressure, blood pressure status, and blood biochemical parameters. Nutritional status was examined by body mass index (BMI). Oral health status included the number of the remaining teeth, oral hygiene status (OHI-s), periodontal treatment need (CPITN), denture wear, and oral soft tissue diseases. **Results:** The result exhibited that most of the respondents presented good general health status. However, there was no significant correlation between general health status (blood glucose, total cholesterol, uric acid level and blood pressure status) with nutrition status (r=0.014, r=0.241, r=-0.034, and r=0.011, respectively). The general health status was also no correlation with oral health (r <0.400), except blood glucose level to remaining teeth (r=0.414). Likewise nutritional status to oral health status, there were no correlations between the variables (r<0.400), except nutrition status to remaining teeth (r=0.410). **Conclusion:** No correlation between general health to nutritional status and oral health, and nutritional status to oral health status of elderly.

Keywords: elderly; health status indicators; metabolic syndrome; nutritional status; oral health

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INTRODUCTION

Recently elderly issue became the main highlight in the World, particularly developed and developing countries where the elderly population is higher than the younger generation. The World Health Organization (WHO) stated elderly are individuals aged over 65 years old and not productive. Of equally divided elderly people to be three groups, individual aged over 65 years; unemployed/not productive; and physical changes.[1]

At present Indonesia is included as a country which is in an aging population era or old structure signed by an increase in elderly population above 7%. Regarding projection data in 2017, elderly people in Indonesia were about 23.6 million (9.03%). This number is estimated to have more than doubled to represent 48.19 million in 2035.[2,3]

An enhancement of elderly population presents advantages and disadvantages. One of the advantages is the enhancement of life expectancy. It will be supported by elderly status that is healthy, active and productive. By this condition, they will be independent and cheerful individuals. However the increase led to other problems, such as health and social life. They were related with body function deterioration of elderly, so they required extraordinary attention, especially their health and activities.[4,5]

General health, nutrition, and oral health are the most common problems experienced by the elderly, especially pensioners. The general health of the elderly is the general physical condition and circumstances surrounding the elderly that support the elderly in carrying out their daily lives. The parameters are determined based on the current condition and the history of the disease or past habits. The current situation includes gender, marital status, living arrangement (residence), and economic status, including quitting work.[6,7] The retiring status changes their life habits, when they still work, they carry out many activities and interact with other people every day. However, when they retire, most of the activities are carried out at home.[8] Moreover, position absence and monthly income reduction directly affect the fulfillment of their health needs and care.[6] While disease history included physical conditions (such as disability), smoking status, presence of systemic disease (frequency and severity). The elderly used to check their blood pressure, blood sugar, cholesterol, and uric acid level for screening it.[7,9]

On the other hand, increasing age affects physical activity, and the degradation of chewing affects the nutritional status and oral health of the elderly.[10] These oral conditions included number of natural teeth, natural teeth occlusion, presence periodontal diseases, presence dentures, oral mucosa health and oral hygiene.[11] Several previous studies reveal many factors that determine the health of the elderly. However, it is debatable whether there are any related or not.[10, 12] Masood et al. described that oral health did not correlate to gender, education, income, systemic diseases, and social support of the elderly, but it correlated to systemic pain sensation.[13]

Likewise nutritional status, the nutritional status of the elderly is the vital thing to know the quality of life of the elderly. Based on the regulation of the Minister of Health of the Republic of Indonesia, nutritional status can be determined by measuring the ratio of body weight and height (Body mass index/ BMI). By BMI, the nutritional status is classified to underweight (malnutrition), normal, pre obesity, and obesity.[14] In addition, this nutritional status may be associated with general and oral health, although it is still unclear. Dai et al. [5] revealed that elderly nutrition was not associated with chronic disease. Meanwhile, El Helou et al. described that poor oral health might increase the risk of chronic systemic disease and malnutrition in the elderly.[15] Moreover, several studies showed that nutrition related to loneliness, family dimension, and social support, which determined life quality and oral health of the elderly, although their life quality did not relate to pension status.[3,4,16] Paguyuban Purnabakti is a retired social community in Patrang, Jember, Indonesia. The member of this community is about 100 people consisting of public and private servant retired. This community possesses several activities, routine meetings (once a month), social activities, and traveling. In routine meetings, they do not only do regular social gatherings, but they also share knowledge and information. This study aimed to analyze the correlation between general health status toward nutrition status and oral health status, and the correlation nutrition status to oral health status Paguyuban Purnabakti Patrang, Jember, Indonesia.

METHODS

Analytical descriptive research with cross sectional method was carried out on 36 respondents in Paguyuban Purnabakti, Patrang, Jember, East Java Province. This study was approved by The Ethical Committee of Medical Research, Faculty of Dentistry, Universitas Jember, No. 924/UN25.8/KEK/DL/2019. Although the population in this study was 100 older people who were recorded as members of Paguyuban Purnabakti, Patrang, Jember, East Java Province, this study used 36 respondents, because only 36 respondents who participate and respond when recalled. This study used non-probability sampling, namely the purposive sampling technique, in which the respondents were older people who qualify the inclusion criteria of this study. The inclusion criteria were recorded as permanent and active members of the association, retired, physically and mentally healthy, male or female, aged 50 years and over, willing to fill in the informed consent as research subjects. The number of respondents who corresponded to the criteria of the study and filled informed consent was 36 people.

Data were collected using questionnaires, general health examinations, nutrition examination, and oral health examinations. Direct interviews with the patient carried out data collection using questionnaires, and the questions on the questionnaire were closed questions (the research subjects only had to choose the option). The questionnaire recorded the respondent's identity or demographic data, including name, address, age, gender, education level (not qualified: uneducated or not/ graduated from elementary school; qualified: graduated from junior or senior high school; and higher education: graduated from bachelor or post graduated), and residence status (independently: stay alone; and with family: stay with their spouse or children or relatives). Besides, this questionnaire recorded respondents' general health status, which includes smoking status (never: not smoked at all; ex-smoker: used to smoke, but quitted more than 6 month; current smoker: smoked until now), routine general health observation (routine: regularly visited the heath service center; moderate: visited the health service center if they were sick; never: not visited the health service center at all, although they were sick), and presence systemic diseases. Beside based on questionnaire, general health checks screened for systemic disorders, which recorded blood pressure and random blood biochemical parameters (glucose, cholesterol, and uric acid levels). Blood pressure was observed using the systolic and diastolic values, which these values determined blood pressure status. The blood pressure were classified into 5 (five) categories: Normal (sistole: 110 – 129; diastole 80 – 84); pre hypertension (sistole: 130 – 139; diastole 85 – 89); Hipertensi 1 (sistole: 140 – 159; diastole: 90 – 99); Hipertensi 2 (sistole: 160 – 179; diastole: 100 – 109); and malignant hypertensison (sistole ≥ 180; diastole ≥ 110). This examination evaluated the possibility of a risk of metabolic disorders.[6,7] Besides, this examination recorded the respondents' nutritional status using the ratio of body weight and height (BMI). The index was classified into 5 (five) categories: underweight (<18.5), normal (18.5-24.9), pre-obesity (25-29.9), obesity grade I (30-34.9), obesity grade II (35-39.9), obesity grade III (more than 40).[17,18]

The clinical data collected were the number of remaining teeth in the oral cavity, oral hygiene status based on oral hygiene index (OHI-s), periodontal treatment needs based on community periodontal index of treatment need (CPITN), denture wear, and oral soft tissue diseases. Whereas the oral soft tissue diseases described oral mucosa condition including presence ulcers, candidiasis, plaques, and petechiae.[11,19]

The data obtained in this study were ordinal or categorical data, so they were analyzed using frequency distributions, such as average, standard deviation, number and percentage. The Spearman rank correlation test was also carried out to see the possible correlation between general health status to nutrition status and oral health status, and nutrition status to oral health status ($p<0.05$).

RESULTS

The study result described mean and frequency distribution (percentage). Table 1 exhibited demographic data of respondents. Demographic data presented groupings of respondents based on age, gender, education level, residence. Based on socio-demographic data, most of the respondents aged more than 60 years old (more than 80%),

Table 1. Characteristic description of the elderly in paguyuban purnabakti, Patrang, Jember (n=36)

Variable	n (%)
Age (years)	
o 51-60	4 (11.1)
o 61-70	10 (27.8)
o 71-80	16 (44.4)
o > 80	6 (16.7)
Sex	
o Male	12 (33.3)
o Female	24 (66.7)
Education level	
o Not qualified	0 (0)
o Qualified	11 (30.6)
o Higher education	25 (69.4)
Residence	
o Independently	16 (44.4)
o With family	20 (55.6)

Data were presented number (percentage); [a] a mean or average; n: number of respondents

Table 2. General health status of the elderly in paguyuban purnabakti, Patrang, Jember (n=36)

Variable	n (%)
General health status	
Smoking status	
o Never	27 (75)
o Ex-smoker	9 (25)
o Current Smoker	0 (0)
Systemic diseases	
o No	23 (63.9)
o Yes	13 (36.1)
Routine general health observation	
o Routine	8 (22.2)
o Moderate	27 75)
o Never	1 (2.8)
Blood biochemical observation	
o Glucose (mg/dl)	123.88±23.54[a]
o Total cholesterol (mg/dl)	130.71±27.45[a]
o Uric acid (mg/dl)	5.44±0.49[a]
Blood pressure (mmHg)	
o Systole	151.48±16.66[a]
o Diastole	85.6±14.61[a]
Blood pressure status	
o Normal	3 (8.57)
o Pre-Hypertension	9 (25.71)
o Hypertension 1	7 (20)
o Hypertension 2	14 (37.14)
o Malignant hypertension	3 (8.57)

which the distribution were 61-70 years (27.8%), 71-80 (44.4%), and more than 80 years (16.7%). Demographic data also showed that most of the respondents were female (66.7%), and 69.4% had a higher education background. Besides, several respondents chose to live alone in their house (44.4%), and 55.6% of respondents choose to live with their family (children/spouse) (Table 1).

Table 2 described general health status grouping consisted of smoking status, presence/absence of systemic disorders, frequency visiting doctor/hospital, biochemical parameters (glucose, cholesterol, and uric acid) and blood pressure. Most of the respondents had not smoked (75%), and only 25% of respondents were former smokers. 36.1% of respondents suffered systemic disorders, but only 22.2% of respondents underwent routine general health observation. The random blood biochemical examination results showed the average levels of glucose, cholesterol, and uric acid in the respondents were 123.88 mg/dl, 130.71 mg/dl, and 5.44 mg/dl, respectively. Besides, based on the type of hypertension classification, almost all respondents have higher than normal pressure, where prehypertension was 25.71%, hypertension 1 was 20%, hypertension 2 was 37.14%, and malignant hypertension was 8.57%.

Based on respondents' nutritional status assessed by BMI, most of the respondents were categorized as poor nutritional status. The respondent who had low body weight was 13.9%, and obesity was 47.2%. In the obesity classification, 36.1% were pre obesity, 8.3% were grade 1 obesity, and 8.3% were grade 2 obesity (Table 3).

Therefore, oral health status described the remaining teeth, oral hygiene status, periodontal treatment need, denture wear, and oral soft tissue diseases. Oral health status showed that

Table 3. Nutrition status of the elderly in paguyuban purnabakti, Patrang, Jember (n=36)

Variable	n (%)
Nutrition status	
o Low weight (Malnutrition)	5 (13.9)
o Normal	14 (38.9)
o Pre-Obesity	13 (36.1)
o Obesity Grade 1	3 (8.3)
o Obesity Grade 2	1 (2.8)
o Obesity Grade 3	0

most respondents experienced tooth loss, where 30.6% of respondents only had 12-17 remaining teeth. Although many respondents experienced tooth loss, only 17.2% used dentures. More than half of the respondents had poor oral hygiene status (58.3%), and 44.4% needed dental cleaning and health education from dentists. Besides, most respondents (82.8%) did not show any abnormalities in the oral soft tissue (Table 4).

Table 5 showed the correlation analysis results for the variables of general health status (blood biochemical parameters and blood pressure) to nutritional status and oral health status. This correlation analysis was as one of screening method to know risk of metabolic syndrome and investigation relationship between nutrition and oral health. Table 5 indicated there was no relationship between general health status with nutrition status and oral health status, except blood glucose level to remaining teeth. There was negative correlation between glucose level to remaining teeth (r=-0.414). It revealed that the higher the blood glucose level, the less the remaining teeth. Blood glucose, total cholesterol, uric acid, and blood pressure status did not correlate to nutritional status, oral hygiene status, periodontal treatment need, denture wear, and oral soft tissue diseases (r<0.400).

Table 4. Oral health status of the elderly in paguyuban purnabakti, Patrang, Jember (n=36)

Variable	n (%)
Oral health status	
The remain of teeth	
○ 0-5	5 (13.9)
○ 6-11	5 (13.9)
○ 12-17	11 (30.6)
○ 18-23	8 (22.2)
○ 24-29	7 (19.4)
○ >29	0 (0)
Oral hygiene status	
○ Good	2 (5.6)
○ Moderate	13 (36.1)
○ Poor	21 (58.3)
Periodontal treatment demand	
○ Not	2 (5.6)
○ Require enhancement of oral hygiene and DHE personally	3 (8.3)
○ Require cleaning from professional and DHE	16 (44.4)
○ Require treatment from professional	15 (41.7)
○ Require complex treatment from professional	0 (0)
Denture wear	
○ No	30 (82.8)
○ Yes	6 (17.2)
Oral soft tissue diseases	
○ No	30 (82.8)
○ Yes	6 (17.2)

Table 5. Result of corellation analysis

		Smoking	Systemic disorders	Routine general health observation	Nutritional status	Remain teeth	OHI-s	CPITN
Age	r	0.236	-0.065	0.020	0.589 **	-0.411*	0.019	0.354*
	Sig.	0.165	0.706	0.906	0.000	0.013	0.914	0.034
Smoking	r	1.000	0.501 **	-0.316	-0.311	-0.311	-0.178	-0.071
	Sig.	.	0.002	0.061	0.065	0.065	0.300	0.682
Systemic disorders	r	0.501 **	1.000	0.440 **	0.003	0.097	-0.186	-0.091
	Sig.	0.002	.	0.007	0.986	0.573	0.278	0.597
General check	r	-0.316	0.440 **	1.000	0.092	0.077	0.148	0.111
	Sig.	0.061	0.007	.	0.594	0.654	0.389	0.520
Nutritional status	r	-0.311	0.003	0.092	1.000	0.410*	0.155	0.160
	Sig.	0.065	0.986	0.594	.	0.013	0.368	0.352
Remain teeth	r	-0.311	0.097	0.077	0.410*	1.000	0.298	0.074
	Sig.	0.065	0.573	0.654	0.013	.	0.077	0.669
OHI-s	r	-0.178	-0.186	0.148	0.155	0.298	1.000	0.371*
	Sig.	0.300	0.278	0.389	0.368	0.077	.	0.026
CPITN	r	-0.071	-0.091	0.111	0.160	0.074	0.371*	1.000
	Sig.	0.682	0.597	0.520	0.352	0.669	0.026	.

Data were coefficient correlation and significant value Data were analyzed by Spearman's Rank; **, strong correlation value; *, moderate correlation; r, coefficient correlation; sig., significant value (p<0.05)

Table 4. The correlation blood biochemical profile and blood pressure to nutrition status, periodontal health and oral hygiene

Variables	Nutrition status	Periodontal health status	Oral hygiene
Blood glucose level	0.014 (NS)	-0.141 (NS)	-0.414 *
Total cholesterol level	0.241 (NS)	-0.192 (NS)	-0.077 (NS)
Uric acid level	-0.034 (NS)	-0.069 (NS)	-0.063 (NS)
Blood pressure	0.011 (NS)	-0.329 (NS)	-0.206 (NS)

Data were presented result of Chi-Square and Pearson's test; P value, correlation value; *,

Table 6 showed the correlation analysis between nutritional status and oral health status. There was no relationship between nutrition status and oral health status ($r<0.400$), except nutritional status to remaining teeth ($r=-0.410$). It revealed that the malnutrition (low body weight) caused tooth loss (fewer remaining teeth).

DISCUSSION

Recent study was cross-sectional study aimed to observe and screen social status, general health, nutrition and oral health of elderly (retired) in Patrang, Jember, Indonesia. The observation demonstrated there was no correlation between general health and nutrition status and oral health status of the elderly who retired. Although several studies was not in line with this study that showed retirement status correlated and impacted the general health status of the elderly, in which the general status would correlate the nutrition and oral health status.[3,11,20,21] However Sulistyawati's and Chi et al. study showed no relationship between the general health, nutrition status and oral health of the elderly who retired.[22,23] No relationship might be probably due to family support (children or relatives) still paid attention to the elderly's basic needs, including nutrition, health, and dental care. In addition, retirement status did not change the elderly income; they still get income even though the amount was reduced. The family support and dimension of pension significantly influenced their health and nutritional status. Beside it, most of them lived with their family (their children), so their daily needs might fulfill with their children. Ederly people who had income and lived with their family had adequate nutrition and other needs supported their health.[24,25]

Interestingly, this study showed there was correlation between blood glucose level to remaining teeth, although there were no correlations between blood glucose level to other oral health status variables. Moreover Kim et al. and Holmlund et al. described that blood glucose level increased tooth loss risk through periodontal destruction and poor oral hygiene.[26,27] The tooth loss in this study might cause other causes, such as trauma or dental caries, whereas in this study only observed periodontal need treatment and oral hygiene index.

Moreover, this study showed that the nutrition status of the elderly in this social community was poor, although there was no relationship between nutrition status and oral health. Koodaryan et al. showed no relationship between oral health and the nutrition status of the elderly.[28] It might be caused by the quantity of food, not the quality. The quality of food does not only determine the BMI, but it is also determined by the quantity and frequency intake of food. The elderly tended to have poor nutrition due to decreased chewing function, especially to chew meat, vegetables, and fruits. These food are difficult to chew, but the elderly can change them with other foods.[10,28]

In addition, there was no relationship in all variables because the respondents enjoyed their lives. This study was not in line with Rina et al. study. Rina et al. revealed that the retirement and family support absence caused a lessening of confidence, income, and facilities impacting to psychological and health status of the elderly.[25,29] The social community of the respondents in this study might build positive character, togetherness and networking, so they expressed confidence to perform their life. Togetherness and shared each other conferred confidence to skip syndrome power which most complained by retired. The elderly lifestyle who actives in the social community, networking, and religious meeting enhanced orderliness, satisfaction, and life quality of elderly—retired elderly who lived solely and enclosed themselves easily experienced

depression and caused mortality.[4,25,29,31] Moreover, interview outcome, they frequently made the meeting on the other time of the routine meeting. This meeting was informal due to discuss the hobby and fascinating topics. Even they traveled together. Furthermore, they were fenceless to get information or training from others or professionals.

This study subsequently exhibited the respondents had metabolic syndrome risk related cardiovascular diseases and hypertension. This was supported by enhancement of glucose, total cholesterol, blood pressure and nutrition status changes. Most of them trended to experience pre-obesity and obesity. This might be related alteration of total cholesterol, blood pressure and life style. However, this recent study deeply did not explore retired life style. The metabolic syndrome is a group of disorders related alteration of glucose, cholesterol and blood pressure which lead diabetes mellitus, hypertension and cardiovascular diseases. The risk of metabolic syndrome enhances following the age and aging due to deterioration of organ function comprehensively and reduction of physical activities, so it stimulates decrease of metabolic rate and increase of fat deposition systemically.[32-34]Although several studies showed a correlation between general health and nutritional status to oral health, this study did not significantly correlate. The oral health of the elderly might be determined by many factors, not only general health and nutrition status, such as physical limitations in maintaining oral health (brushing teeth) and decreased awareness of maintaining dental health. The elderly might not pay attention to their performance, although this study did not investigate it. Moreover, the types and frequency of meals determined general health, oral health, and nutrition status. Oral health correlates with general health and nutrition, although maintaining oral health is difficult for the elderly. Few elderly have an awareness of their oral health and require special dental care, although we should not assume that all elderly communities have this condition. Following the increasing age, the support of body tissues decreases, including the supporting tissues of the teeth and the oral environment, such as decreased salivary flow. The consequences of this condition were decreasing the oral cavity's self-cleansing ability, so plaque accumulates quickly and leads to periodontal disease and tooth loss.[7,17,21,35,36]

This study presented many limitations, such as sample size and primary data exploration. The sample size of this study was few, although more than 10% of population, the size could not represent and conclude the profile of social status, general health, nutrition and oral health of elderly who retired. Moreover, the proportion of sex and age was imbalance, so this study could not conclude the association age and sex to social status, general health, nutrition and oral health of elderly who retired. Primary data exploration, such as interview and observation, was inadequate, such as daily meal consumption, daily physical ability, regular drug consumption, their life alteration after retired etc. It influenced investigation of factors related quality life of elderly. Community studies were extremely depended on sample size, primary and secondary data exploration, because these studies were predominantly affected confounding factor influencing result and conclusion.[36]

CONCLUSION

This study limited in Paguyuban Purnabakti, Patrang, Jember, East Java Province. Although this study could not generate in all communities, this study concluded no relationship between general health status to nutritional status, and oral health status, and nutritional status to oral health status of the elderly who retired in this community. This research required further research on lifestyle, consistency of physical activity, and visits to posyandu. Further study should consider the sample size and proportion of each variable.

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REFERENCES

1. WHO. World report on Ageing and Health. 1th ed. Luxembourg: WHO Library Cataloguing;

2015. p. 1–260.
2. Adioetomo SM, Mujahid G. Indonesia on The Threshold of Population Ageing. UNFPA Indonesia Monograph series. 2014. p. 1–90.
3. Setiati S, Laksmi PW, Aryana IGPS, Sunarti S, Widajanti N, Dwipa L, Seto E, Istanti R, Ardian LJ, Chotimah SC. Frailty state among Indonesian elderly: prevalence, associated factors, and frailty state transition. BMC Geriatr. 2019; 19(1): 182. DOI: 10.1186/s12877-019-1198-8.
4. Moeini B, Barati M, Farhadian M, Ara MH. The association between social support and happiness among elderly in Iran. Korean J Fam Med. 2018;39(4):260–5. DOI: 10.4082/kjfm.17.0121
5. Dai Y, Zhang CY, Zhang BQ, Li Z, Jiang C, Huang HL. Social support and the self-rated health of older people: A comparative study in Tainan Taiwan and Fuzhou Fujian province. Medicine (Baltimore). 2016;c95(24):ce3881. DOI: 10.1097/MD.0000000000003881.
6. Kemenkes RI. Analisis lansia di Indonesia. Pusat Data dan Informasi Kementerian Kesehatan RI. Jakarta: Kementerian Kesehatan Republik Indonesia; 2017. p. 1–2.
7. Razak PA, Richard KMJ, Thankachan RP, Hafiz KAA, Kumar KN, Sameer KM. Geriatric oral health: a review article. J Int oral Heal JIOH. 2014; 6(6): 110–6.
8. Motegi H, Nishimura Y, Terada K. Does Retirement Change Lifestyle Habits. Japanese Econ Rev. 2016;67(2):169–91. DOI: 10.1111/jere.12104
9. Hsieh MH, Lin WY, Chien HH, Chien LH, Huang CK, Yang JF, Ho CK. Waist circumference, body mass index, serum uric acid, blood sugar, and triglyceride levels are important risk factors for abnormal liver function tests in the Taiwanese population. Kaohsiung J Med Sci. 2012; 28(9) :470-6. DOI: 10.1016/j.kjms.2012.04.003
10. Yoshida M, Suzuki R, Kikutani T. Nutrition and oral status in elderly people. Jpn Dent Sci Rev. 2014; 50(1): 9–14. DOI: 10.1016/j.jdsr.2013.09.001
11. Moriya S., and Miura H. Oral health and general health at the early stage of ageing: a review of contemporary studies. Jap Dent Sci Rev. 2014; 50(1):15-20. DOI: 10.1016/j.jdsr.2013.10.002
12. Amarya S, Singh K, Sabharwal M. Changes during aging and their association with malnutrition. J Clin Gerontol Geriatr. 2015; 6(3): 78–84. DOI: 10.1016/j.jcgg.2015.05.003
13. Masood M, Newton T, Bakri NN, Khalid T, Masood Y. The relationship between oral health and oral health related quality of life among elderly people in United Kingdom. J Dent. 2017; 56: 78-83. DOI: 10.1016/j.jdent.2016.11.002.
14. Kemenkes RI. Peraturan menteri kesehatan republik indonesia nomor 2 tahun 2020. Kementerian kesehatan republik indonesia. Jakarta: Kementerian Kesehatan Republik Indonesia. 2020. p. 78
15. El Hélou M, Boulos C, Adib SM, Tabbal N. Relationship between oral health and nutritional status in the elderly: A pilot study in Lebanon. J Clin Gerontol Geriatr. 2014; 5(3): 91–5. DOI: 10.1016/j.jcgg.2014.04.002
16. Wiliyanarti PF, Notobroto HB, Asri K. The effect of social and participation environmental factors on achievement of the well-being for elderly. J Appl Sci Res. 2017; 5(6): 71–8.
17. Kim S, Chang Y, Kang J, Cho A, Cho J, Hong YS, et al. Relationship of the blood pressure categories, as defined by the acc/aha 2017 blood pressure guidelines, and the risk of development of cardiovascular disease in low-risk young adults: insights from a retrospective cohort of young adults. J Am Heart Assoc. 2019; 8(11): 1–15. DOI: 10.1161/JAHA.119.011946.
18. Nuttall FQ. Body Mass Index: Obesity, BMI, and Health: A Critical Review. Nutr Today. 2015; 50(3): 117-8. DOI: 10.1097/NT.0000000000000092.
19. Chatzopoulos GS, Tsalikis L. Periodontal treatment needs and systemic diseases in an older population in Greece. J Clin Exp Dent. 2016; 8(1): e32-7. DOI: 10.4317/jced.52763.
20. Triningtyas DA, Muhayati S. Konseling lansia: upaya lanjut usia dalam membangun kemandirian hidup dan penerimaan diri terhadap kesiapan memasuki masa pensiun (studi pada lansia di bina keluarga lansia posyandu cempaka kabupaten ngawi). (JKI Jurnal Konseling Indonesia). 2018; 4(1):16-21.
21. Sulistiyawati I. Hubungan Antara Pekerjaan,

Pendapatan, Pengetahuan Sikap Lansia Dengan Kunjungan Ke Posyandu Lansia. STRADA J Ilmiah Kesehatan. 2012; 1(2): 14-20.
22. Chi DL, Tucker-Seeley R. Gender-stratified models to examine the relationship between financial hardship and self-reported oral health for older US men and women. Am J Public Health. 2013; 103(8): 1507-15. DOI: 10.2105/AJPH.2012.301145.
23. Fares D, Rodrigues Barbosa A, Ferreti Borgatto A, Silva Coqueiro R da, Henrique Fernandes M. Factors associated with nutritional status of the elderly in two regions of brazil. Rev da assoc médica bras. 2012; 58(4): 434-41. DOI: 10.5935/MedicalExpress.2015.06.05
24. Eskelinen K, Hartikainen S, Nykänen I. Is Loneliness Associated with Malnutrition in Older People? Int J Gerontol. 2015; 10(1): 43-5. DOI: 10.1016/j.ijge.2015.09.001
25. Koodaryan R., Hafezeqoran A., Nourizadeh A., Rahimi A. O., Ahmadian M. The relationship between dental status, body mass index and nutrient intake. Advances in Bioscience and Clinical Medicine. 2014; 2(2): 24-33. DOI: 10.7575/aiac.abcmed.14.02.02.06
26. Dahlberg L, Agahi N, Lennartsson C. Lonelier than ever? Loneliness of older people over two decades. Arch Gerontol Geriatr . 2018; 75(November 2017):96–103. DOI: 10.1016/j.archger.2017.11.004
27. Park J, Roh S, Yeo Y. Religiosity, social support, and life satisfaction among elderly Korean immigrants. Gerontologist. 2012; 52(5): 641-9. DOI: 10.1093/geront/gnr103.
28. Kim SN, Lee SB. Spiritual Well-Being, Social Support, Life Satisfaction and Depression in the Community Dwelling Elderly. J East-West Nurs Res. 2013; 19(2): 186–94. DOI: 10.14370/jewnr.2013.19.2.186
29. Tanner RM, Brown TM, Muntner P. Epidemiology of obesity, the metabolic syndrome, and chronic kidney disease. Curr Hypertens Rep. 2012; 14(2): 152-9. DOI: 10.1007/s11906-012-0254-y.
30. Fava F, Gitau R, Griffin BA, Gibson GR, Tuohy KM, Lovegrove JA. The type and quantity of dietary fat and carbohydrate alter faecal microbiome and short-chain fatty acid excretion in a metabolic syndrome "at-risk" population. Int J Obes. 2013; 37(2): 216–23. DOI: 10.1038/ijo.2012.33
31. Andersen CJ, Fernandez ML. Dietary strategies to reduce metabolic syndrome. Rev Endocr Metab Disord. 2013; 14(3): 241–54. DOI: 10.1007/s11154-013-9251-y.
32. Razak PA, Richard KMJ, Thankachan RP, Hafiz KAA, Kumar KN, Sameer KM. Geriatric oral health: a review article. J Int oral Heal JIOH. 2014; 6(6): 110–6.
33. Shantia K, Savabi G, Khazaei S, Savabi O, Esmaillzadeh A, Keshteli AH, et al. Association between food intake and oral health in elderly: SEPAHAN systematic review no. 8. Dent Res J (Isfahan). 2011; suppl 1(8): S15.
34. Gil-Montoya JA, de Mello AL, Barrios R, Gonzalez-Moles MA, Bravo M. Oral health in the elderly patient and its impact on general well-being: a nonsystematic review. Clin Interv Aging. 2015; 10: 461-7. DOI: 10.2147/CIA.S54630.
35. Chatzopoulos GS, Tsalikis L. Periodontal treatment needs and systemic diseases in an older population in Greece. J Clin Exp Dent. 2016; 8(1): 1–6. DOI: 10.4317/jced.52763.
36. Braveman P, Gottlieb L. The social determinants of health: it's time to consider the causes of the causes. Public Health Rep. 2014; 129 Suppl 2(Suppl 2):19-31. DOI: 10.1177/00333549141291S206.