

Factors influencing the implementation of 'Four Pillars of Balanced Nutrition' in a Retired Health Cadre Program for the elderly in BTPN Salatiga

¹Sarwoningrum, R.T., ^{1*}Nissa, C., ¹Purwanti, R. and ²Setiarso, O.

¹Department of Nutrition Science, Faculty of Medicine, Universitas Diponegoro, Semarang

²Communication and Daya, PT BTPN Tbk, Jakarta

Article history:

Received: 29 December 2019

Received in revised form: 27 February 2020

Accepted: 23 May 2020

Available Online: 30 May 2020

Keywords:

Elderly,
Four pillars of Balanced Nutrition,
Clean and healthy lifestyle,
Frequency of attendance,
Dietary diversity,
Integrated Service Post

DOI:

[https://doi.org/10.26656/fr.2017.4\(S3\).S18](https://doi.org/10.26656/fr.2017.4(S3).S18)

Abstract

Elderly people are at risk in overnutrition or undernutrition, and thus leading to cause multiple diseases. Responding to this, 'Four Pillars of Balanced Nutrition' is recommended to promote health status, particularly in Integrated Service Post for Retired People (*Posyandu lansia*). However, there is limited evidence regarding factors influencing the implementation of 'Four Pillars of Balanced Nutrition'. Retired Health Cadre is a BTPN bank-funded program which provides similar facilities to regular Integrated Service Post with several adjustments including time, services and the usage of peer counseling. Therefore, this cross sectional study was aimed to investigate the correlation of the frequency of participant attendance, gender, education level and income of elderly people in Retired Health Cadre Program to implement 'Four Pillars of Balanced Nutrition'. This research was conducted in BTPN Salatiga branch offices with forty-four participants aged 60-74 years, enrolled by consecutive sampling method. Data collected include general characteristics, single 24-hour recall, level of physical activity and questionnaire of implementation clean and healthy lifestyle. The participants' weight and height were measured to calculate BMI. Statistical analysis included univariate analysis, bivariate analysis using chi-square and multivariate analysis using logistic regression. Bivariate analysis showed no correlation between the program attendance frequency with Dietary Diversity Score (DDS) ($p=0.1000$), physical activity ($p=0.383$), clean and healthy lifestyle implementation ($p=0.357$) and nutrition status ($p=0.068$). However, the multivariate analysis showed that the level of education affects food diversity more than the frequency of attendance ($p=0.019$) and frequency of attendance is the factor that affects nutritional status most ($p=0.037$) compared to others. In conclusion, there was no correlation between participant attendance frequency toward dietary diversity, physical activity, clean and healthy lifestyle implementation and nutrition status among elderly participants of Retired Health Cadre Program in BTPN Salatiga. However, dietary diversity was affected by education level while the nutrition status was affected by the frequency of attending.

1. Introduction

Elderly people are more prone to have both undernutrition and overweight for several reasons. These conditions related to many factors like problems in chewing and digestion, or lack of appetite which contribute to loss of weight. In contrast, sedentary lifestyle, being physically inactive, imbalance intake, or hormonal change could cause overweight (Boscatto *et al.*, 2013). Moreover, overweight raises the risk of mortality to suffer from diabetes, hypertension, and cardiovascular diseases (Ahmed and Haboubi, 2010).

Recently the data shows that adults above 75 years old by far have the highest prevalence in developing hypertension and cardiovascular disease with 69.5% and 4.7% respectively (Kementerian Kesehatan Republik Indonesia, 2018). While type 2 diabetes mostly occurred on the elderly aged 55-64 years with 6.3% (Kementerian Kesehatan Republik Indonesia, 2018). Thus, the provider caring for the elderly must take this data into consideration due to the number of elderly are predicted to rise in the future, especially when setting the program aim. Several methods are established in order to decrease this number including to apply the principle of balanced

*Corresponding author.

Email: nissaeyong@gmail.com

nutrition.

Balanced nutrition consists of four main pillars basically a series of efforts to balance between nutrients intake and uptake by monitoring body weight regularly (Kementerian Kesehatan Republik Indonesia, 2014). The four pillars involve food diversity, physical activity, implementation of clean and healthy lifestyle, and also monitoring and maintaining normal body weight (Kementerian Kesehatan Republik Indonesia, 2014). Previous research shows the higher the food diversity score, the healthier and better their cognitive function (Clausen and Holmboe-Ottesen, 2005). Other studies describe physical activity such as Tera Gymnastics improves their heart and lung fitness (Parwati *et al.*, 2013). Moreover, the implementation of clean and healthy lifestyle has a strong correlation with preventing infectious diseases that lead to malnutrition (Kemenkes, 2011). In general, applying 'Four Pillars of Balanced Nutrition' helps the elderly to adapt during their ageing process. Delivering this information becomes mandatory for everyone.

Government, as well as the private sector, has provided information to the application of 'Four Pillars of Balanced Nutrition'. For instance, government launch Communication, Information, and Education (IEC) for elderly people by encouraging local people through Integrated Service Post (*posyandu*) as the closest basic health care facility in the community, which services are delivered by the women at the society. It is considered as a place for basic health services that focused on prevent and promote without ignoring curative and rehabilitative (Khofifah, 2016). The main purpose of the program is to improve the health status of the elderly in order to achieve a happy and more beneficial in the family and community (Khofifah, 2016). However, the implementation of Integrated Service Post for elderly needs the role of community in long term care services. Integrated service post for the elderly is difficult to succeed without adequate government support. It is also necessary to improve services with creativity and culturally acceptable activities (Pratono and Maharani, 2018).

Few studies on the participation of the elderly in Integrated Service Post revealed that older adult who attends in the program have a strong impact in the ability to detect malnutrition earlier (Utami and Palupi, 2017), better nutrition status (Sam and Asnindari, 2014) and have a better quality of life (Karohmah, 2016). Although the information on health status, food pattern, and lifestyle are accessible for the elderly, frequency of attendance in these programs is quite low, some factors including lack of knowledge about the program, difficult

access, lower level of family support, cadre services, and physical condition (Pertiwi, 2013; Alhidayati, 2014; Ginting and Etalia, 2019).

In the private sector, BTPN in collaboration with Universitas Diponegoro released a Retired Health Cadre Program for their retirement customer. This program adopts the elderly Integrated Service Post with several modifications including the time of implementation, provided service, and counseling methods to deliver message especially 'Four Pillars of Balanced Nutrition' to boost their attendance in the program. First, the access to this program is high since retired customer of BTPN bank withdraws their retirement payment at the beginning of the month for 2 until 4 days. While waiting to be called by the teller or after taking their money, they could get benefits of this program (Wijayanti *et al.*, 2019). Secondly, it provides services such as height and weight measurement, nutritional status, blood pressure and additional services for measuring body composition. Body composition especially body fat and visceral fat are important indicators in the early detection of cardiovascular disease and diabetes mellitus type 2 (Chang *et al.*, 2018). Thirdly, participants also receive nutrition and health counseling from cadres using peer counseling methods. The counseling process helps the elderly to acknowledge and to deal with their individual nutrition and health problems (Waryana, 2016). Furthermore, during counseling, participants sharing experiences occurs in order to help the elderly in making decisions related to self-management, especially a healthy lifestyle (Officer and Beard, 2015).

This program attracts elderly to participate, to check and to monitor their health status repeatedly, therefore the message delivers continuously. Previous research presented that elderly who were actively attended on Integrated Service Post more than six times have a better quality of life than older people who are not active (Latifah, 2013). The result of other studies also showed that active leisure activities, such as club/organization or volunteering, homemaking/maintenance and traveling, were significant predictors of life satisfaction for older adults (Dongwook *et al.*, 2017). The evidence about the effectiveness of Integrated Service Post for elderly people, particularly in implementing balanced nutrition is still limited. Provision of information on an ongoing basis will increase knowledge that will be the basis for forming behavior in accordance with the knowledge possessed (Notoadmodjo, 2014). Hence, this study aimed to analyze the association between which factors that affect the implementation of 'Four Pillars of Balanced Nutrition' most at Retired Health Cadre Program for the elderly in BTPN bank Salatiga.

2. Materials and methods

2.1 Research design

A cross sectional study design with forty-four elderly people bank customers aged 60 to 74 years old was selected using consecutive sampling in BTPN Salatiga. Location selection was based on a large number of elderly people around 21.396 (11.6%), high prevalence of non-communicable disease like hypertension (74%) and DMT2 (8.8%) (Dinkes, 2015), and also high client participation. Subjects were qualified if participated in the program at least twice from June until November 2018 and able to communicate with others.

2.2 Data collected

2.2.1 General characteristics

General characteristics including name, date of birth, address, occupation, income, level education, residence status and housing status and history of disease.

2.2.2 Frequency of attendance

Attending frequency data was collected using attendance book which categorized based on the median, $<4x$ and $\geq 4x$ of attendance.

2.2.3 Dietary diversity

A single 24-hour recall was performed to measure Dietary Diversity Score (DDS) with 9 food group according to the guidelines by FAO (2013). DDS was categorized into minimal dietary diversity (<4 food group) and adequate dietary diversity ($\geq 4x$ food group) (Krawinkel, 2017).

2.2.4 Physical activity

Global Physical Activity Questionnaire (GPAQ) was performed based on the levels of physical activity which categorized into light (<600 MET/week), moderate (600-3000 MET/week) and vigorous (3000 MET/week) (WHO, 2010a).

2.2.5 Clean and healthy lifestyle

Implementation of Clean and Healthy Lifestyle (Perilaku Hidup Bersih Sehat/PHBS) was recorded based on the Indonesia Ministry of Health Guideline (Kemenkes, 2011). This research used 5 points individual PHBS which categorized into two categories: do not implement if it less than 5 points and implemented if it meets 5 points required.

2.2.6 Body mass index (BMI)

The participant weight and height were measured to calculate BMI which categorized as: normal weight (18.5-24.9 kg/m^2) and overweight (≥ 25 kg/m^2) (Depkes,

2017).

2.3 Statistical analysis

Statistical analysis includes univariate analysis, bivariate analysis using chi-square and multivariate analysis using logistic regression. This research was approved by the Health Research Ethics Committee Faculty of Medicine of Universitas Diponegoro Number 142/EC/KEPK/FKUNDIP/V/2019, and signed informed consent was obtained from all participants.

3. Results and discussion

In this research, elderly men and women have the same amount to participate in the Retired Health Cadre Program in BTPN Salatiga as seen in Table 1. This result was not in line with previous research that showed more elderly women took part in the Elderly Integrated Service Post (*Posyandu Lansia*) than elderly men (Latifah, 2013). A factor that might affect the interest in attendance in this research is the level of education. Most of the participants in this program were elderly with high education. The level of education will affect attitude development toward new value (Notoadmodjo, 2014). Previous research shows a positive correlation between the level of education toward the interest in attending of Integrated Service Post (Sari, 2009). This means that the level of education will be followed by a high level of interest in attending of Integrated Service Post (Sari, 2009). High interest can be seen from the attendance frequency in a certain period of time.

Table 1. General characteristics subject

Characteristic Subjects	n	Percentage (%)
Age		
60-74 years old	44	100.00%
Gender		
Male	22	50.00%
Female	22	50.00%
Education		
Basic Education	3	6.80%
Secondary Education	19	43.20%
High Education	22	50.00%
Income		
$<$ Minimal income labour	11	25.00%
\geq Minimal income labour	33	75.00%

Based on attendance book, 52.3% subject had attended the program more than equal four times, a larger number compared with subjects who had attended the program less than four times (47.7% subject) as depicted in Table 2. Based on the result of observation and interview show that new client will participate the program if it directed/invented by cadre, want to use the service provided and have a health problem. This result

was appropriate with previous research that showed the elderly were more motivated to attend the integrated service post if they were sick or had a health problem (Lestari *et al.*, 2018). On the other hand, a long time client's reasoned to attend this program to know their health condition and make a conversation with Cadre. Other research showed that good services and Cadre attitude will lead participants attendance continuously (Alhidayati, 2014).

Table 2. Distribution of attendance frequency and implementation of 'Four Pillars of Balanced Nutrition'

Variable	n	Percentage (%)
Attending Frequency		
< 4x	21	47.70%
≥ 4x	23	52.30%
Dietary Diversity Score		
Minimal dietary diversity	22	50.00%
Adequate dietary diversity	22	50.00%
Physical Activity		
Moderat	19	43.20%
Vigorous	25	56.80%
PHBS Implementation		
Not implement	23	52.30%
Implement	21	47.70%
Body Mass Index		
Overweight	14	31.80%
Normal weight	30	68.20%

Elderly who attend continuously will get regular and ongoing counseling. During counseling, subjects were given information about 'Four Pillar of Balanced Nutrition' in general and health problem solution in specific. The provision of sustainable health information will increase knowledge about it (Notoadmodjo, 2014). Furthermore, with the knowledge they build, it will lead to the awareness that ultimately makes a person behave according to the knowledge he had (Notoadmodjo, 2014). Previous research showed that counseling intervention was effective in improving elderly knowledge and changing their attitudes to be more positive, which led to improve their dietary practice (Mohamed *et al.*, 2013).

The statistical analysis in Table 3 showed that there

Table 3. Crosstab of dietary diversity score

		Minimal Dietary Diversity		Adequate Dietary Diversity		p-value
		n	%	n	%	
Attending Frequency	<4x	10	47.6	11	52.4	1.000
	≥4x	12	52.2	11	47.8	
Gender	Male	12	54.5	10	45.5	0.763
	Female	10	45.5	12	54.5	
Education level	Basic education	15	68.2	7	31.8	0.034
	High education	7	31.8	15	68.2	
Income	< Minimal income labour	8	72.7	3	27.3	0.164
	≥ Minimal income labour	14	42.4	19	57.6	

is no correlation between attendance frequency towards the dietary diversity score in the elderly participants of Retired Health Cadre Program in BTPN bank Salatiga with $p=0.1000$ ($p>0.05$). Apparently, the frequency of attendance is not a direct factor that affects the subject's dietary diversity. Based on the result of multivariate analysis, the level of education had more effect on the subject's food diversity than the frequency of attendance ($p=0.019$). Some subjects claimed not to tell their wife or family about health information during counseling process. As a result, there was a barrier to the process of delivering information into behavior. In addition, the elderly usually have oral problem (Otsuka *et al.*, 2016) and subjects tend to choose foods based on appetite without considering adequate nutrition (Whitelock and Ensaiff, 2018).

In general, subjects with minimal and adequate dietary diversity have the same amount as much as 22 people (50%). Minimal dietary diversity (less than 4 food group) associated with inadequate nutrient intake. Previous research showed a positive association between DDS and probability of nutrition adequacy (Rathnayake *et al.*, 2012; Tavakoli *et al.*, 2016). In this research, most subjects do not consume food groups including organ meat, dairy product and egg because a high level of fat and cholesterol. Besides, dairy products had a strong correlation with the probability of adequacy of vitamin B2, vitamin B12, calcium, magnesium, protein and energy intakes (Tavakoli *et al.*, 2016). Calcium plays essential roles in various metabolic and physiological pathways (Tavakoli *et al.*, 2016). In contrast, starch/grains were consumed by all subjects, while dark green leafy vegetables; fruits and vegetable source vitamin A; meat, poultry, fish; legumes and seeds; also other fruits and vegetables were consumed by most participants. DDS of the grains group was correlated with the probability of adequacy in vitamin B2, vitamin B3, protein and energy intake (Tavakoli *et al.*, 2016). Dietary pattern with relatively high amounts of vegetables, whole grains fruits, poultry, fish and low-fat dairy products may be associated with superior nutrition status, quality of life and survival in older adults (Anderson *et al.*, 2013). Increased dietary diversity was related to reduce risk of

mortality, chronic disease, cardiovascular disease, and abdominal obesity (Tavakoli *et al.*, 2016). Other research shows that higher DDS associated with lower prevalence abdominal and regular obesity (Abris *et al.*, 2018).

Statistical analysis showed that there is no correlation between attendance frequency toward the physical activity of elderly participants of Retired Health Cadre Program in BTPN Salatiga with a p-value of 0.383 ($p > 0.05$) as shown in Table 4. This is because most of the subject have adequate physical activity even before participating in this program. Moderate physical activity like daily household chores, while vigorous physical activity including farming, raising livestock, gardening, and carpentering which is conducted 3-5 days a week. Subject's physical activity in this research was appropriate with the physical activity recommended for the elderly people by WHO (WHO, 2010b.) Adequate physical activities for the elderly should be associated to reduce cardiovascular disease, hypertension, diabetes mellitus type 2, osteoporosis, obesity and cancer (Chodzko-Zajkoet *al.*, 2009). In addition, most of the subjects had exercises like walking, aerobic, and static cycling with duration 15-30 minutes/3-5x/week for walking, and 60 minutes/2x/week for aerobic. Exercising can increase body fitness, muscle strength, flexibility and balanced (Chodzko-Zajkoet *al.*, 2009). Besides, physical activity in the elderly is good for maintaining cognitive function and prevent depression (WHO, 2010b).

Table 5 displays that there is no correlation between the attendance frequency toward the implementation of Clean and Healthy Lifestyle in elderly participants of Retired Health Cadre in BTPN Salatiga with a p-value of

0.357 ($p > 0.05$). Based on cross-tabulation, elderly with the frequency of attendance more than four times tend to implement PHBS. This study uses 5 individual PHBS points including washing hands with soap, using a latrine, consuming fruits and vegetables, doing physical activities and not smoking (Kemenkes, 2011). It categorized to implement PHBS if all points qualified. In general, 52.3% subjects did not implement PHBS. The PHBS point which is not implemented the most is washing hands with soap. Based on interviews, subjects carried out the practice of washing hands but did not use soap. This result appropriate with Riskesdas (2018) that states prevalence washing hand in the right way among the population aged ≥ 10 years old as much 49.8% (Kementerian Kesehatan Republik Indonesia, 2018). Another point that is also often not implemented is the consumption of fruits and vegetables and smoking behavior. Poor consumption of fruits and vegetable prevalence in the elderly population as much 97.2% (Hermina and Prihatini, 2016) and 28.8% population was smoking (Kementerian Kesehatan, 2018). Most subjects said that consumption of fruits and vegetables depends on availability and appetite, while for smoking the subjects admitted that it was still difficult to stop because it was a habit since they were young.

No correlation was found between the attendance frequency toward body mass index in elderly participants of Retired Health Cadre program in BTPN Salatiga as seen in Table 6 with a p-value of 0.068 ($p > 0.05$). However, based on the multivariate analysis result, attendance frequency is the factor that most affects nutritional status ($p = 0.037$) compared to other factors such as gender, education level and income. In this

Table 4. Crosstab of physical activity (GPAQ)

		Moderate Physical Activity		High Physical Activity		p-value
		n	%	n	%	
Attending Frequency	<4x	11	52.4	10	47.6	0.383
	$\geq 4x$	8	34.8	15	65.2	
Gender	Male	10	45.5	12	54.5	1.000
	Female	9	40.9	13	59.1	
Education level	Basic education	8	36.4	14	63.6	0.534
	High education	11	50.0	11	50.0	
Income	< Minimal income labour	5	45.5	6	54.5	1.009
	\geq Minimal income labour	14	42.4	19	57.6	

Table 5. Crosstab of clean and healthy lifestyle implementation

		Not Implement		Implement		p-value
		n	%	n	%	
Attending Frequency	<4x	13	61.9	8	38.1	0.357
	$\geq 4x$	10	43.5	13	56.5	
Gender	Male	13	59.1	9	40.9	0.546
	Female	10	45.5	12	54.5	
Education level	Basic education	14	63.6	8	36.4	0.227
	High education	9	40.9	13	59.1	
Income	< Minimal income labour	8	72.7	3	27.3	0.223
	\geq Minimal income labour	15	45.5	18	54.5	

Table 6. Crosstab of nutrition status

		Overweight		Normal weight		p-value
		n	%	n	%	
Attending Frequency	<4x	10	47.6	11	52.4	0.068
	≥4x	4	17.4	19	82.6	
Gender	Male	9	40.9	13	59.1	0.332
	Female	5	22.7	17	77.3	
Education level	Basic education	6	27.3	16	72.7	0.746
	High education	8	36.4	14	63.6	
Income	< Minimal income labour	5	45.5	6	54.5	0.287
	≥ Minimal income labour	9	27.3	24	72.7	

study, nutritional status is a result of the implementation of 'Four Pillar of Balanced Nutrition' that is affected by dietary diversity, physical activity and PHBS implementation (Kementerian Kesehatan Republik Indonesia, 2014). Dietary diversity affects sufficient nutrient adequacy. Nutrition adequate supports the metabolism which will have an impact on health. Physical activity has a role in energy expenditure to maintain energy balance. A positive energy balance causes overweight whereas a negative energy balance causes underweight (Lee, 2010). The implementation of PHBS is related to the occurrence of infectious diseases that directly affect nutritional status. Infectious diseases cause an increase in energy requirements, however, at the same time decreasing appetite resulting in a negative energy balance (Kementerian Kesehatan Republik Indonesia, 2014). Although statistically declared unrelated, there is a tendency that the elderly with an attending frequency more ≥4x have a normal weight (82.6%).

In general, the result of bivariate analysis showed that there is no correlation between attendance frequency toward the implementation of the 'Four Pillars of Balanced Nutrition' in elderly participants of Retired Health Cadre Program in BTPN Salatiga. This is because the knowledge of the subjects is limited to information that does not encourage them to implement 'Four Pillars of Balanced Nutrition'. However, based on multivariate analysis as seen in Table 7, attendance frequency is the most influencing factor toward nutritional status compared to other factors with a risk of 0.232. In addition, multivariate analysis in Table 8 also showed that level of education is the most influencing factor toward dietary diversity with a risk of 0.218. This result was in line with previous research which stated that participants with a lower level of education were higher expected risk of having a low DDS (Taruvunga et al., 2013).

Table 7. Multivariate analysis logistic regression of nutrition status (BMI)

	Coefficient	S.E	Wald	Df	p-value
Frequency of	-1.463	0.703	4.336	1	0.037

Table 8. Multivariate analysis logistic regression of dietary diversity score (DDS)

	Coefficient	S.E	Wald	Df	p-value
Education Level	-1.524	0.647	5.545	1	0.019

Based on SOR (Stimulus, Organism, Responses) theory, behavior can change if the stimulus exceeds the original stimulus (Notoadmodjo, 2014). In this study, stimulus is in the form of providing health information through peer counseling. If the stimulus is received by the organism means there is attention, understanding and acceptance from individual. After that, the organism processed the stimulus provided. Finally, with the encouragement of the surrounding, the stimulus has an action effect. The results or changes in behavior in this way require a long time and other supporting factors like family support as a reinforcing factor (Notoadmodjo, 2014). In addition, a barrier in information transfers to the subject's family and short-term memory may be a factor that can impact the implementation of 'Four Pillar of Balanced Nutrition'.

4. Conclusion

There was no correlation between attendance frequency toward Four Pillar of Balanced Nutrition (dietary diversity, physical activity, clean and healthy lifestyle implementation and nutrition status). However, there was a tendency that older people with more frequency of attendance have better physical activity, better clean and healthy lifestyle implementation and normal body weight. In addition, *multivariate analysis* result shows that dietary diversity affected by education level while nutrition status affected by frequency of attendance. For further research is recommended to use a cohort study design with larger sample size.

Conflict of Interest

There is no conflict of interest in this study.

References

Abris, G.P., Provideo, S.M.P., Hong, S., Yu, S.H., Lee, C.B., and Lee, J.E. (2018). Association between

- dietary diversity and obesity in the Filipino Women's Diet and Health Study (FiLWHEL): A cross-sectional study. *PLoS ONE*, 13(11), 1–16. <https://doi.org/10.1371/journal.pone.0206490>
- Ahmed, T. and Haboubi, N. (2010). Assessment and management of nutrition in older people and its importance to health. *Clinical Intervention in Aging*, 5, 207–216. <https://doi.org/10.2147/CIA.S9664>
- Alhidayati. (2014). Faktor-faktor yang Berhubungan dengan Perilaku Kunjungan Lansia ke Posyandu Lansia di Kerja Puskesmas Kampar Kabupaten Kampar Tahun 2013. *Jurnal Kesehatan Komunitas*, 2(5), 220–224. [In Bahasa Indonesia]. <https://doi.org/10.25311/jkk.Vol2.Iss5.78>
- Anderson, A.L., Harris, T.B., Tylavsky, F.A., Perry, S.E., Houston, D.K., Hue, T.F., Strotmeyer, E.S. Sahyoun, N.R. and Health ABC Study. (2013). Dietary patterns and survival of older adults. *American Dietetic Association*, 111(1), 84–91. <https://doi.org/10.1016/j.jada.2010.10.012>
- Boscatto, E.C., da Silva Duarte, M.F., da Silva Coqueiro, R. and Barbosa, A.R. (2013). Nutritional status in the oldest elderly and associated factors. *Revistada Associacao Medica Brasileira*, 59(1), 40–47. <https://doi.org/10.1590/S0104-42302013000100010>
- Chang, K., Chen, C., Chuang, H., Tsao, Y., Lin, Y. and Lin, P. (2018). Which obesity index is the best predictor for high cardiovascular disease risk in middle-aged and elderly population? *Archives of Gerontology and Geriatrics*, 78, 165–170. <https://doi.org/10.1016/j.archger.2018.06.002>
- Chodzko-Zajko, W.J., Proctor, D.N., Fiatarone Singh, M.A., Minson, C.T., Nigg, C.R., Salem, G.J. and Skinner, J.S. (2009). Exercise and physical activity for older adults. *Medicine and Science in Sports and Exercise*, 41(7), 1510–1530. <https://doi.org/10.1249/MSS.0b013e3181a0c95c>
- Clausen, T. and Holmboe-Ottesen, G. (2005). Predictors of food variety and dietary diversity among older persons in Botswana. *Nutrition*, 21(1), 86–95. <https://doi.org/10.1016/j.nut.2004.09.012>
- Depkes. (2017). Pedoman Praktis Memantau Status Gizi Orang Dewasa. Jakarta, Indonesia: Departement Kesehatan. [In Bahasa Indonesia].
- Dinkes. (2015). Profil Kesehatan Kota Salatiga. Salatiga, Indonesia: Dinas Kesehatan Kota Salatiga. [In Bahasa Indonesia].
- Dongwook, C., Post, J. and Kim, S.K. (2017). Comparison of passive and active leisure activities and life satisfaction with aging: Leisure and life satisfaction with aging. *Geriatrics and Gerontology International*, 18(3), 380–386. <https://doi.org/10.1111/ggi.13188>
- FAO. (2013). Guidelines for measuring household and individual dietary diversity. Rome, Italy: FAO.
- Ginting, D. and Etalia, N.(2019). Hubungan Dukungan Keluarga dengan Keaktifan Lansia Mengikuti Kegiatan Posyandu di Desa Lumban Sinaga Wilayah Kerja Puskesmas Lumban Sinaga Kecamatan Pangaribuan Kabupaten Tapanuli Utara Tahun 2017 Elderly Follows Integrated Service Post Activities in Lumb. *Journal of Healthcare Technology and Medicine*, 5(1), 72–85. [In Bahasa Indonesia]. <https://doi.org/10.33143/jhtm.v5i1.327>
- Hermina, and Prihatini, S. (2016). Gambaran Konsumsi Sayur dan Buah Penduduk Indonesia dalam Konteks Gizi Seimbang: Analisis Lanjut Survei Konsumsi Makanan Individu (SKMI) 2014. *Buletin Penelitian Kesehatan*, 44(3), 205–218. [In Bahasa Indonesia]. <https://doi.org/10.22435/bpk.v44i3.5505.205-218>
- Karohmah, A.N. (2016). Peran Posyandu Lansia dalam Meningkatkan Kesejahteraan Lanjut Usia (Kasus Pada Posyandu Lansia Sejahtera Kelurahan Pasirmuncang). Indonesia: Universitas Negeri Semarang, BSc. Thesis. [In Bahasa Indonesia].
- Kemenkes. (2011). Pedoman Pembinaan Perilaku Hidup Bersih dan Sehat (PHBS). Jakarta: Kementerian Kesehatan Republik Indonesia. [In Bahasa Indonesia].
- Kementerian Kesehatan Republik Indonesia. (2014). Pedoman gizi seimbang. Jakarta, Indonesia: Kementerian Kesehatan Republik Indonesia. [In Bahasa Indonesia]. [In Bahasa Indonesia].
- Kementerian Kesehatan Republik Indonesia. (2018). Riset Kesehatan Dasar 2018. Indonesia: Kementerian Kesehatan Republik Indonesia. [In Bahasa Indonesia].
- Khofifah, S.N. (2016). Keperawatan Gerontik. Jakarta, Indonesia: Kementerian Kesehatan Republik Indonesia. [In Bahasa Indonesia].
- Krawinkel M. (2017). Dietary Diversity Score: A Measure of Nutritional Adequacy or an Indicator of Dietary Diversity Score A Measure of Nutritional Adequacy or an Indicator of Healthy Diet? *Journal of Nutrition and Health Sciences*, 3(3), 1–9. <https://doi.org/10.15744/2393-9060.3.303>
- Latifah, D. (2013). Perbedaan Kualitas Hidup Lansia yang Aktif Mengikuti Posyandu Lansia dengan yang Tidak Aktif Mengikuti Posyandu Lansia di Desa Sirnobojo Kecamatan Pacitan. Indoensia: Universitas Muhammadiyah Surakarta, BSc. Thesis [In Bahasa Indonesia].
- Lee, R.D. (2010). Energy Balance and Body Weight. In *Nutrition Therapy and Pathophysiology*, p. 253.

- Wadsworth: Cengage Learning Inc.
- Lestari, Y.A., Yulianto, Hartono, A., Indrawati and Yunita, R. (2018). Motivation of the Elderly and Elderly Visits to the Elderly Integrated Service Post (Posyandu Lansia) in Klampisan Hamlet, Kedunggede Village, Dlanggu Sub-District, Mojokerto District. *Journal of Nurse and Health*, 7 (2), 124–132. <https://doi.org/10.36720/nhjk.v7i2.47>
- Mohamed, R.A., Awad, M.M., Shalaby, S.I. and Abdelsatar, H.N.E. (2013). Effect of Nutritional Health Education Program on Elderly Nutritional Knowledge, Attitude and Practice in Abu Khalifa Primary Health Care Center, Ismailia Governorate. *Medical Journal of Cairo University*, 81(1), 405–409.
- Notoadmodjo, S. (2014). Ilmu Perilaku Kesehatan. Jakarta: PT Rineka Cipta. [In Bahasa Indonesia].
- Officer, A. and Beard, J. (2015). Toward an Age-Friendly World. In World Report On Ageing And Health, p. 159-196. Geneva, Switzerland: WHO Publication.
- Otsuka, R., Kato, Y., Nishita, Y., Tange, C., Nakamoto, M., Tomida, M., Imai, T., Ando, F., Shimokata, H. and Suzuki, T. (2016). Dietary diversity and 14-year decline in higher-level functional capacity among middle-aged and elderly Japanese. *Nutrition*, 32(7–8), 784–789. <https://doi.org/10.1016/j.nut.2016.01.022>
- Parwati, N.M., Karmaya, I.N.M. and Sutjana, D.P. (2013). Group breathing-based exercise to improve cardiopulmonary fitness of aged care patients in Werdha Wana Seraya Denpasar. *Public Health and Preventive Medicine Archive*, 1(1), 24-28. <https://doi.org/10.15562/phpma.v1i1.154>
- Pertiwi, H.W. (2013). Faktor - Faktor yang Berhubungan dengan Frekuensi Kehadiran Lanjut Usia di Posyandu Lansia. *Jurnal Ilmiah Kebidanan*, 4(1), 1-15.
- Pratono, A.H. and Maharani, A. (2018). Long-Term Care in Indonesia: The Role of Integrated Service Post for Elderly. *Journal of Aging and Health*, 30(10), 1556–1573. <https://doi.org/10.1177/0898264318794732>
- Rathnayake, K.M., Madushani, P.A.E. and Silva, K.D.D.R. (2012). Use of dietary diversity score as a proxy indicator of nutrient adequacy of rural elderly people in Sri Lanka. *BMC Research Notes*, 5(469), 1-6. <https://doi.org/10.1186/1756-0500-5-469>
- Sam, R.M. and Asnindari, L.N. (2014). Perbedaan Status Gizi pada Lansia yang Mengikuti Posyandu Lansia dengan yang Tidak Mengikuti Posyandu Lansia di RW 02 Serangan Ngampilan Yogyakarta. Indonesia: Sekolah Tinggi Ilmu Kesehatan 'Aisyiyah, BSc. Thesis [In Bahasa Indonesia].
- Sari, P. (2009). Gambaran motivasi lansia dalam mengikuti posyandu lansia di dusun Siluk I selopamioro imogiri bantul Yogyakarta. Indonesia: Sekolah Tinggi Ilmu Kesehatan 'Aisyiyah, BSc. Thesis [In Bahasa Indonesia].
- Tavakoli, S., Dorosty-Motlagh, A.R., Hoshiar-Rad, A., Eshraghian, M.R., Sotoudeh, G., Azadbakht, L., Karimi, M. and Jalali-Farahani, S. (2016). Is dietary diversity a proxy measurement of nutrient adequacy in Iranian elderly women?. *Appetite*, 105, 468–476. <https://doi.org/10.1016/j.appet.2016.06.011>
- Utami, U. and Palupi, F.H. (2017). Efektivitas Posyandu Lansia terhadap Kemampuan Deteksi Dini Penyakit Degeneratif di Posyandu Lansia GBI Colomadu. *Jurnal Ilmiah Maternal*, 11(1), 70–74. [In Bahasa Indonesia].
- Waryana. (2016). Promosi Kesehatan, Penyuluhan, dan Pemberdayaan Masyarakat. Yogyakarta: Nuha Medika. [In Bahasa Indonesia].
- Whitelock, E. and Ensaff, H. (2018). On Your Own Older Adults' Food Choice and Dietary Habits. *Nutrients*, 10(4), 413, 1-17. <https://doi.org/10.3390/nu10040413>
- WHO. (2010a). Global Physical Activity Questionnaire (GPAQ) Analysis Guide. Geneva, Switzerland: Prevention of Noncommunicable Diseases Department, WHO.
- WHO. (2010b). Global Recommendation on Physical Activity for health. Switzerland: World Health Organization.
- Wijayanti, H.S., Purwanti, R., Setiarso, O., Fitranti, D.Y., Nissa, C., Panunggal, B. and Marfuah, D. (2019). Modul Pelaksanaan Program Kelompok Lansia Sehat BTPN (Kader Kesehatan Purnabakti). Yogyakarta : K-Media. [In Bahasa Indonesia].