

# Assessing Registered Dietitians and Nutritionists' Knowledge and Barriers in Conducting Malnutrition-Related Physical Examination among Older Adults

Almira Sitasari<sup>1,2,\*</sup>, Weni Kurdanti<sup>1,2</sup>, Rina Oktasari<sup>1</sup>, Astrid Herlinda Puspitasari<sup>1</sup>, Sakinah Harith<sup>3</sup>

<sup>1</sup>Department of Nutrition, Politeknik Kesehatan Kementerian Kesehatan Yogyakarta, Indonesia

<sup>2</sup>Center of Excellence for Applied Technology Innovation in the Field of Public Health (PUI-NOVAKESMAS), Politeknik Kesehatan Kementerian Kesehatan Yogyakarta, Indonesia

<sup>3</sup>School of Nutrition and Dietetics, Faculty of Health Sciences, Universiti Sultan Zainal Abidin, Gong Badak Campus, Malaysia

Received April 4, 2023; Revised July 19, 2023; Accepted August 15, 2023

## Cite This Paper in the Following Citation Styles

(a): [1] Almira Sitasari, Weni Kurdanti, Rina Oktasari, Astrid Herlinda Puspitasari, Sakinah Harith , "Assessing Registered Dietitians and Nutritionists' Knowledge and Barriers in Conducting Malnutrition-Related Physical Examination among Older Adults," *Universal Journal of Public Health*, Vol. 11, No. 4, pp. 487 - 493, 2023. DOI: 10.13189/ujph.2023.110414.

(b): Almira Sitasari, Weni Kurdanti, Rina Oktasari, Astrid Herlinda Puspitasari, Sakinah Harith (2023). *Assessing Registered Dietitians and Nutritionists' Knowledge and Barriers in Conducting Malnutrition-Related Physical Examination among Older Adults*. *Universal Journal of Public Health*, 11(4), 487 - 493. DOI: 10.13189/ujph.2023.110414.

Copyright©2023 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

**Abstract** Life expectancy in Indonesia is improving in the last decades resulting in an aging population. Older adults are at high risk of getting micronutrient deficiency and malnutrition. The competency of registered dietitians and nutritionists (RDNs) in assessing deficiencies and malnutrition is very important so that older adults can be given appropriate nutrition interventions. This study aims to determine the practice of physical examination (NFPE) among RDNs. This study was a cross-sectional study of 97 RDNs who take care of older adults in clinical and community settings in the Special Region of Yogyakarta. Dietitians and Nutritionists were asked to complete the online self-administered questionnaire on NFPE knowledge perception and its barriers to micronutrient deficiencies, hydration, and malnutrition in older adults. Mann-Whitney analysis was used. The majority of RDNs were knowledgeable in assessing micronutrients of vitamin C (41.2%) and Fe (40.2%); hydration status on dehydration (56.7%) and edema (53.6%); and malnutrition related to fat mass (39.2%). The majority reported barriers were lack of proper training (58.8%) and insufficient time practicing NFPE (36.1%). There were differences in knowledge of

physical examination related to vitamin C deficiency, hydration, dehydration, edema, ascites, muscle mass, and fat mass ( $p < 0.05$ ) between those who perceived and did not perceive the barrier "lack of time". Participants who perceived a lack of proper training have less knowledge of physical examination related to vitamin D, vitamin E, vitamin B, vitamin C, hydration, and muscle mass ( $p < 0.05$ ). Barriers to "outside the scope of practice" and "confidence" were not statistically significant to NFPE practice. Specific training on NFPE is needed to increase the capacity of RDNs. A reasonable workload will allow NFPE to be carried out by RDNs.

**Keywords** NFPE, Barrier, Older Adults, Muscle Mass, Vitamin

---

## 1. Introduction

Older adults is one of the groups at risk of malnutrition [1], [2]. Older adults who experience malnutrition will

increase risk of delirium, increased length of hospitalization, frailty, and also premature death [3], [4]. The risk of malnutrition in older adults is widely identified through nutritional screening tools such as Mini Nutritional Assessment (MNA), Malnutrition Universal Screening Tool (MUST), and Nutrition Risk Screening (NRS) [5] which enable registered dietitians and nutritionists (RDNs) to prioritize which patients they will meet first.

After doing the screening process, RDNs need to complete the assessment including the physical signs and symptoms [6]. The process by which RDNs may detect malnutrition among older adults has become increasingly standardized in recent years [7]. It's not new to examine someone physically to determine their nutritional status. However, over the years, methods for determining body composition have developed [8]. The chapter on nutrition assessment has been greatly enlarged to cover specific locations for assessing muscle mass and fat stores, along with descriptions of normal and deficient conditions for each location [9], clinical symptoms of vitamin and mineral deficiencies, and also functional capacity [10]. In clinical settings where the nutrition status of older adults may continue to decline during admission or in community settings where malnourished older adults may be left untreated. The conduct of NFPE will be important to prevent it from happening.

To determine the proper diagnosis of malnutrition or deficiency, RDNs need to perform NFPE well to the patients. Studies revealed that some factors may enhance and limit the use of NFPE in both clinical and community settings were prior NFPE education and training, having no confidence to conduct NFPE, time and workload of the RDNs, policy and procedures, the refusal of patients and their significant others in participating NFPE, and recognizing values of conducting NFPE [11], [12], [13].

Despite almost all RDNs have received Nutrition Care Process training both in clinical and community settings, there is little reported from dietitians' perspective regarding barriers to NFPE practice. Therefore, the aim of this study was to identify barriers to NFPE practice reported by geriatric RDNs.

## 2. Materials and Methods

The study was a cross-sectional study in the Special Region of Yogyakarta. Yogyakarta is known as a region with a high percentage of older adults [14]. The selected chronology was: March 2022 when online questionnaires were sent to 120 RDN. After 1 month, the RDN who had not responded to the questionnaire will be sent a follow-up email.

### 2.1. Ethical Approval

Ethics approval was granted by Politeknik Kesehatan Kementerian Kesehatan Yogyakarta Research Ethics

Committee (approval number e-KEPK/ POLKESYO/ 0123/ I/ 2022).

### 2.2. Study Population

We randomly sent an online questionnaire to 120 RDNs who worked in both community and clinical-based healthcare facilities and were asked to participate. We used the following inclusion criteria: RDNs who were registered in the Indonesian Nutrition Association of Yogyakarta, working at least 1 year doing Nutrition Care Process to older adult patients prior to the study. However, only 97 RDNs responded and completed the online questionnaire in this study.

### 2.3. Instruments

Respondents were asked to fill out an online questionnaire with question construction consisting of perceptions of knowledge (consisting of micronutrient deficiencies, fluid status, and malnutrition) as well as RDNs' barriers in carrying out nutrition-related physical examination practices in accordance with previously conducted research [15]. Micronutrient deficiencies assessed for knowledge perception are vitamin A, vitamin D, vitamin E, vitamin B, vitamin C, Zn, and Fe. Perceptions of knowledge regarding hydration status include hydration, dehydration, edema, and ascites. We assessed self-perception on NFPE skills of micronutrient deficiencies, fluid status, and malnutrition with the following questions : 1) for micronutrient deficiencies : *how knowledgeable are you in detecting vitamin A, vitamin D, vitamin E, vitamin B, vitamin C, Zn, Fe using physical examination?* With replies "not knowledgeable", "little knowledge", "somewhat knowledgeable", "knowledgeable", and "very knowledgeable"; 2) for fluid status: *how knowledgeable are you in detecting hydration and dehydration using physical examination?* With replies "not knowledgeable", "little knowledge", "somewhat knowledgeable", "knowledgeable", and "very knowledgeable". 3) for malnutrition status : *how knowledgeable are you in detecting fat mass, muscle mass, edema, and ascites using physical examination?* With replies "not knowledgeable", "little knowledge", "somewhat knowledgeable", "knowledgeable", and "very knowledgeable".

### 2.4. Statistical Analysis

All statistical analysis was carried out using SPSS version 26.0 software (Chicago, IL, USA). Significance testing was conducted using Mann-Whitney Test.

## 3. Results

In total, 97 of 120 RDNs completed the original survey and provided open and close-ended responses to the questions relating to self-perception on NFPE knowledge and the barriers of conducting NFPE.

**Table 1.** Distribution of RDN

N = 97	
Years as RDN (years ±SD)	9.783 ±8.59
Number of Older Adults Patients with Moderate to High Risk of Malnutrition per month (n ±SD)	17.54 ±25.93
Education (n%)	
Diploma	33 (33.7)
Bachelor/Applied Bachelor	54 (55.7)
Dietitian Internship Program	8 (8.2)
Master	2 (2.1)
Type of Healthcare Facility	
Top Referral Hospital	4 (4.1)
District Hospital	33 (34)
Regional Hospital	15 (15.5)
Clinics and Special Hospitals	22 (22.7)
Primary Healthcare	23 (23.7)
Certificate of Competencies	
Nutrition Care Process	69 (71.1)
Other Nutrition-Related Training	12 (12.4)
None	16 (16.5)

The majority of RDNs work in primary healthcare (23.7%) and clinics or special hospitals (22.7). The RDN reported that they handle approximately 17.54 ±25.93 older adults with moderate to high risk of malnutrition per month

(Table 1). The barriers reported can be seen in Table 2.

More than half of the RDNs felt that they lacked sufficient time, didn't feel confident enough, and believed that NFPE was outside of their area of practice. And more than half of RDNs reported that they didn't lack of NFPE training.

**Table 2.** Reported Barriers of Conducting NFPE

Barriers	No	Yes
	n (%)	n (%)
I don't have time	35 (36.1)	62 (63.9)
I lack proper training	57 (58.8)	40 (41.2)
I don't feel confident enough	22 (22.7)	75 (77.3)
It is outside of my job	5 (5.2)	92 (94.8)

The majority of the RDNs felt “knowledgeable” and “somewhat knowledgeable” in some parameters of micronutrient status (vitamin A, D, E, B, C, and Zn). In the parameter of Fe status, more than half of RDNs felt knowledgeable. Interestingly in fluid status parameters, more RDNs reported that they were “knowledgeable” in assessing dehydration than hydration status. In assessing malnutrition status, the majority of RDN reported that they were “knowledgeable” to assess ascites and edema in older adult patients, whereas they felt “knowledgeable” and “somewhat knowledgeable” in assessing fat and muscle mass. The results are summarized in Table 3.

**Table 3.** Self-Perception of NFPE Knowledge

Micronutrient Deficiency/ Malnutrition	Self Perception				
	Not Knowledgeable n (%)	Little Knowledge n (%)	Somewhat Knowledgeable n (%)	Knowledgeable n (%)	Very Knowledgeable n (%)
Vitamin A	5 (5.2)	9 (9.3)	41 (42.3)	31 (32)	11 (11.3)
Vitamin D	6 (6.2)	16 (16.5)	37 (38.1)	33 (34)	5 (5.2)
Vitamin E	7 (7.2)	27 (27.8)	44 (45.4)	15 (15.5)	4 (4.1)
Vitamin B	8 (8.2)	22 (22.7)	41 (42.3)	24 (24.7)	2 (2.1)
Vitamin C	3 (3.1)	10 (10.3)	30 (30.9)	40 (41.2)	14 (14.4)
Zn	15 (15.5)	19 (19.6)	38 (39.2)	22 (22.7)	3(3.1)
Fe	2(2.1)	5 (5.2)	21 (21.6)	39 (40.2)	30 (30.9)
Hydration	5 (5.2)	9 (9.3)	37 (38.1)	35 (36.1)	11 (11.3)
Dehydration	2 (2.1)	4 (4.1)	16 (16.5)	55 (56.7)	20 (20.6)
Fat Mass	4 (4.1)	10 (10.3)	39 (40.2)	38 (39.2)	6 (6.2)
Muscle Mass	2 (2.1)	17 (17.5)	36 (37.1)	36 (37.1)	6 (6.2)
Ascites	2 (2.1)	5 (5.2)	21 (21.6)	45 (46.4)	24 (24.7)
Edema	0 (0)	2 (2.1)	17 (17.5)	52 (53.6)	26 (26.8)

**Table 4.** Self- Perception Mean Rank of NFPE Knowledge

Self- Perception	Lack of Time			Lack Proper Training			Lack Confidence			Outside of the Job		
	Yes (n=35)	No (n=62)	p	Yes (n=57)	No (n=40)	p	Yes (n=22)	No (n=75)	p	Yes (n=5)	No (n=92)	p
<b>Micronutrient deficiency</b>												
Vitamin A	51.57	47.55	0.47	44.86	54.90	0.067	45.82	49.93	0.523	48.60	49.02	0.972
Vitamin D	55.60	45.27	0.06	43.34	57.06	0.013*	50.39	48.59	0.782	53.50	48.76	0.669
Vitamin E	56.86	44.56	0.02*	40.31	61.39	0.001*	41.50	51.20	0.130	63.10	48.23	0.220
Vitamin B	53.00	46.74	0.26	42.15	58.76	0.003*	41.98	51.06	0.160	51.00	48.89	0.863
Vitamin C	56.30	44.88	0.04*	42.75	57.90	0.006*	46.80	49.65	0.659	50.90	48.90	0.870
Zn	55.73	45.20	0.06	42.16	58.75	0.003	44.66	50.27	0.390	53.20	48.77	0.721
Fe	52.86	46.82	0.28	45.59	53.86	0.132	52.16	48.07	0.527	40.30	49.47	0.453
<b>Hydration Status</b>												
Hydration	60.77	42.35	0.001*	43.63	56.65	0.018*	46.05	49.87	0.554	41.40	49.41	0.512
Dehydration	58.74	43.50	0.004*	48.05	50.35	0.659	47.05	49.57	0.680	41.30	49.42	0.484
<b>Malnutrition</b>												
Fat Mass	56.99	44.49	0.025*	44.75	55.05	0.058	51.23	50.63	0.266	53.80	48.74	0.675
Muscle Mass	58.36	43.72	0.009*	44.46	55.46	0.045*	43.45	48.35	0.652	50.80	48.90	0.876
Ascites	58.30	43.75	0.009*	44.61	55.25	0.050	42.95	50.77	0.221	48.70	49.02	0.979
Edema	61.36	42.02	0.001*	46.35	52.78	0.222	46.52	49.73	0.604	46.40	49.14	0.815

\*significance at  $p < 0.05$  (Mann Whitney Test)

Table 4 presents the difference in NFPE knowledge between those who perceived and didn't perceive barriers. There were statistically differences in knowledge of vitamin E and C's assessment between those who perceived and didn't barrier 'perceive lack of time' ( $p=0.02$  and  $p=0.04$ ). Differences in NFPE knowledge of all hydration status and malnutrition parameters were also found.

RDNs who perceived barrier 'lack of proper training' significantly had less knowledge of NFPE in some micronutrient deficiencies like vitamin D, vitamin E, vitamin B, and vitamin C ( $p=0.013$ ;  $p=0.001$ ;  $p=0.003$ ; and  $p=0.006$  respectively). Additionally, they also reported having less knowledge in assessing hydration and muscle mass ( $p=0.018$  and  $p=0.045$ ). There were no statistically differences in NFPE knowledge of all micronutrient deficiencies, hydration status, and malnutrition status parameters between those who perceived and didn't perceive barriers 'lack confidence' and 'outside of the job'.

## 4. Discussion

This research explores the barriers to NFPE and its practice among nutritionists and dietitians. Perceptions, attitudes, and role models in the workplace have an impact on how well health professionals perform. These three elements also interact with one another [16], [17].

The majority of practicing RDNs in this study had a bachelor or applied a bachelor degree in nutrition. It's interesting that as many as 17-42 older adults who had

moderately to severe malnutrition were seen by RDNs. This number is quite a lot that it can be interpreted as every 2 days, dietitians and nutritionists found at least 1 older adult patient with moderate to severe malnutrition. This could be possible because most of the nutritionists and dietitians who participated in this study worked in reference hospitals. The previous study done in one of reference hospitals in Jakarta, Indonesia showed that upon admission, over one-third of the patients had malnutrition [18]. Malnutrition at admission was quite common and strongly correlated with the length of hospital stay [19], [20]. Thus, as the number of malnutrition in Indonesia is quite prevalent [21], [22], it is crucial that RDNs are able to do nutrition-related examination after hospital admission and monitor them.

Overall, these findings suggest that the majority of RDNs have knowledge in NFPE and they have barriers to conducting it. Frequencies were calculated regarding the level of knowledge of NFPE assessing micronutrient deficiencies, fluid state, and malnutrition status in older adults. Over half of the RDNs felt 'somewhat knowledgeable' and 'knowledgeable' in assessing these 3 parameters. Knowledge and ability to practice physical examination practice in the clinical area for health practitioners are affected by several things such as lack of confidence, self-motivation, autonomy to practice, support from medical staff, and education support [23] [24].

In low and middle-income countries like Indonesia where micronutrient deficiencies frequently happen among adults and vulnerable groups, it is possible for professional health workers to have more knowledge of it. The public

health significance of micronutrient deficiencies in Indonesia is Fe and Zn deficiencies [25]. Other studies indicated that Ca and Vitamin A deficiency is also frequently found among adults [26]. Three Micronutrient deficiencies the RDNs in this study felt most knowledgeable and very knowledgeable about were Fe, vitamin C and Vitamin A. The fact that these micronutrient deficiencies are more prevalent than other micronutrient deficiencies may be the reason why participants knew more about these deficiencies than about other micronutrient deficiencies.

In fluid status, the RDNs felt more knowledgeable in dehydration status than hydration status. Among both hospitalized or community-dwelling older adults, the case of low-intake dehydration is prevalent and often brought on by an inadequate beverage intake to make up for probable fluid losses from breath, perspiration, urine, and/or feces [27]. Low-intake dehydration in older adults is measured using methods that are often used in clinical practice such as heart rate, urine volume and color, skin turgor, and sensation of dry mouth [28]. This could be the reason of RDNs to be capable of dehydration assessment.

In malnutrition assessment, the RDNs felt more knowledgeable in examining ascites and edema. Examining ascites and edema is becoming a common step and an important component in some disease-related nutrition care such as end-stage renal disease [29] and liver disease [30]. The widely used nutrition screening tool like Subjective Global Assessment (SGA) [31] also has these 2 parameters to assess the risk of malnutrition among adults. This could explain why the RDNs are knowledgeable enough to examine ascites and edema.

This study indicated that there was a significant relationship between lack of time and NFPE knowledge on vitamin E, vitamin C, hydration, dehydration, fat mass, muscle mass, ascites, and edema. Time constraints in medical practice are commonly found among health workers who do physical examinations, like general practitioners and nurses [32], [33]. This study suggests that RDNs also have this barrier. Time constraints may impair RDNs' use of NFPE that was affected by some factors including great workloads [34].

This study also suggests that there was a significant relationship between lack of proper training and NFPE knowledge on vitamin D, vitamin E, vitamin B, vitamin C, hydration and muscle mass. It needs not only knowledge but also skills to practice NFPE. Teaching clinical skills need appropriate curricula and assessment. Some studies suggest that pedagogical teaching methods can increase skills in NFPE. One of them is simulation-based education which needs inclusions of Pre-and post-briefing conversations between instructors and students, as are safe spaces for practice and error-making as well as genuine patient case situations in the learning environment [35], [36]. The signs of symptoms of vitamin deficiencies are very specific [37], [38]. Therefore, RDNs who received

proper training on NFPE felt that they have enough knowledge and know how to conduct it. Assessing muscle mass in older adults is a valuable skill for RDNs since it can predict mortality [39]. The method for assessing it includes functional capacity that needs special tools such as a handgrip dynamometer [35]. This tool is traditionally not provided for use by RDNs. This can be the reason why trained RDNs are aware to prepare needed tools for assessing muscle mass. The relationships between knowledge of NFPE and lack of confidence and perception about the authority of conducting NFPE were not significantly found in this study.

## 5. Conclusions

Registered Dietitians and Nutritionists are the ideal professionals to administer the NFPE and assist in detecting malnutrition in older adults. The research's results provide a broad summary of this practice's present state. It will mostly be up to hospitals or primary health center's regulations to foster an atmosphere in which this practice may expand in order to boost NPFE behaviour among RDNs. Future work should seek to explore potential strategies to increase knowledge and skills on NFPE as this method plays a critical role in identifying underfeeding and inflammation among older adults. The RDNs reported barriers can be used to create and develop training curriculum.

## Acknowledgements

We acknowledge the effort spent by participating RDNs from the Indonesian Nutrition Association of Yogyakarta.

## REFERENCES

- [1] Corcoran C., Murphy C., Culligan E. P., Walton J., and Sleator R. D., "Malnutrition in the elderly," *Sci. Prog.*, vol. 102, no. 2, pp. 171–180, 2019, doi: 10.1177/0036850419854290.
- [2] Norman K., Ulrike H., Pirlich M., "Malnutrition in older adults—recent advances and remaining challenges," *Nutrients*, vol. 13, no. 8, p. 2764, 2021, doi: 10.3390/nu13082764.
- [3] Rosted E., Prokofieva T., Sanders S., and Schultz M., "Serious Consequences of Malnutrition and Delirium in Frail Older Patients," *J. Nutr. Gerontol. Geriatr.*, vol. 37, no. 2, pp. 105–116, 2018, doi: 10.1080/21551197.2018.1470055.
- [4] Won C. W., Yoo H. J., Kim C. O., Dumlao L. C. I., Dewiasty E., Rowland J., Chang H. H., Wang J., Akishita M., Tan T. L., Lum C., Prakash O., "Lists of geriatric syndromes in the Asian-Pacific geriatric societies," *Eur. Geriatr. Med.*, vol. 4, no. 5, pp. 335–338, 2013, doi: 10.1016/j.eurger.2013.07.005.

- [5] Donini L. M., Poggiogalle E., Molino A., Rosano A., Lenzi A., Fanelli F. R., Muscaritoli M., "Mini-Nutritional Assessment, Malnutrition Universal Screening Tool, and Nutrition Risk Screening Tool for the Nutritional Evaluation of Older Nursing Home Residents," *J. Am. Med. Dir. Assoc.*, vol. 17, no. 10, pp. 959.e11-959.e18, 2016, doi: 10.1016/j.jamda.2016.06.028.
- [6] Wetherill M. S., White K. C., and Rivera C., "Food Insecurity and the Nutrition Care Process: Practical Applications for Dietetics Practitioners," *J. Acad. Nutr. Diet.*, vol. 118, no. 12, pp. 2223-2234, 2018, doi: 10.1016/j.jand.2017.08.114.
- [7] White J. V., Guenter P., Jensen G., Malone A., and Schofield M., "Consensus Statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (Undernutrition)," *J. Acad. Nutr. Diet.*, vol. 112, no. 5, pp. 730-738, 2012, doi: 10.1016/j.jand.2012.03.012.
- [8] Hummell, A. C., & Cummings M., "Role of the nutrition-focused physical examination in identifying malnutrition and its effectiveness," *Nutr. Clin. Pract.*, vol. 37, no. 1, pp. 41-49, 2022.
- [9] Dowhan L., Moccia L., Remer E. M., Lyu R., Kou L., Steiger E., "Comparison of pre-intestinal transplant and posttransplant sarcopenia and visceral adiposity measurements using computed tomography in the diagnosis of malnutrition during a nutrition-focused physical examination," *J. Parenter. Enter. Nutr.*, vol. 37, pp. 41-49, 2022.
- [10] Krishnan, K. & Taylor M. D., *Nutrition assessment. Nutrition Support for the Critically Ill Patient: A Guide to Practice*, 2nd ed. Boca Raton, Florida: CRC Press, 2015.
- [11] Desjardins S., Brody R., Touger-Decker R., "Nutrition-focused physical examination practices of registered dietitian nutritionists who have completed an in-person NFPE course," *Top. Clin. Nutr.*, vol. 33, no. 2, pp. 95-105, 2018.
- [12] Craven D. L., Pelly F. E., Isenring E., and Lovell G. P., "Barriers and enablers to malnutrition screening of community-living older adults: A content analysis of survey data by Australian dietitians," *Aust. J. Prim. Health*, vol. 23, no. 2, pp. 196-201, 2017, doi: 10.1071/PY16054.
- [13] Gaboreau Y., Imbert P., Jacquet J. P., Marchand O., Couturier P., and Gavazzi G., "What are key factors influencing malnutrition screening in community-dwelling elderly populations by general practitioners? A large cross-sectional survey in two areas of France," *Eur. J. Clin. Nutr.*, vol. 67, no. 11, pp. 1193-1199, Nov. 2013, doi: 10.1038/ejcn.2013.161.
- [14] Badan Pusat Statistik DIY, *Provinsi Daerah Istimewa Yogyakarta dalam Angka*. Badan Pusat Statistik Provinsi D.I Yogyakarta, 2022.
- [15] Jeffrey Moore, "Current Nutrition Focused Physical Exam Practices and Barriers of Registered Dietitian Nutritionists in The Clinical Setting," California State University, 2017.
- [16] Oh H. S., "Knowledge, perception, performance, and attitude regarding hand hygiene and related factors among infection control nurses in South Korea: A cross-sectional study," *Am. J. Infect. Control*, vol. 47, no. 3, pp. 258-263, 2019, doi: 10.1016/j.ajic.2018.09.006.
- [17] Diamantidis A. D. and Chatzoglou P., "Factors affecting employee performance: an empirical approach," *Int. J. Product. Perform. Manag.*, vol. 68, no. 1, pp. 171-193, 2019, doi: 10.1108/IJPPM-01-2018-0012.
- [18] D. Purnamasari, Bunawan N. C., Rinaldi I., and Dillon D. H. S., "In-hospital malnutrition among adult patients in a national referral hospital in Indonesia," *Nutr. Res. Pract.*, vol. 16, no. 2, pp. 1-10, 2022.
- [19] Nigatu Y. D., Gebreyesus S. H., Allard J. P., and Endris B. S., "The effect of malnutrition at admission on length of hospital stay among adult patients in developing country: A prospective cohort study," *Clin. Nutr. ESPEN*, vol. 41, pp. 217-224, 2021, doi: 10.1016/j.clnesp.2020.12.013.
- [20] Czapla M., Izabella U., Raul J. V., Angela D, Marta K. O., Katarzyna Ł, Ramón B. T, Jacek S., "Relationship between nutritional status and length of hospital stay among patients with atrial fibrillation – a result of the nutritional status heart study," *Front. Nutr.*, vol. 9, pp. 1-17, 2022, doi: 10.3389/fnut.2022.1086715.
- [21] Arjuna T., Soenen S., Hasnawati R. A., Lange K., Chapman I., and Luscombe-Marsh N. D., "A cross-sectional study of nutrient intake and health status among older adults in Yogyakarta Indonesia," *Nutrients*, vol. 9, no. 11, 2017, doi: 10.3390/nu9111240.
- [22] Rizka A., Indraspati A., Dwimartutie N., and Muhadi M., "Frailty among older adults living in nursing homes in Indonesia: Prevalence and associated factors," *Ann. Geriatr. Med. Res.*, vol. 25, no. 2, pp. 93-97, 2021, doi: 10.4235/agmr.21.0033.
- [23] McElhinney E., "Factors which influence nurse practitioners ability to carry out physical examination skills in the clinical area after a degree level module - an electronic Delphi study," *J. Clin. Nurs.*, vol. 19, no. 21-22, pp. 3177-3187, 2010, doi: 10.1111/j.1365-2702.2010.03304.x.
- [24] Kris-Etherton P. M., Akabas S. R., Bales C. W., Bistrian B., Braun L., Edwards M. S., Laur C., Lenders C. M., Levy M. D., Pratt C. A., Ray S., Rock C. L., Saltzman E., Seidner D. L., Horn L. V., "The need to advance nutrition education in the training of health care professionals and recommended research to evaluate implementation and effectiveness," *Am. J. Clin. Nutr.*, vol. 99, no. 5, 2014, doi: 10.3945/ajcn.113.073502.
- [25] Roos N. Ponce M. C., Doak C. M., Dijkhuizen M., Polman K., Chamnan C., Khov K., Chea M., Prak S., Kounnavong S., Akkhavong K., Mai L. B., Lua T. T., Muslimatun S., Famida U., Wasantwisut E., Winichagoon P., Doets E., Greffeuille V., Wieringa F. T. & Berger J., "Micronutrient status of populations and preventive nutrition interventions in South East Asia," *Matern. Child Health J.*, vol. 23, no. 0, pp. 29-45, 2019, doi: 10.1007/s10995-018-2639-2.
- [26] Prasetyo T. J., Hardinsyah H., Baliwati Y. F., and Sukandar D., "The application of probability method to estimate micronutrient deficiencies prevalence of Indonesian adults," *J. Gizi dan Pangan*, vol. 13, no. 1, pp. 17-26, 2018, doi: 10.25182/jgp.2018.13.1.17-26.
- [27] Beck A. M., Seemer J., Knudsen A. W., and Munk T.,

- “Narrative review of low-intake dehydration in older adults,” *Nutrients*, vol. 13, no. 9, pp. 1–16, 2021, doi: 10.3390/nu13093142.
- [28] Hooper L., Abdelhamid A., Campbell W., Chassagne P., Fletcher S., Fortes M., Gaspar P., Gilbert D., Hooper L., *et al.*, “Non-invasive clinical and physical signs, symptoms and indications for identification of impending and current water-loss dehydration in older people: a diagnostic accuracy systematic review,” *Eur. Geriatr. Med.*, vol. 5, no. 4, pp. S69–S70, 2014, doi: 10.1016/s1878-7649(14)70148-2.
- [29] Ziegler J., “Nutrition-Focused Physical Examination and Assessment in Chronic Kidney Disease,” in *Nutrition in Kidney Disease*, 2020, pp. 79–93.
- [30] Hilgendorf M., “Assessing Malnutrition in Liver Disease Patients Being Evaluated for Transplant Using the Nutrition Focused Physical Exam,” 2018.
- [31] Makhija S. and Baker J., “The subjective global assessment: A review of its use in clinical practice,” *Nutr. Clin. Pract.*, vol. 23, no. 4, pp. 405–409, 2008, doi: 10.1177/0884533608321214.
- [32] Knesebeck O. V. D., Koens S., Marx G., and Scherer M., “Perceptions of time constraints among primary care physicians in Germany,” *BMC Fam. Pract.*, vol. 20, no. 1, pp. 7–11, 2019, doi: 10.1186/s12875-019-1033-5.
- [33] Komatsu H. and Komatsu Y., “The Role of Nurse on the Treatment Decision Support for Older People with Cancer: A Systematic Review,” *Healthc.*, vol. 11, no. 4, pp. 1–17, 2023, doi: 10.3390/healthcare11040546.
- [34] Yang W. Y. and Fu Y., “Level of empathy among dietitians: A pilot study,” *Nutr. Diet.*, vol. 75, no. 4, pp. 411–417, 2018, doi: 10.1111/1747-0080.12421.
- [35] Mac Quillan E., Ford J., and Baird K., “Increased competency of registered dietitian nutritionists in physical examination skills after simulation-based education in the United States,” *J. Educ. Eval. Health Prof.*, vol. 17, pp. 1–7, 2020, doi: 10.3352/JEEHP.2020.17.40.
- [36] Morse C. J., Fey M., Kardong-Edgren S., Mullen A., Barlow M., “The Changing Landscape of Simulation-Based Education,” *Am. J. Nurs.*, vol. 119, no. 8, 2019.
- [37] Hosen Z., Bipasha S. A., Kamal S., Rafique S., Islam B., and Fatema K., “Dietary Supplementation of Citrus limon L. (Lemon) and Evaluation of Its Role to Prevent and Cure of Vitamin C Deficiency Diseases,” *Int. J. Nutr. Food Sci.*, vol. 9, no. 1, p. 1, 2020, doi: 10.11648/j.ijnfs.20200901.11.
- [38] Demir N., Doğan M., Koç A., Kaba S., Bulan K., Ozkol H. U., Doğan Ş. Z., “Dermatological findings of vitamin B12 deficiency and resolving time of these symptoms,” *Cutan. Ocul. Toxicol.*, vol. 33, no. 1, pp. 70–73, 2014, doi: 10.3109/15569527.2013.861477.
- [39] de Santana F. M., Premaor M. O., Tanigava N. Y., and Pereira R. M. R., “Low muscle mass in older adults and mortality: A systematic review and meta-analysis,” *Exp. Gerontol.*, vol. 152, no. June, p. 111461, 2021, doi: 10.1016/j.exger.2021.111461.