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**Association among Plant-based Proteins to Albumin and Handgrip Strength  
in Maintenance Hemodialysis Patients Universitas Gadjah Mada (UGM)  
Hospital-Indonesia**

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**Objectives:** Maintenance hemodialysis (MHD) patients require to increase protein intake, so nutrition guideline recommends protein intake at least 50% from high biological value. Meanwhile, most of Indonesians' protein intake was from plant-based sources. Hypoalbuminemia frequently found in MHD patients and it is associated with increased risk of morbidity and mortality. This study aimed to examine the association among plant-based protein to albumin and handgrip strength (HGS) in MHD patients.

**Methods:** This study was observational with a cross-sectional design. The study involved 68 MHD patients at UGM Hospital in 2019. We collected protein intake using the Brief Food Frequency Questionnaire method, serum albumin level, and mean HGS from 2 times measurement. Protein intakes were categorized into plant-based and animal-based with  $\geq 66.7\%$  intake, and into adequate ( $\geq 1.1\text{g/kg/IBW}$ ) and inadequate ( $< 1.1\text{g/kg/IBW}$ ).

**Results:** Most of the subjects consumed plant-based protein (75.0%). Plant-based protein consumptions were composed of staple food (such as rice, noodle, sweet potato), vegetable side dish (such as tempeh, tofu), and vegetables (such as green leafy vegetables, beans). Mean albumin of all subjects was  $4.68 \pm 0.50$ , HGS  $22.56 \pm 10.96$  in men and  $14.28 \pm 6.61$  in women which considered good. Adequate protein intake group had higher mean albumin and HGS compare to inadequate ( $4.93 \pm 0.46$  vs  $4.64 \pm 0.50$ ) and ( $22.57 \pm 11.74$  vs  $18.35 \pm 9.84$ ), respectively. Plant- and animal-based protein group had the same mean albumin result ( $4.68 \pm 0.50$  and  $4.68 \pm 0.51$ ), but higher HGS in animal-based protein ( $20.82 \pm 12.97$  vs  $18.27 \pm 9.04$ ). The highest mean albumin and HGS in plant- and animal-based protein with adequate intake. There was no association among plant- and animal-based protein in adequate and inadequate intake with albumin and HGS.

**Conclusions:** Plant-based protein was as powerful as animal-based protein in affecting albumin and HGS.

Table 1. Mean serum albumin level difference in protein composition and adequacy

Variables	Serum albumin level Mean ± SD	p	Handgrip strength Mean ± SD	p
<b>Protein adequacy</b>				
Adequate	4.93 ± 0.46	0.105*	22.57 ± 11.74	0.311**
Inadequate	4.64 ± 0.50		18.35 ± 9.84	
<b>Protein composition</b>				
Plant-based protein	4.68 ± 0.50	0.978*	18.27 ± 9.04	0.586**
Animal-based protein	4.68 ± 0.51		20.82 ± 12.97	

\*Significance test using Independent-Samples T Test with  $p < 0.05$

\*\*Significance test using Mann Whitney U Test with  $p < 0.05$

Table 2. Relationship between mean serum albumin level and the adequacy of protein composition

Protein composition	Protein adequacy	Serum albumin level Mean ± SD	p	Handgrip strength Mean ± SD	p
Plant-based protein	Adequate	5.00 ± 0.33	0.406*	21.75 ± 13.70	0.577*
Plant-based protein	Inadequate	4.64 ± 0.51		17.80 ± 8.35	
Animal-based protein	Adequate	4.80 ± 0.72		24.22 ± 8.70	
Animal-based protein	Inadequate	4.65 ± 0.50		20.09 ± 13.86	

\*Significance test using One Way ANOVA with  $p < 0.05$