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RESEARCH ARTICLE

ROLE OF INFLAMMATION TO MALNUTRITION EVENTS IN PREDIALYSIS CHRONIC KIDNEY DISEASE PATIENTS

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ABSTRACT

Background: Malnutrition is often found in patients with chronic kidney disease (CKD) and inflammation is an important factor in the complications of CKD. However, until now it is unclear whether the inflammatory reaction is a major cause of malnutrition or just merely signs in CKDpatients.
Aim: Know the role of inflammation to the incidence of malnutrition in predialysis CKDpatients.
Methods: Observational study with cross sectional method on October 2010-March 2011 in Wahidin Sudirohusodo Makassar. The study population was CKD patients men and women (15-70 years) who had never received renal replacement therapy and met the inclusion criteria.
Results: This study involved 64 predialysis CKD subjects (29 men (45.3%)), in which 54 subjects (84.4%) with malnutrition. The correlation between inflammation and glomerular filtration rate (GFR) shows GFR is negatively correlated with hsCRP levels (p=0.762) on malnutrition subject, but shows positive correlation in not malnourished subjects (p=0.250). In GFR <15 mL/min/1,73m2 there is a positive correlation between albumin and SGA score with levels of hsCRP levels (p=0.085; p=0.488); BMI and LLA are negatively correlated with hsCRP levels (p=0.426; p=0.345). In GFR 15-29 mL/min/1,73m2 there is a negative correlation between albumin, BMI and LLA with hsCRP levels (p=0.699; p=0.046; p=0.936); SGA scores is positively correlated with hsCRP levels (p=0.581). In GFR 30-59 mL/min/1,73m2 there is a negative correlation between albumin levels and LLA with hsCRP levels (p=0.071; p=0.027); SGA score and BMI is positively correlated with hsCRP levels (p=1.000; p=0.350). In GFR ≥60 mL/min/1,73m2 there is a positive correlation between albumin, SGA score, BMI and LLA with high levels of hsCRP (p=0.800; p=0.400; p=0.000; p=0.262).
Conclusion: We found an increased incidence of malnutrition and inflammation in predialisis CKDsubjects, but no correlation between them.

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INTRODUCTION

Chronic Kidney Disease (CKD) is one of health problem in the world. In CKD, the kidney function is diminished gradually and irreversible until one point the kidney become failure and need renal replacement therapy (dialysis or kidney transplantation) with expensive cost. (Susalit, 2009) Malnutrition commonly found in CKD patient, whether before or after dialysis. (Hakim and Levin, 1993; Kopple, 1999; Lawson *et al*., 2001) The incidence of malnutrition in CKD is 37–84% and still increasing even after renal replacement therapy. (Stevinkel *et al*., 2004) Serum albumin is frequently used to evaluate nutritional status in CKD patient. (Toigo *et al*., 2000) The prevalence of inflammation in end stage renal disease is 30-50%. Inflammation play an important role in CKD complication. Chronic inflammation also become an etiology of hypoalbuminemia. (Stenvinkel, 2001) Catabolism proccess is increased in hemodialys is patients with bio in compatible membranes. (Nascimento *et al*., 2004) Around 40% patients with CKD have elevated inflammation response, which is elevated of C-reactive protein (CRP), even before having a renal replacement therapy. C-reactive protein also an important systemic inflammation marker. However, it is not clear yet, whether the inflammation by cytokines is the main cause of

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malnutition or malnutrition and inflammation is common in predialysis CKD patient. This study want to know the role of inflammation to the incidence of malnutrition in predialysis CKD patients.

MATERIALS AND METHODS

This is an observational study with cross sectional method on October 2010-March 2011 from outpatient clinic and inpatient ward in Wahidin Sudirohuso do Hospital Makassar. The study population was CKD patients men and women (15-70 years) who had never received renal replacement therapy (dialysis or kidney transplantation), have no acute or chronic infection, including tuberculosis, in the last 3 months, and willing to join the study. Criteria for inflammation if CRP >10mg/L. Criteria for malnutrition if patient has serum albumin <3,5 g/dL, or SGA score ≥15 or IMT <18.5 kg/m2 or arm circumference <20 cm (man) and <18,5 cm (woman). Collected data will be analyze using computer with SPSS statistic program using Chi Square and correlation test (T test).

RESULTS

This study involved 64 predialysis CKD subjects, 29 men (45,3%) and 35 women (54,7%). Based on nutritional status we found 54 subjects (84,4%) are malnutrition (Table 1) and based on inflammation status we found no significant difference between inflammation and non inflammation subjects (Table 2). The correlation between inflammation and glomerular filtration rate (GFR) shows GFR is negatively correlated with hsCRP levels (p=0.762) on malnutrition subject, but shows positive correlation in not malnourished subjects (p=0.250) (Picture 1). In GFR <15 mL/min/1,73m2 there is a positive correlation between albumin and SGA score with levels of hsCRP levels (p=0.085; p=0.488); BMI and LLA are negatively correlated with hsCRP levels (p=0.426; p=0.345) (Picture 2). In GFR 15-29 mL/min/1,73m2 there is a negative correlation between albumin, BMI and LLA with hsCRP levels (p=0.699; p=0.046; p=0.936); SGA scores is positively correlated with hsCRP levels (p=0.581) (Picture 3).

Appendix 1.Table List

Table 1. Subject Characteristics Based on Nutritional Status

Variable	Malnutrition			Non-Malnutrition			p
	n	Mean	SD	N	Mean	SD	
Age (year)	54	54.91	9.42	10	53.50	14.96	0,696
Hb (g/dL)	54	8,83	2,19	10	10,67	3,05	0,025
Creatinin (mg/dL)	54	6.00	5.86	10	4.34	4.97	0,405
GFR (mL/mnt/1,73m^2)	54	24.29	21.95	10	25.64	16.91	0,854
hsCRP (mg/L)	54	62.12	89.52	10	62.26	92.55	0,997

n: Total, SD: Standard Deviation

Appendix 2.Figure List

Table 2. Subject Characteristics Based on Inflammation Status

Variable	Inflammation (n, %)	Non Inflammtion (n, %)	p
Sex			0,612
Man	19 (65,5)	10 (34,5)	
Woman	25 (71,4)	10 (28,6)	
Age (year)			0,407
< 50	10 (58,8)	7 (41,2)	
50-59	18 (78,3)	5 (21,7)	
≥ 60	16 (66,7)	8 (33,3)	
GFR (mL/mnt/1,73m^2)			0,344
< 15	23 (79,3)	6 (20,7)	
15-29	6 (54,5)	5 (45,5)	
30-59	12 (60,0)	8 (40,0)	
≥ 60	3 (75,0)	1 (25,0)	
BMI (kg/m^2)			0,533
< 18,5	12 (75,0)	4 (25,0)	
≥ 18,5	32 (66,7)	16 (33,3)	
Man arm circumference (cm)			0,516
< 20	2 (100,0)	0 (0,0)	
≥ 20	15 (60,0)	10 (40,0)	
Woman arm circumference (cm)			1,000
< 18,5	2 (100,0)	0 (0,0)	
≥ 18,5	22 (68,8)	10 (31,2)	
Albumin (g/dL)			1,000
< 3,5	30 (73,2)	11 (26,8)	
≥ 3,5	8 (72,7)	3 (27,3)	
SGA score			0,351
< 15	12 (60,0)	8 (40,0)	
15-35	30 (75,0)	10 (25,0)	
> 35	2 (50,0)	2 (50,0)	

Appendix 2.Figure List

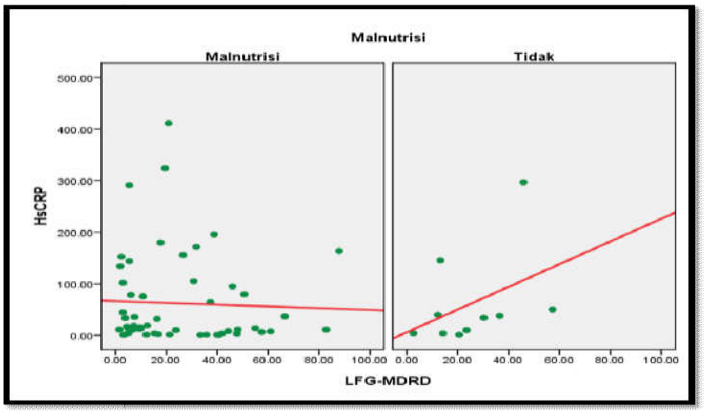
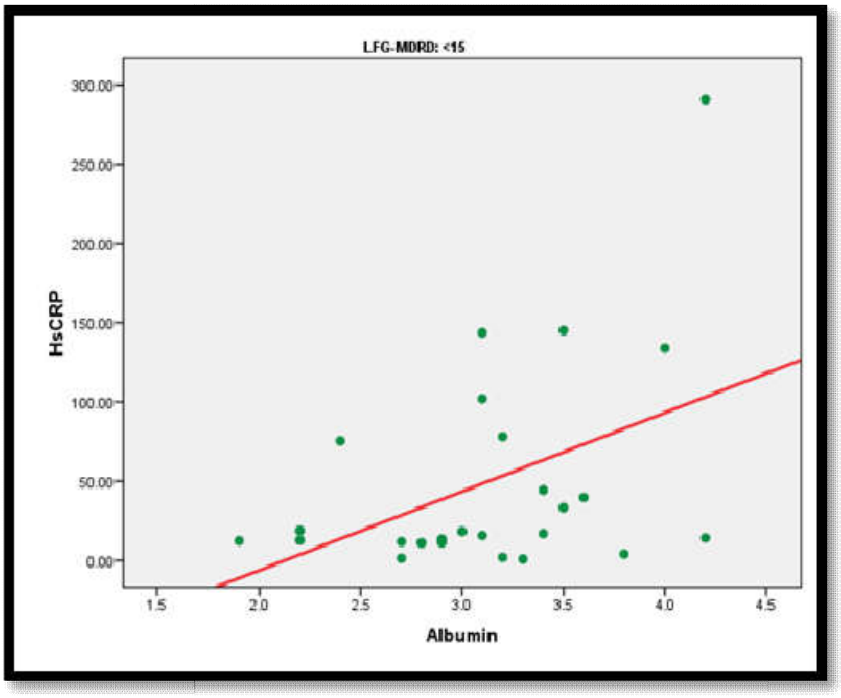


Figure 1. Correlation between inflammation and glomerular filtration rate based on nutritional status



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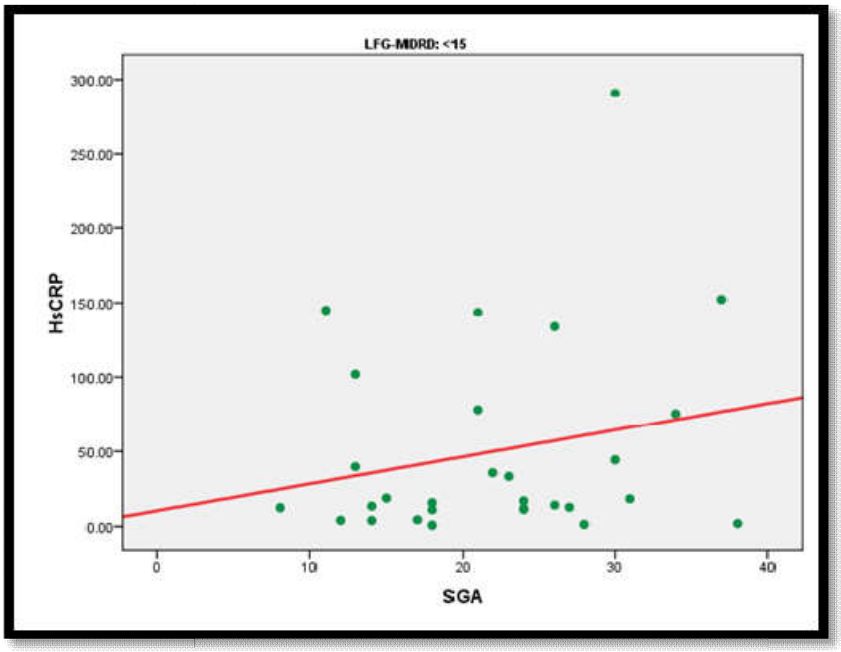

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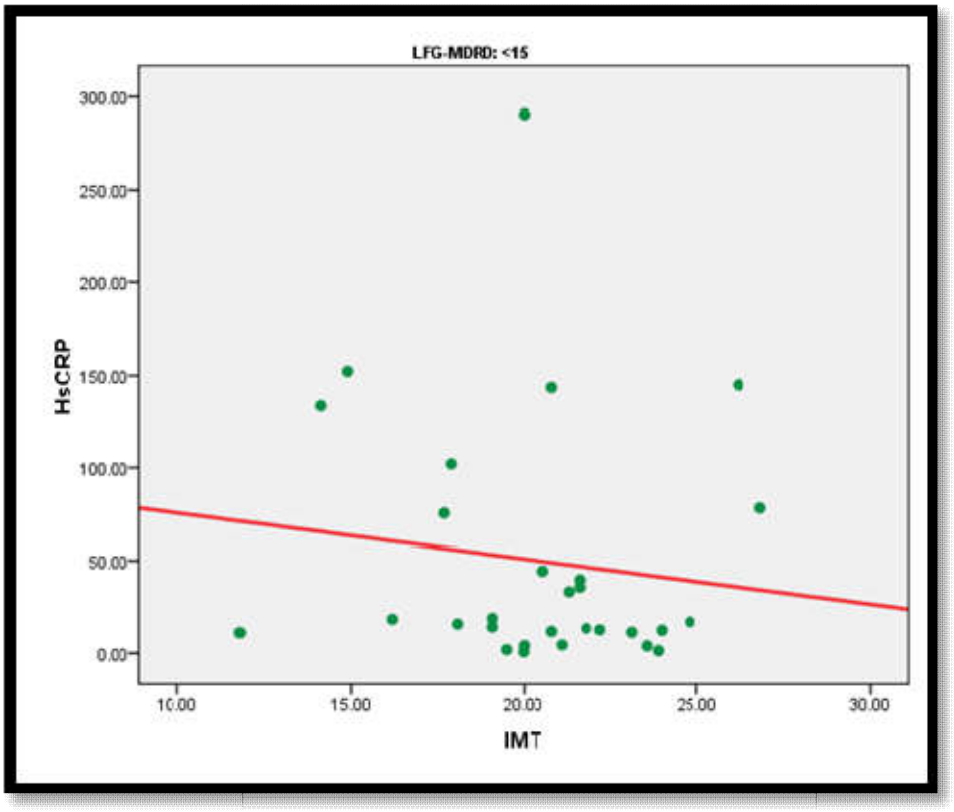

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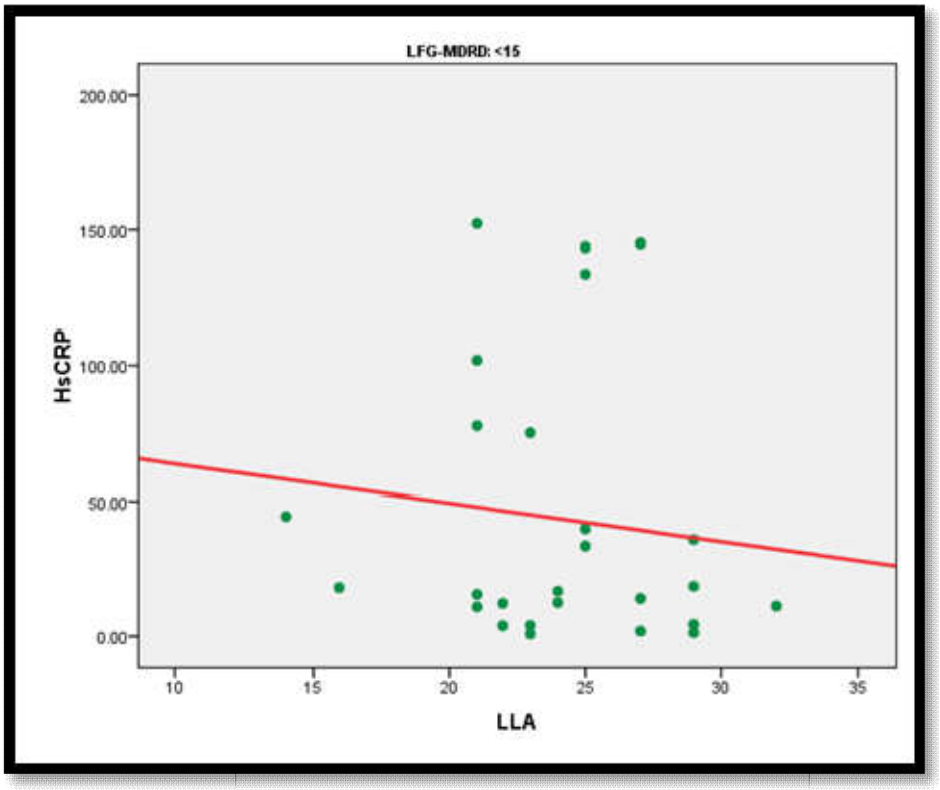
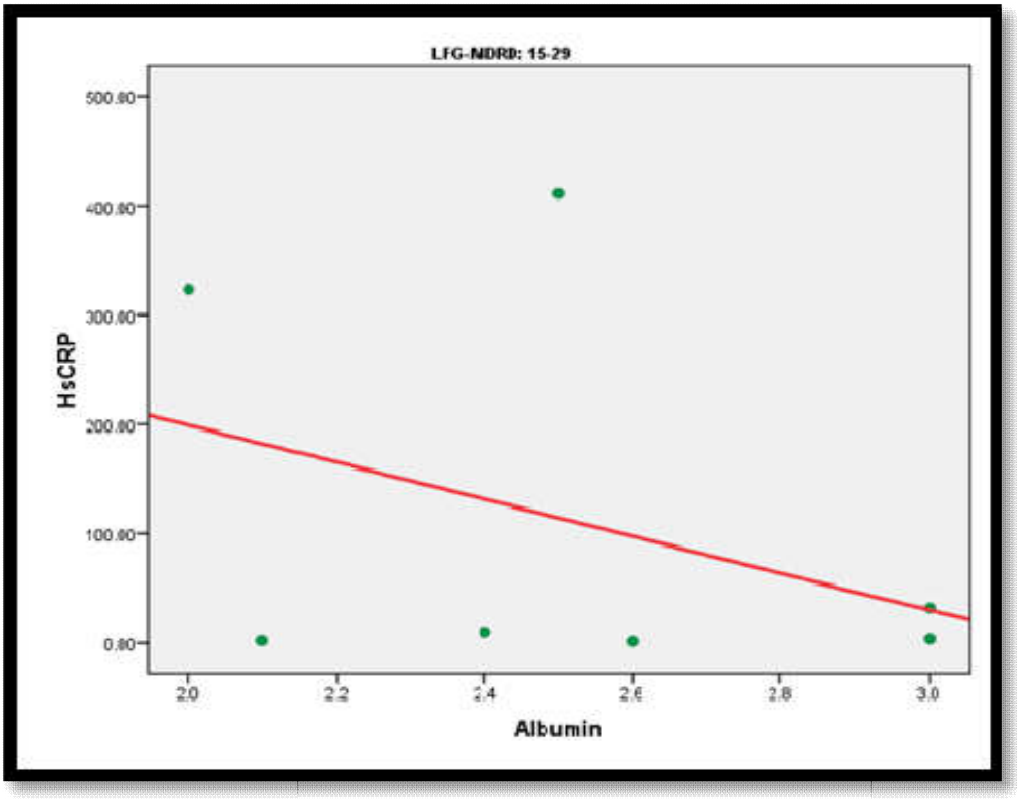
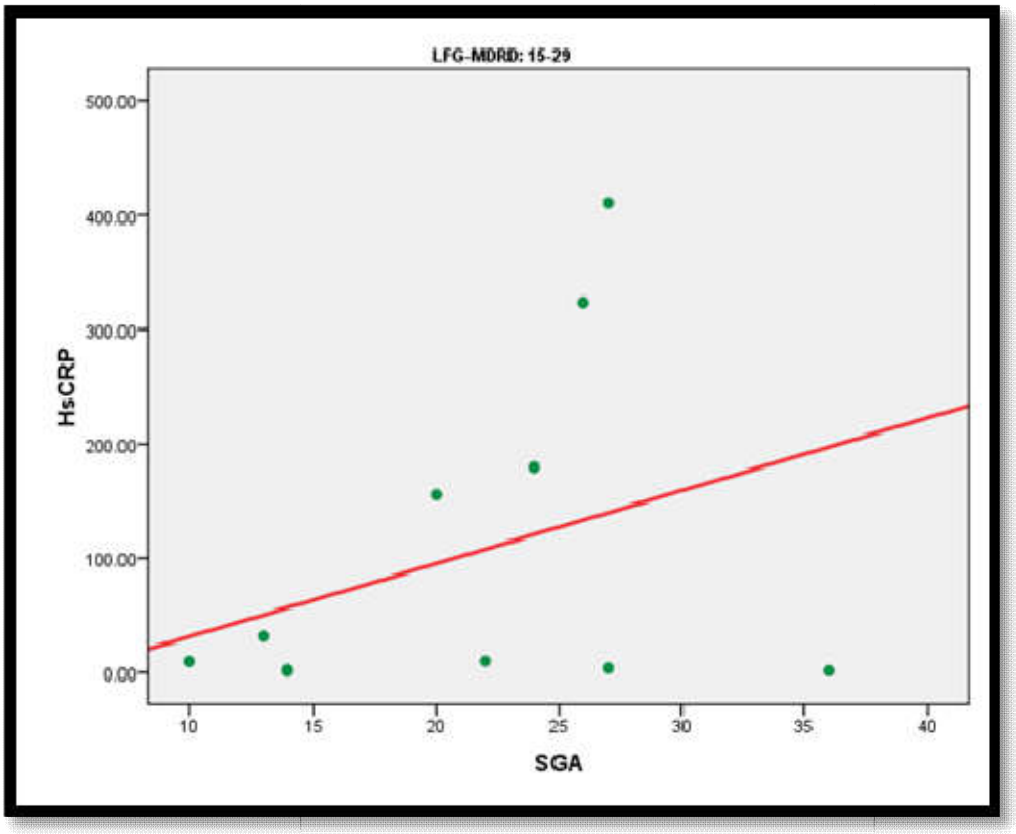


d)

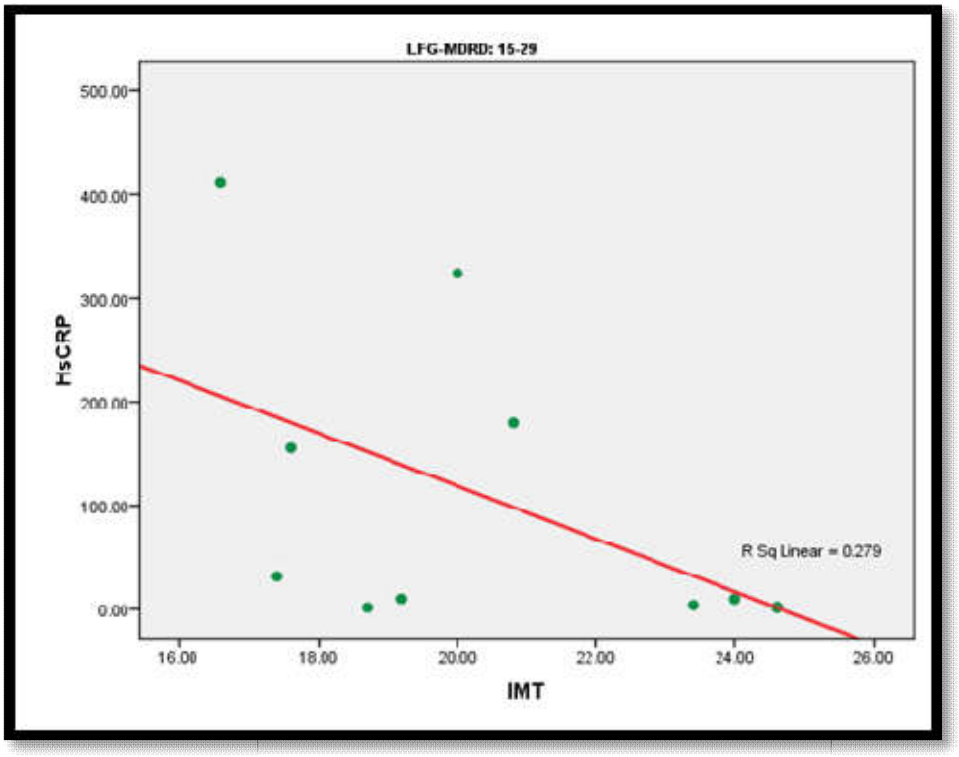
Figure 2. Correlation between various malnutition parameters with hsCRP in GFR <15 mL/min/1,73m^2, (a) Albumin; (b) SGA Score; (c) BMI; (d) Arm Circumference


LFG-MDRD: 15-29
500.00
400.00
300.00
200.00
100.00
0.00
HsCRP
2.0
2.2
2.4
2.6
2.8
3.0
Albumin

a)


LFG-MDRD: 15-29
500.00
400.00
300.00
200.00
100.00
0.00
HsCRP
10
15
20
25
30
35
40
SGA

b)



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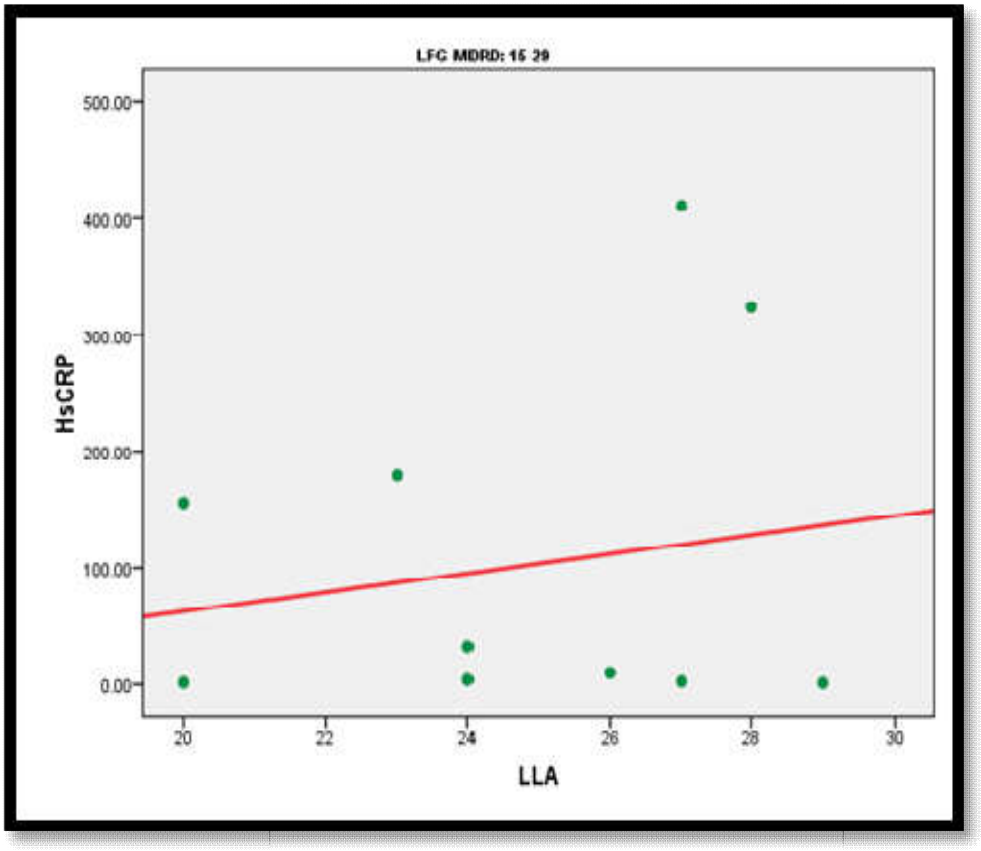
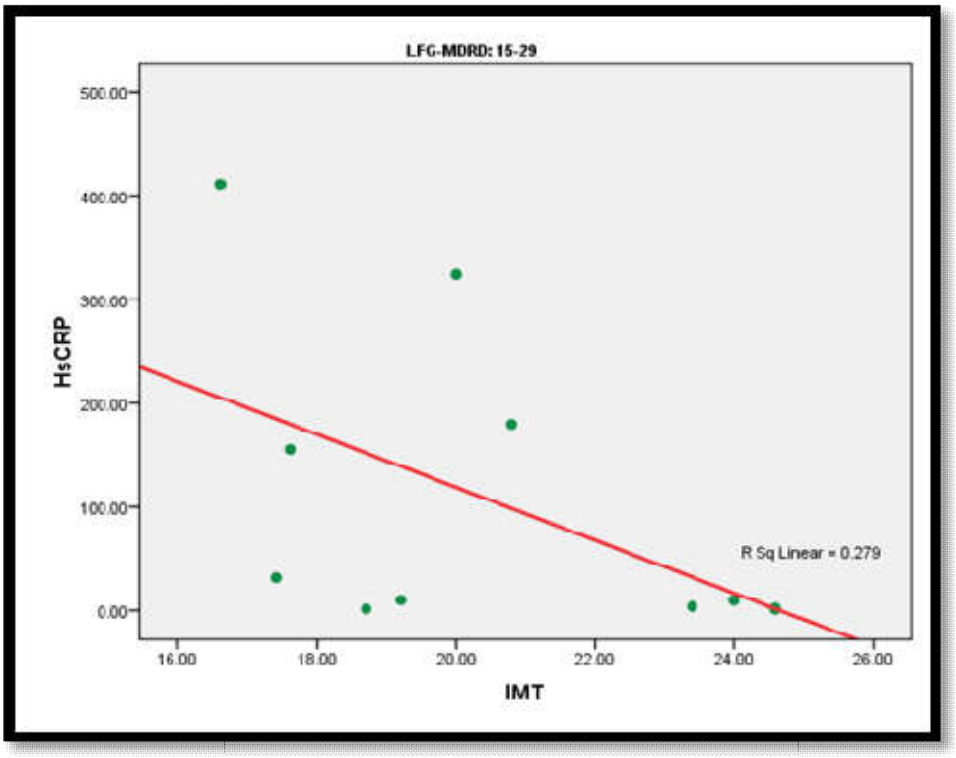


d)

Figure 3. Correlation between various malnutition parameters with hsCRP in GFR 15-29 mL/min/1,73m^2, (a) Albumin; (b) SGA Score; (c) BMI; (d) Arm Circumference



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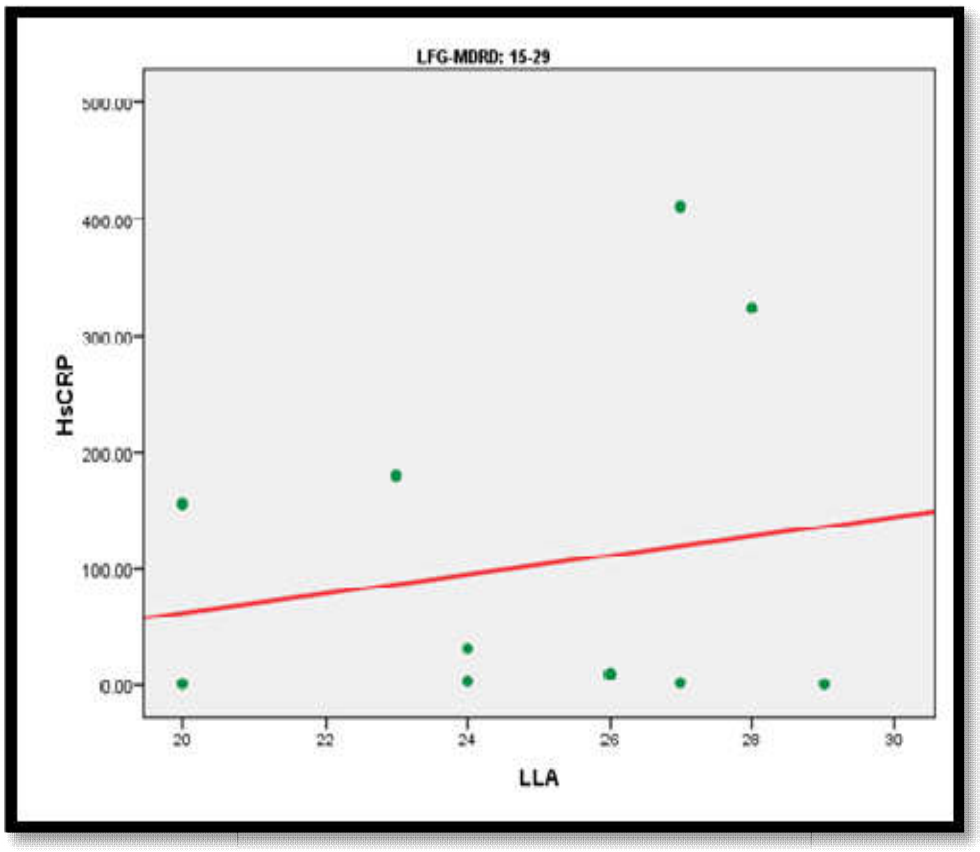
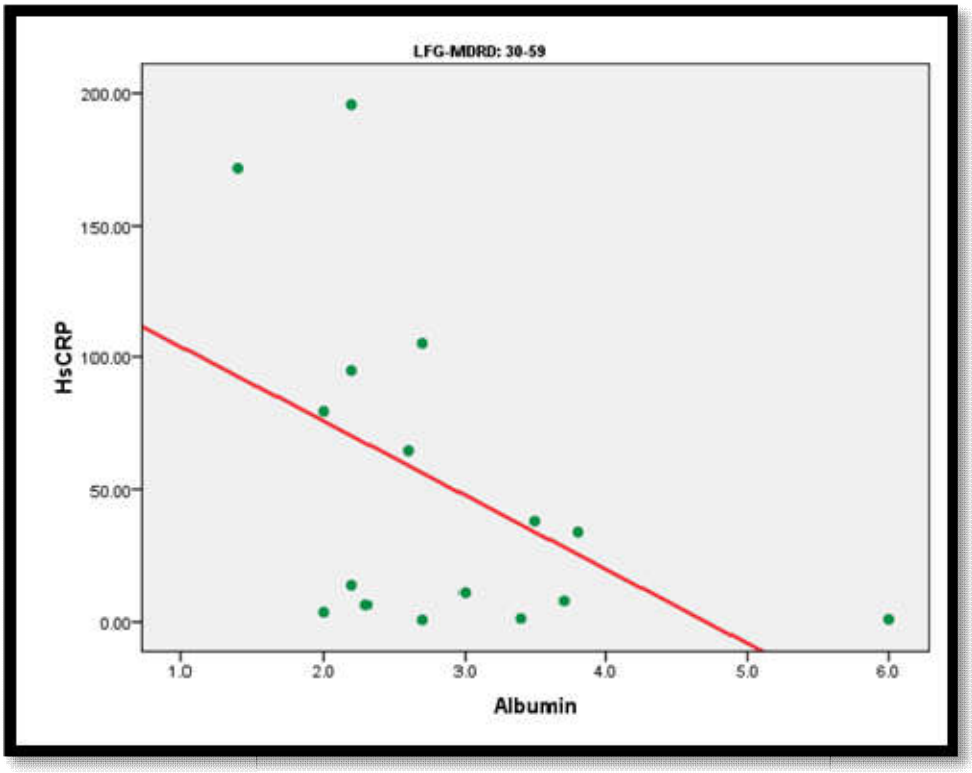
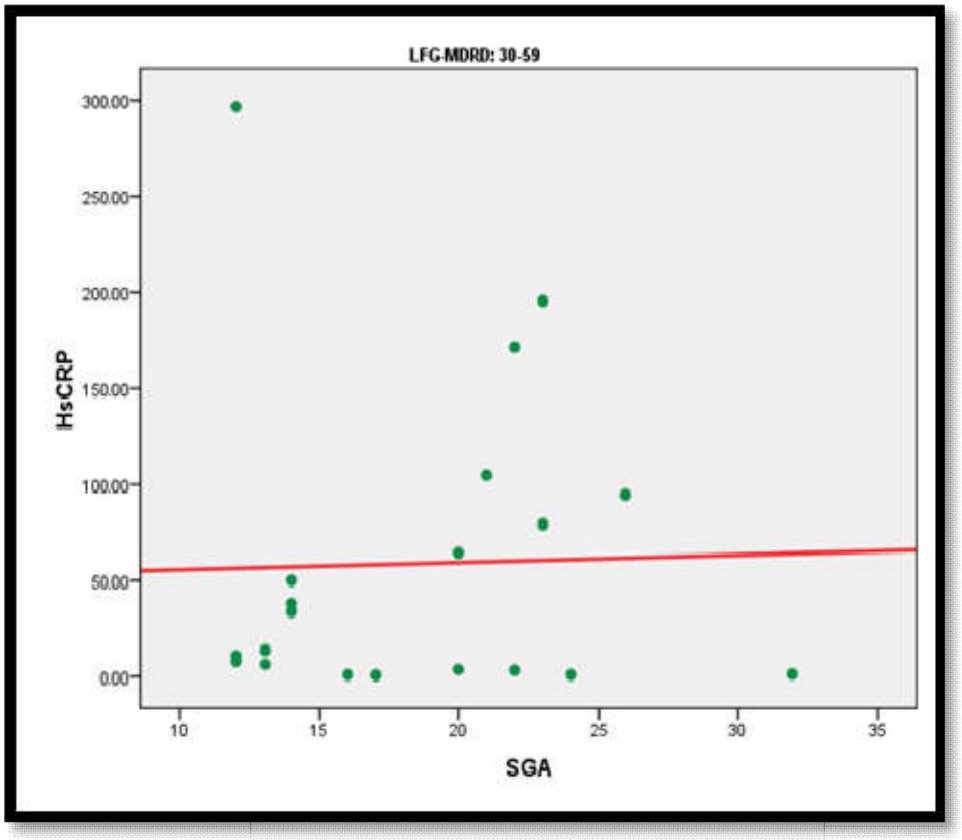


d)

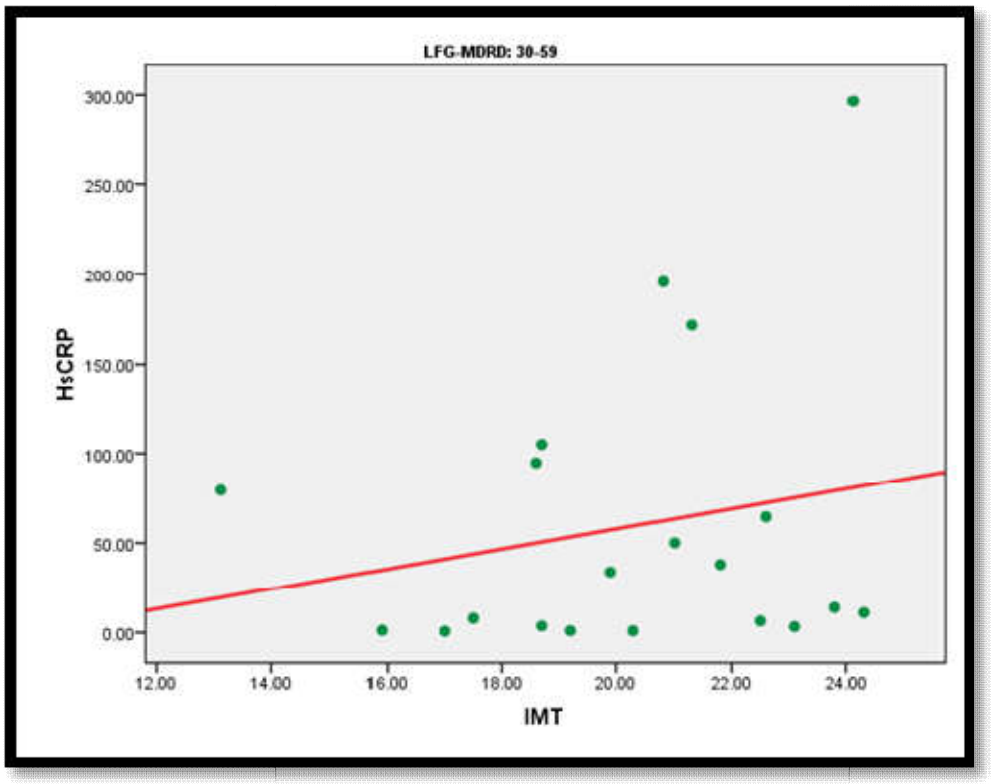
Figure 3. Correlation between various malnutition parameters with hsCRP in GFR 15-29 mL/min/1,73m^2, (a) Albumin; (b) SGA Score; (c) BMI; (d) Arm Circumference


LFG-MDRD: 30-59
HsCRP
200.00
150.00
100.00
50.00
0.00
1.0
2.0
3.0
4.0
5.0
6.0
Albumin

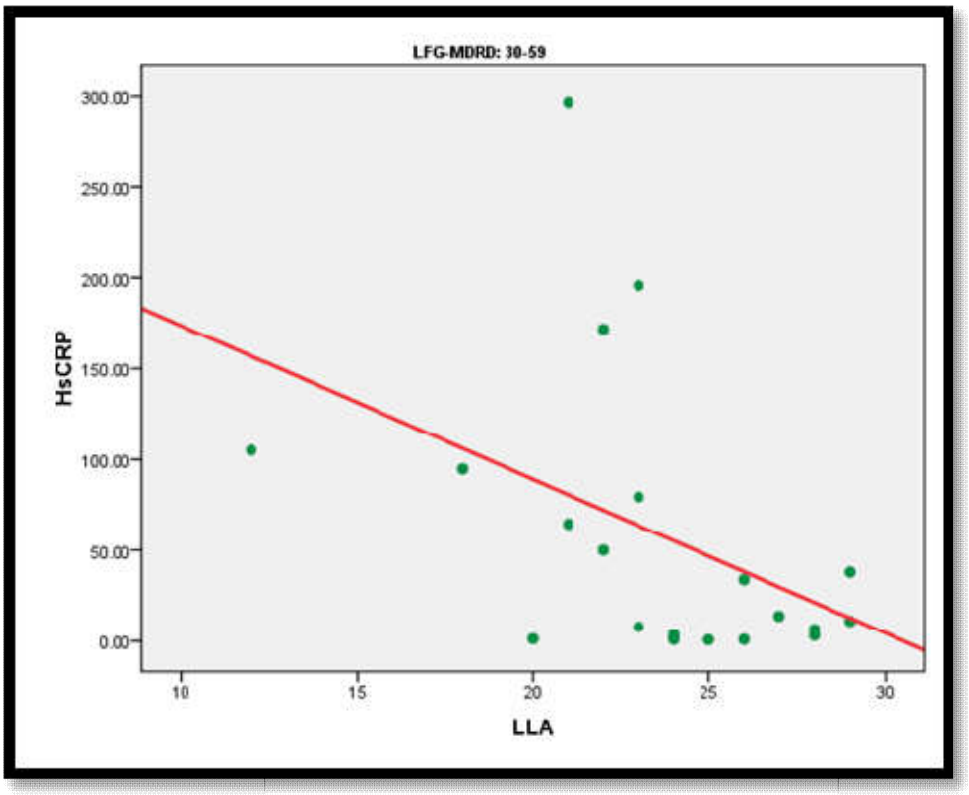
a)


LFG-MDRD: 30-59
HsCRP
300.00
250.00
200.00
150.00
100.00
50.00
0.00
10
15
20
25
30
35
SGA

b)

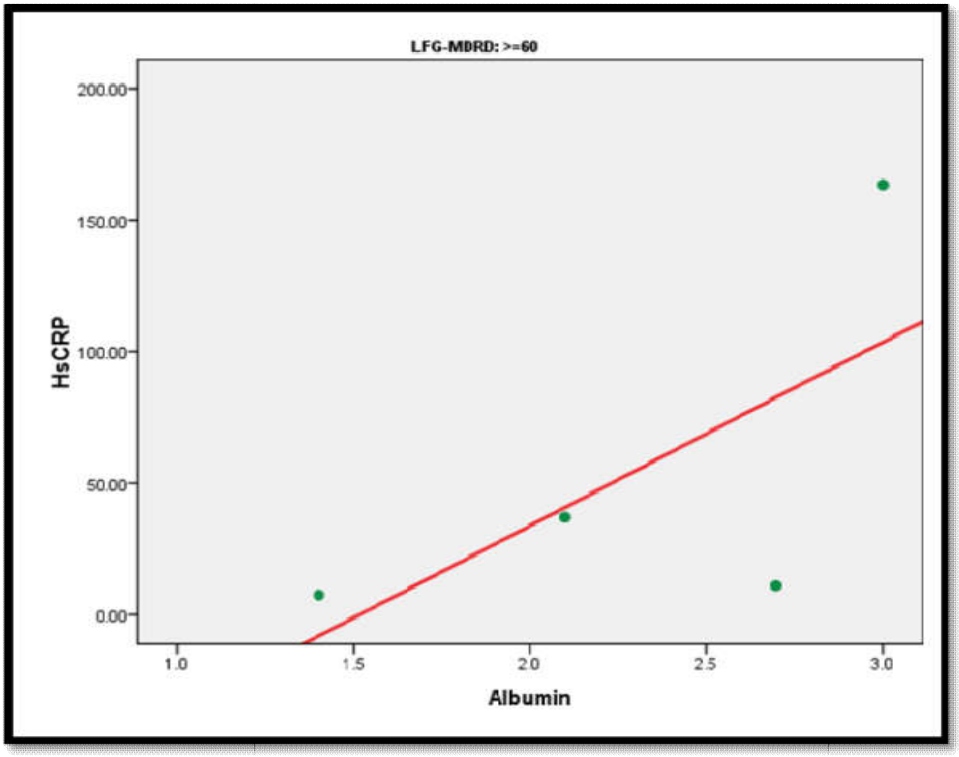


c)

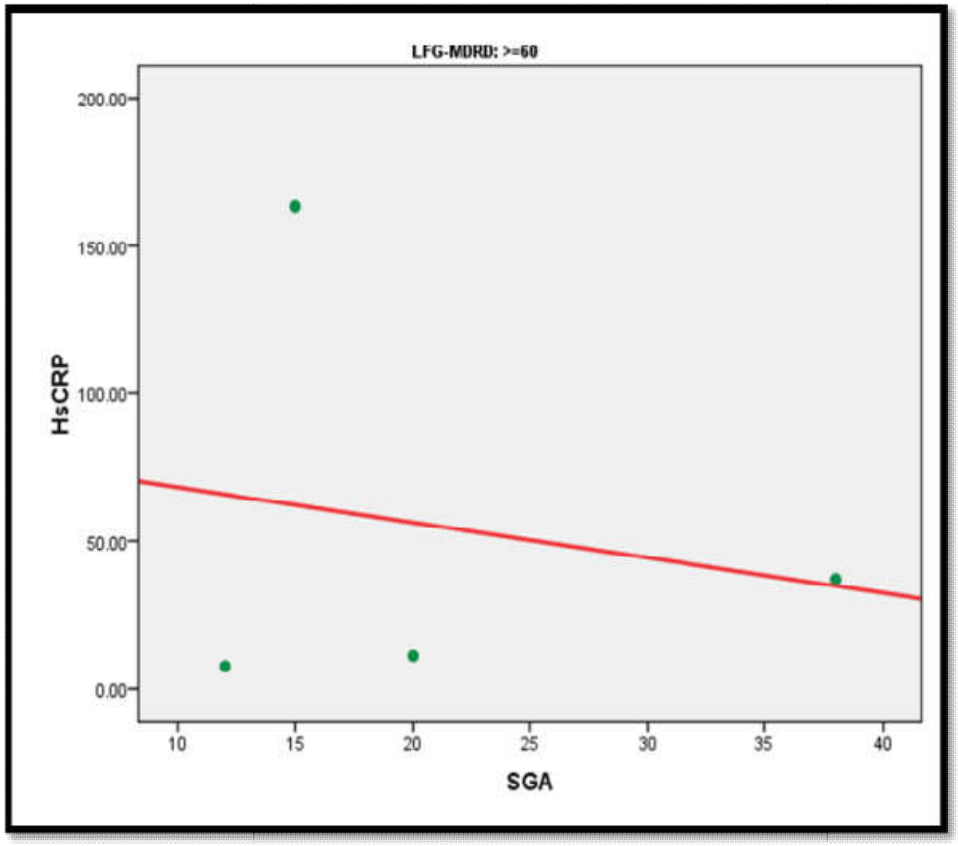


d)

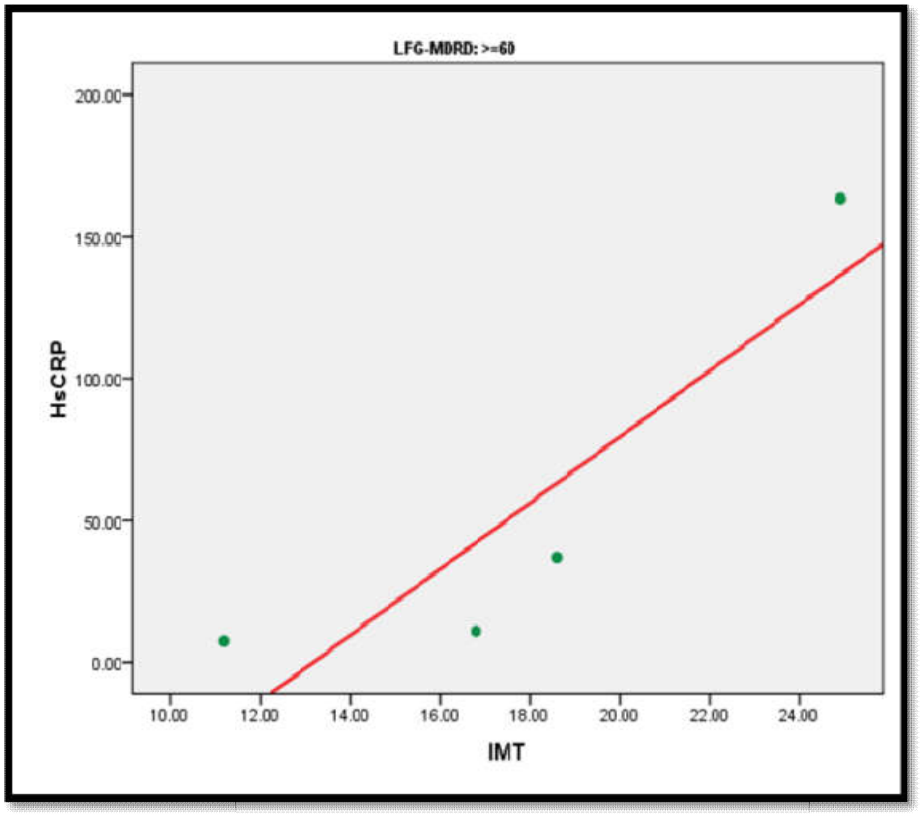
Figure 4. Correlation between various malnutition parameter with hsCRP in GFR 30-59 mL/min/1,73m^2, (a) Albumin; (b) SGA Score; (c) BMI; (d) Arm Circumference


LFG-MDRD: >=60
200.00
150.00
100.00
50.00
0.00
HsCRP
1.0
1.5
2.0
2.5
3.0
Albumin

a)


LFG-MDRD: >=60
200.00
150.00
100.00
50.00
0.00
HsCRP
10
15
20
25
30
35
40
SGA

b)



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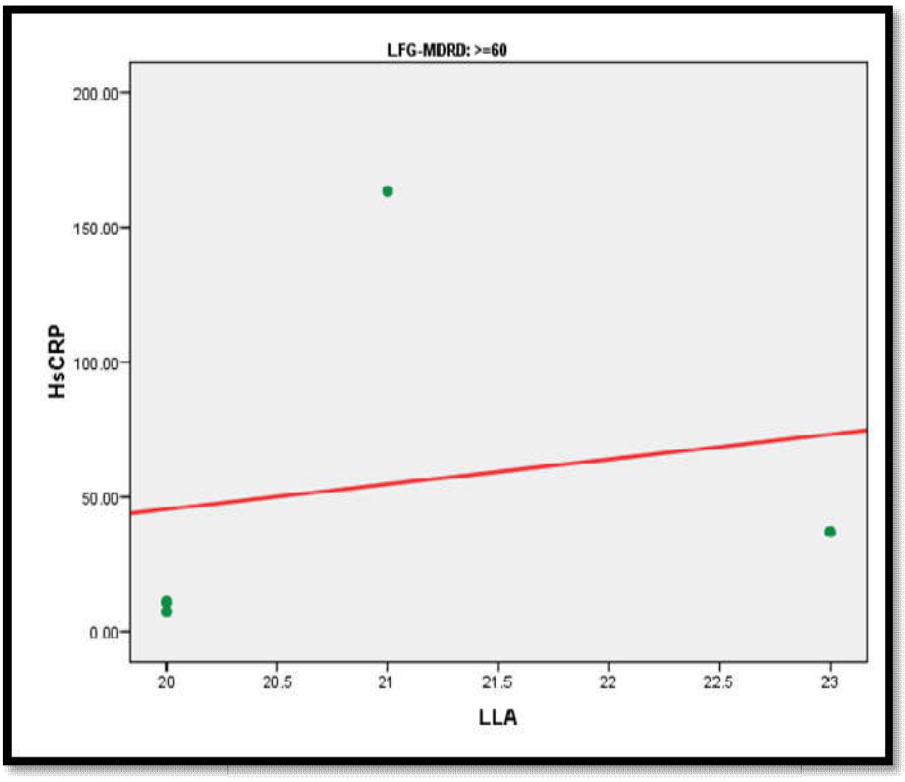

d)

Figure 5. Correlation between various malnutition parameter with hsCRP in GFR ≥ 60 mL/min/1,73m^2, (a) Albumin; (b) SGA Score; (c) BMI; (d) Arm Circumference

In GFR 30-59 mL/min/1,73m2 there is a negative correlation between albumin levels and LLA with hsCRP levels (p=0.071; p=0.027); SGA score and BMI is positively correlated with hsCRP levels (p=1.000; p=0.350) (Picture 4). In GFR ≥60 mL/min/1,73m2 there is a positive correlation between albumin, SGA score, BMI and LLA with high levels of hsCRP (p=0.800; p=0.400; p=0.000; p=0.262) (Picture 5).

DISCUSSION

Malnutrition and inflammation are common in patient with CKD, especially patient on dialysis. It is related with malnutrition-inflammation-atherosclerosis syndrome and cardiovascular disease. (Rao and Reddy, 2008) Malnutrition will influence patient quality of life and increased mortality and morbidity, but until now never has enough attention. (Lawson *et al*., 2001) In CKD patient, there is stress oxidative induced inflammation, but no evidence shows this happened especially in dialysis CKD patient. (Stenvinkel, 2002) Some studies used CRP as a inflammation marker in CKD patient, however not many studies used CRP in predialysis CKD patient. C-reactive protein is a chronic inflammation marker for proinflammation that have been used widely but until now there is a variation of proinflammation cut off point. In this study, we used cut off point CRP <10 mg/L. Based on that we found 44 subjects (68,8%) have inflammation (woman (71,4%) and man (65,5%)). However, the mean hsCRP shows no significant difference between malnutrition and non-malnutrition subjects. It shows in predialysis CKD patient inflammation event is not as much as dialysis CKD patient. Also, in this study, in every stage of CKD, the number of subjects that have inflammation increased, especially in GFR <15mL/min/1.73m2. Possible causes of high CRP in CKD patient are (1) various factors linked with dialysis and (2) others factors not linked with dialysis, such as uremia toxin effect in immune system, comorbid, chronic infection, increased expression of cytokine proinflamation or decreased clearence of cytokine proinflammation and disorder in calcium and phosphate. Until now, there's no single ideal examination to diagnose malnutrition in CKD. Therefore, combination of nutrition parameters must be used in CKD patients. In this study, we used albumin serum, SGA score, BMI and arm circumference. Serum albumin is routinely used in clinical setting to evaluate nutritional setting. However, serum albumin is also effected by other condition, such as chronic liver disease, over hydration and chronic inflammation. It's important to differenciated whether low albumin serum caused by malnutrition or chronic infection, (Sylvestre *et al*., 2007).

Antropometric evaluation is also used to evaluate nutritional status, in this study, we used BMI and arm circumference. Recently, SGA score used because this method is easy and simple, but very subjective tools to evaluated nutritional status. In this study, all nutritional parameters show no correlation with subject inflammation status.

Conclusion

We found an increased incidence of malnutrition and inflammation in predialisis CKDsubjects, but no correlation between them.

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