



# Vitamin D in overweight chronic kidney disease patients

Athanasios Kitsos<sup>a</sup>, Stelios Tigas<sup>b</sup>, Evangelia Ntounousi<sup>a</sup>, Rigas Kalaitzidis<sup>a</sup>, Anna Challa<sup>c</sup>, Kostas C. Siamopoulos<sup>a</sup>

<sup>a</sup> Department of Nephrology, University of Ioannina, Greece.

<sup>b</sup> Department of Endocrinology, University of Ioannina, Greece.

<sup>c</sup> Pediatric Research Laboratory, Child Health Department, University of Ioannina, Greece

## Introduction:

Obesity is a strong risk factor for incident chronic kidney disease (CKD). Furthermore, high body mass index (BMI) is consistently associated with low serum vitamin D in the general population. The aims of the present study were to i) compare vitamin D metabolite levels in overweight/obese versus normal weight individuals with normal to severely impaired renal function and ii) to assess the impact of 25(OH)D on the development of secondary hyperparathyroidism (SHPT).

## Methods:

25(OH)D, 1,25(OH)<sub>2</sub>D, PTH, calcium (Ca) and phosphate (P) were measured in 104 CKD outpatients with BMI>25kg/m<sup>2</sup>. Participants were categorized according to the eGFR (ml/min/1.73m<sup>2</sup>) in three categories:

1. G1 ≥60 ml/min/1.73 m<sup>2</sup> (n=53),
2. G2: 30-59 ml/min/1.73 m<sup>2</sup> (n=35) and
3. G3: 15-29 ml/min/1.73 m<sup>2</sup> (n=16).

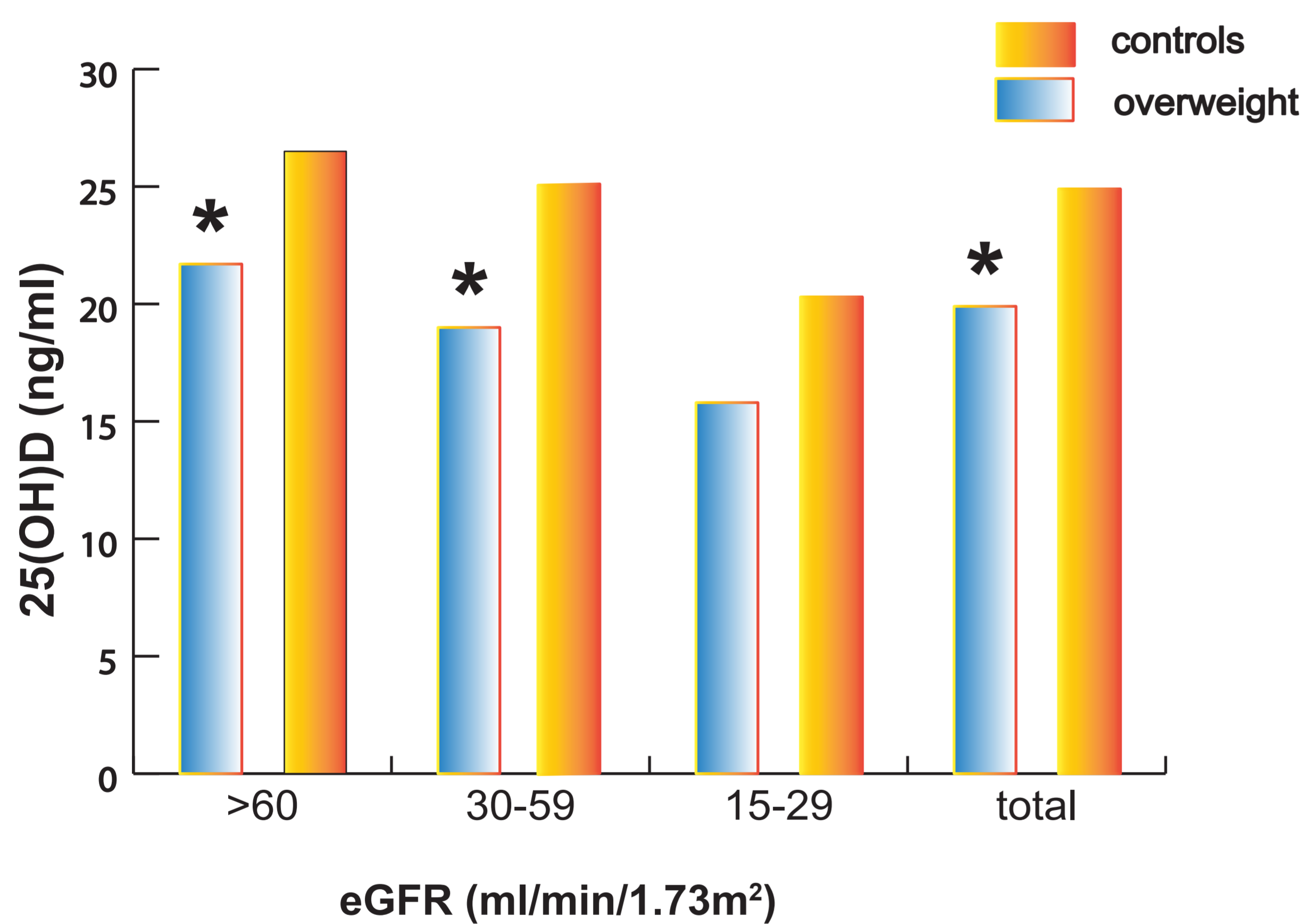
A control group of fifty normal-weight outpatients with comparable eGFR levels was included (G1-nw – G3-nw).

## Results:

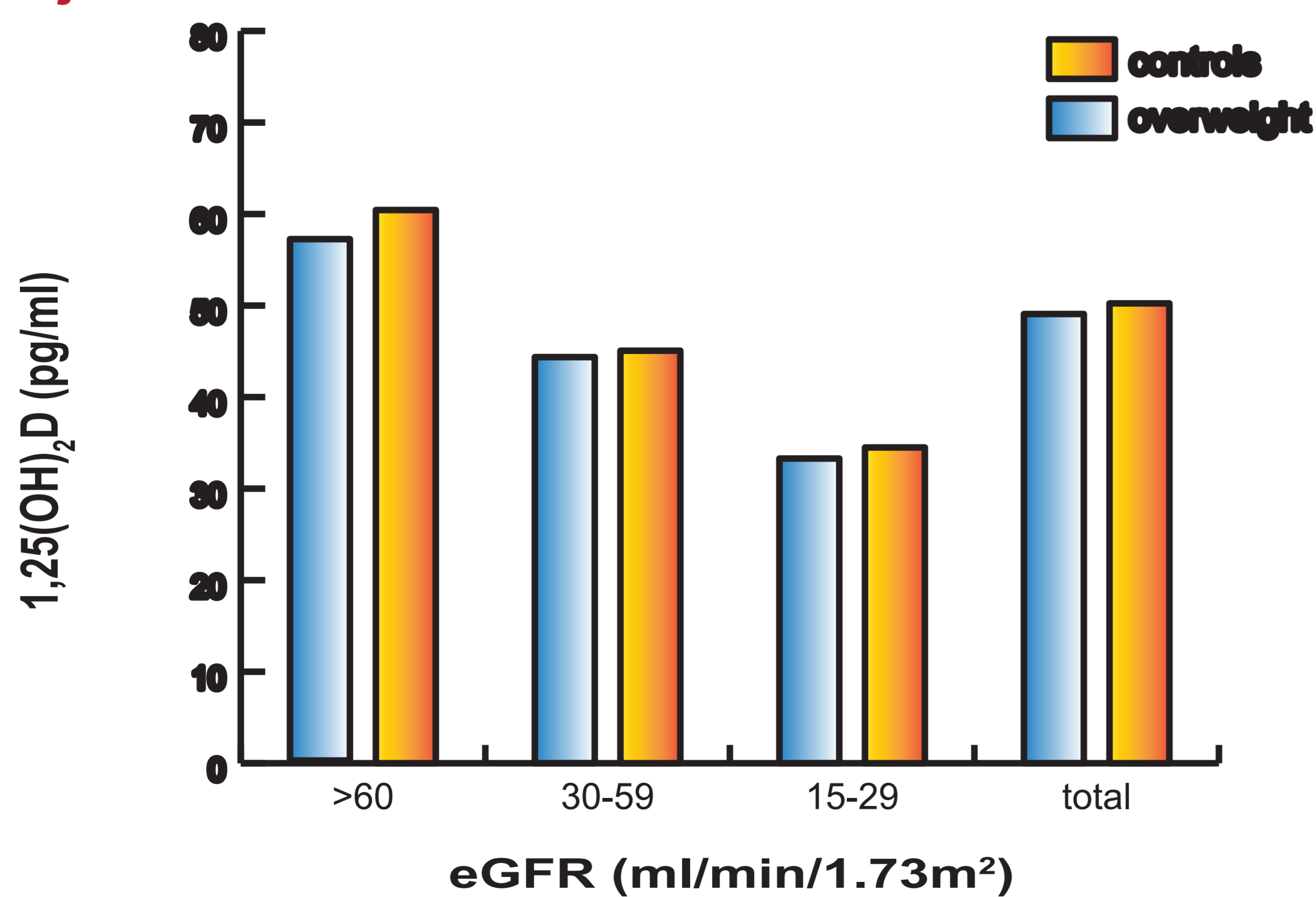
25(OH)D was lower in overweight/obese (G1-G3) subjects (19.9±6.4 vs 24.9±6.3 ng/ml, p<0.01) compared to normal individuals. This difference was observed in G1 patients compared to G1-nw (21.7 ±6.5 vs 26.5±7.0 ng/ml, p=0.02) and in G2 patients versus G2-nw (19.0±6.0 vs 25.0±5.2 ng/ml, p<0.01), whereas the level did not differ among G3 groups (15.8±4.7 ng/ml vs 20.3±4.5 ng/ml, p=0.49 in G3 vs G3-nw respectively) (figure 1).

Mean 1,25(OH)<sub>2</sub>D and PTH levels were similar in obese/overweight versus normal-weight individuals in each eGFR category (figure 2, figure 3 and

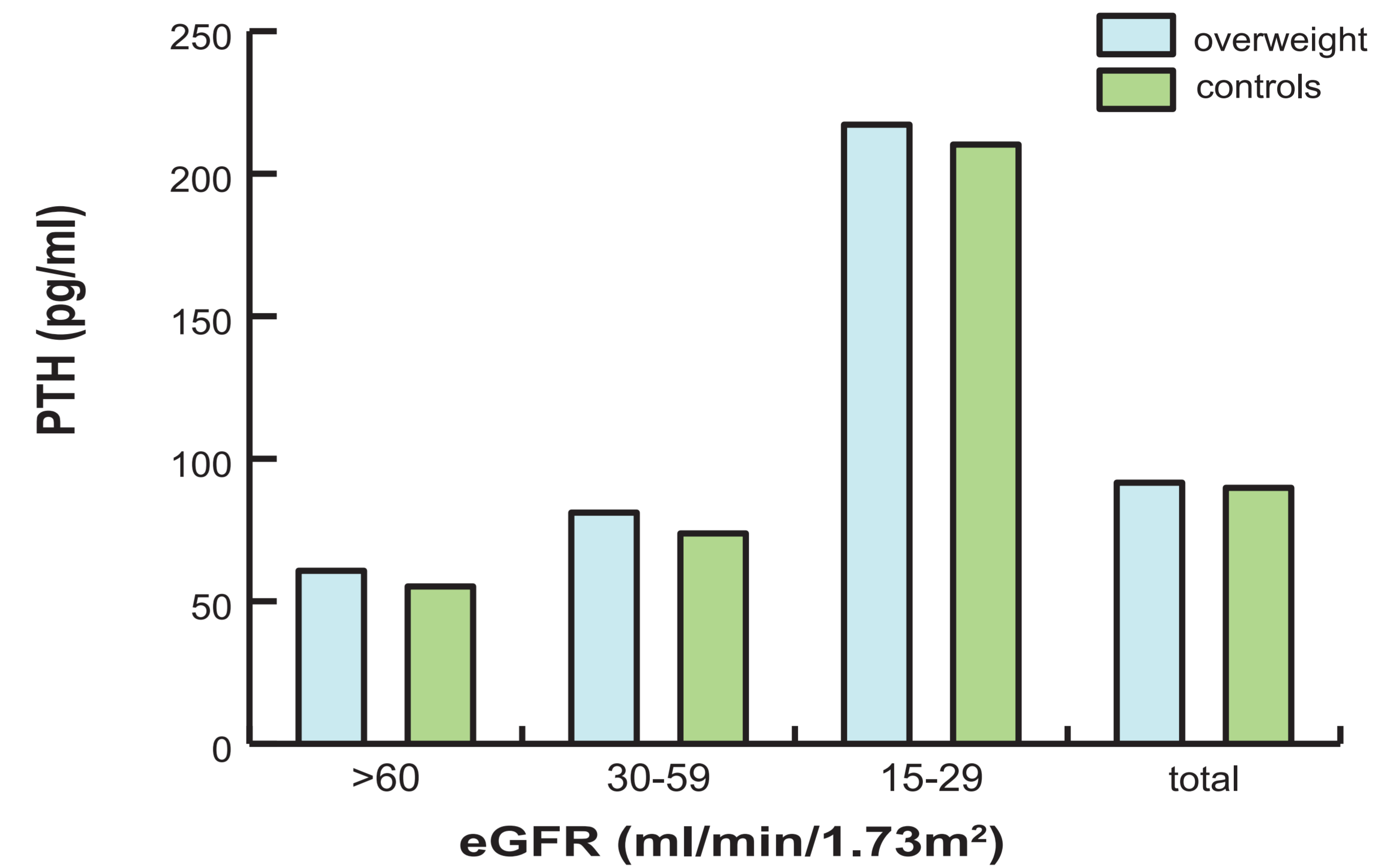
**Figure 1: 25(OH)D levels in overweight vs normal weight subjects**



**Figure 2: 1,25(OH)<sub>2</sub>D levels in overweight vs normal weight subjects**



**Figure 3: PTH levels in overweight vs normal weight subjects**



Multivariate regression analysis in the entire cohort revealed that factors independently associated with low 25(OH)D levels were:

1. BMI>25kg/m<sup>2</sup>
2. eGFR<30 ml/min/1.73m<sup>2</sup> and
3. female gender.

Factors independently associated with low 1,25(OH)<sub>2</sub>D levels were:

1. eGFR<30 ml/min/1.73m<sup>2</sup>
2. older age and
3. increased serum phosphate.

Even though mean 25(OH)D was suboptimal (<30ng/ml) in all eGFR groups, SHPT begun to occur in eGFR levels<60 ml/min/1.73m<sup>2</sup>.

Almost half of the participants with CKD stage 3 (16 out of 35) had PTH levels above the upper limit of the normal lab reference range and most of them (14/16 or 87,5%) had eGFR <45ml/min/1.73m<sup>2</sup>.

Significant hyperparathyroidism, in terms of PTH levels higher than those recommended by current clinical guidelines, were only observed in G3.

**Table 1: Bone metabolism markers by eGFR levels in overweight and normal weight subjects**

Variables	eGFR ml/min/1.73m <sup>2</sup>	overweight	controls	p
25OHD ng/ml	>60	21.7 ±6.5	26.5 ±7.0	<b>0.02</b>
	30-59	19.0 ±6.0	25.1 ±5.2	<b>&lt;0.01</b>
	15-29	15.8 ±4.7	20.3 ±4.8	0.49
	total	19.9 ±6.4	24.9 ±6.3	<b>&lt;0.01</b>
1.25 OH <sub>2</sub> D pg/ml	>60	57.0 ±18.5	60.4 ±20.9	0.63
	30-59	44.4 ±15.7	45.1 ±13.6	0.84
	15-29	33.3 ±12.4	34.5 ±10.0	0.80
	total	49.1 ±18.8	50.2 ±19.5	0.98
PTH pg/ml	>60	81.1 ±45.9	73.8 ±34.7	0.27
	30-59	217.2 ±141.9	210.22 ±66.2	0.68
	15-29	91.6 ±83.4	89.8 ±68.4	0.57
	total	91.6 ±83.4	89.8 ±68.4	0.76

\* p refers to post-hoc test significance in anova analysis

## Conclusions:

Lower serum 25(OH)D but similar 1,25(OH)<sub>2</sub>D and PTH levels were observed in overweight/obese compared to normal weight individuals and preserved or moderately impaired renal function.

Even though vitamin D insufficiency was a common feature across all eGFR categories, SHPT was only observed in those with severely impaired renal function.