Protein Intake Per Meal in Varsity Athletes With Low and High Lean Body Mass Index

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ABSTRACT:

PURPOSE: To compare the protein intake per meal in varsity athletes with low and high lean body mass index (LBMI).

METHODS: Protein intake per meal and LBMI were assessed in 94 varsity male athletes. Protein intake was evaluated with a 24-h dietary recall by trained nutritionists. The protein amount per meal was estimated for each subject and was classified as inadequate if it contained lower than 20 g of protein. Lean body mass was evaluated with bioelectrical impedance and LBMI was calculated (lean body mass [kg]/ height2 [m]). Then the sample was divided per LBMI thertiles, and the lower and higher thertiles defined as low (LLBM) and high (HLBM) lean body mass groups, respectively. Median intake for total (g/day), relative (g/kg/day) and per meal (g) protein as well as prevalence of inadequate protein intake (INPI) per meal were calculated for each group. We made comparisons between groups for protein intake (U Mann-Whitney test) and INPI prevalence (two samples t-test), we also analyzed within groups per meal protein intake (Friedman ANOVA, Dunns post hoc) and per meal INPI prevalence (one sample t-test).

RESULTS: HLBM group had a higher total but not relative protein intake compared with LLBM group. The per meal protein intake analysis didn´t show significant differences between groups. The INPI prevalence was similar in both groups, but none comparison reached statistical significance. LLBM group ingested the majority of their protein at lunch being higher than dinner ($p<0.05$) and the INPI prevalence was lower at lunch ($p>0.05$). HLBM also ingested the majority of their protein at lunch, being higher than breakfast and dinner ($p<0.05$) and the lowest prevalence of INPI was showed in lunch compared with dinner ($p<0.05$) but not for breakfast ($p>0.05$).

CONCLUSIONS: INPI per meal is common in varsity athletes, independently if they are LLBM or HLBM. Despite an adequate daily protein intake, efforts should be addressed to provide adequate amounts of protein on a per meal basis.

INTRODUCTION

It is well stablished that exercising subjects require a higher protein intake in order to improve training adaptations [1,2]. We know that total daily protein intake mainly determines these responses. However, recent evidence suggests that there are other factors that must be taken into account in order to get the best results [3]. Probably, the 20 g of protein per meal is the soundest factor. Consuming this amount in a per meal basis could help to optimally stimulate muscle protein synthesis through the day, which could be translated into increase in lean body mass (LBM) in the long term [4].

However, there is evidence suggesting athletes do not consume this protein amount at every meal, which could lead to suboptimal muscle adaptive response to exercise [5]. Nonetheless, this trend could be different depending on subjects' body composition, in other words, it is suggested that subjects with higher LBM need more protein than those with lower LBM [6]. Subjects with higher LBM may be more conscious about their protein intake than those with lower LBM, and this could be reflected in the protein intake analyzed as a whole day and per meal basis. Therefore, the purpose of this study was to compare the protein intake per meal in varsity athletes with low and high lean body mass index (LBMI).

METHODS

Subjects

We evaluated 94 male athletes (mean age 21 ±2 y) belonging to our university´s representative teams prior to the national university games. These are preliminary data from a larger athlete cohort.

Protein intake

Trained nutritionists evaluated protein intake with a 24-h dietary recall employing food replicas. Total (g/day), relative (g/kg/day) and per meal (g) protein intake were estimated with a professional software (Nutrickal®VO) for each subject. The protein intake per meal was classified as inadequate if it contained lower than 20 g of protein.

LBM grouping

LBM was evaluated with bioelectrical impedance (TANITA, TBF-410) and LBMI was calculated (lean body mass [kg]/ height^2 [m] [7]). Then the sample was divided per LBMI tertiles (n=31 each), and the lower and higher tertiles defined as low (LLBMI ≤17.7 kg/m^2) and high (HLBMI, ≥19.8 kg/m^2) lean body mass index groups, respectively.

Statistics

General groups characteristics are expressed as mean ±SD, and were compared using t-test for independent samples.

For both groups total, relative, and per meal protein intake was expressed by median and interquartile range; and inadequate protein intake (INPI) was expressed as prevalence and 95% CI. We made comparisons between groups (LLBMI vs HLBMI) for protein intake (U Mann-Whitney test) and INPI prevalence (t-test for independent proportions). We also compared per meal protein intake (Friedman ANOVA, Dunns post hoc) and per meal INPI prevalence (Cochran's Q test for proportions) within groups. Significant differences were considered at $p<0.05$.

RESULTS

HLBMI group was heavier and taller than LLBMI group, similarly LBM and LBMI were higher in the former group (Table 1). HLBMI group had a higher total (129.7 [93.3-197.5] vs 105.5 [90.0-128.7], p=0.04) but not relative (1.5 [1.2-2.6] vs 1.8 [1.3-2.3], p=0.55) protein intake compared with LLBMI group. The per meal protein intake analysis did not show significant differences between groups (Figure 1A). The INPI prevalence was similar in both groups, but none comparison reached statistical significance (Figure 1B). Protein intake was above the 20 g for all meals except for dinner in HLBMI group. Both groups ingested most of their protein at lunch, similarly, INPI prevalence was lower at lunch for both groups.

Table 1. General groups characteristics (mean ±SD).

Group	Weight (kg)	Height (cm)	LBM (kg)	LBMI (kg/m^2)
LLBMI (n=31)	60.8 ±10.4	168.3 ±9.7	46.1 ±5.7	16.4 ±1.1
HLBMI (n=31)	82.1 ±10.6*	176.7 ±8.1*	65.5 ±6.9*	20.9 ±0.8*

LBM: Lean body mass; LBMI: Lean body mass index; LLBMI: Low lean body mass index group; HLBMI: High lean body mass index group.

*Significant differences between groups (p<0.001)

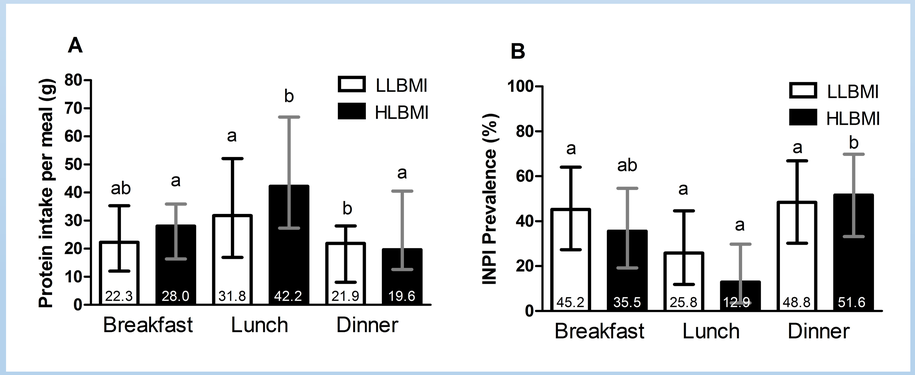

Figure 1. Protein intake per meal (A) and inadequate protein intake prevalence per meal (B) in male varsity athletes per lean body mass index group. Different lower case letters mean significant differences between meals within groups ($p<0.05$). There were not significant differences between groups. HLBMI: High lean body mass index group; INPI: Inadequate protein intake; LLBMI: Low lean body mass index group. Graph A median-interquartile range; graph B prevalence-95% CI.

CONCLUSIONS

With these preliminary data we found that there were not differences in protein intake and INPI prevalence per meal between male varsity athletes with HLBMI and LLBMI. Despite an adequate daily protein intake, efforts should be addressed to provide adequate amounts of protein on a per meal basis.

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