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# Body composition and dietary intake in male amateur rugby players, juvenile category M15 and M16 of Tigres Rugby Club, San Lorenzo

## Composición corporal e ingesta alimentaria en jugadores masculinos de rugby amateur, categoría juvenil M15 y M16 de Tigres Rugby Club, San Lorenzo

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fat mass, muscle mass, calories, macronutrients, 24-hour recall.

**ABSTRACT**

The study aimed to analyze the relationship between body composition and dietary intake in male youth amateur rugby players from Tigres Rugby Club (San Lorenzo). A cross-sectional, observational, descriptive, and correlational study was conducted. Anthropometric measurements were assessed using the ISAK protocol, and energy and macronutrient intake were measured using 24-hour dietary recalls in 53 players from the M15 and M16 categories (backs and forwards). The results indicated that the majority of participants had adequate levels of body fat (64%) and muscle mass (83%), although 36% showed excess fat and 17% muscle deficit, with a higher prevalence among forwards. Regarding energy intake, 62% reached adequate levels, with a tendency towards excess calories in some backs and a deficit in certain forwards. The macronutrient distribution revealed insufficient carbohydrate intake (73%) and excesses in fats (96%) and proteins (36%). Furthermore, a dietary pattern was observed characterized by high consumption of ultra-processed foods and low intake of fruits and vegetables. No statistically significant associations were found between body composition and intake; however, trends suggest that excess adipose tissue and muscle mass development in players are more related to diet quality and macronutrient distribution than to total caloric intake, along with factors specific to adolescence, such as growth and maturation.
In conclusion, although overall body composition is adequate, poor dietary quality is evident, requiring nutritional interventions tailored to youth rugby.

**Palabras clave:**
masa adiposa, masa muscular, calorías, macronutrientes, recordatorio de 24 horas.

**RESUMEN**

El estudio tuvo como objetivo analizar la relación entre composición corporal e ingesta alimentaria en jugadores masculinos juveniles de rugby amateur de Tigres Rugby Club (San Lorenzo). Se realizó un estudio observacional, descriptivo y correlacional de corte transversal. Se evaluaron medidas antropométricas mediante protocolo ISAK y la

ingesta energética y de macronutrientes mediante recordatorios de 24 horas en 53 jugadores de categorías M15 y M16 (backs y forwards).
Los resultados indicaron que la mayoría presentó valores adecuados de masa adiposa (64%) y masa muscular (83%), aunque un 36% mostró exceso de adiposidad y un 17% déficit muscular, con mayor prevalencia en los forwards. En cuanto a la ingesta energética, el 62% alcanzó valores adecuados, registrándose tendencia de exceso calórico en algunos backs y de déficit en ciertos forwards. La distribución de macronutrientes evidenció ingesta insuficiente de carbohidratos (73%) y excesos en grasas (96%) y proteínas (36%). Además, se observó un patrón alimentario con alto consumo habitual de ultraprocesados y baja ingesta de frutas y verduras. No se encontraron asociaciones estadísticamente significativas entre composición corporal e ingesta; sin embargo, las tendencias sugieren que el exceso de masa adiposa y el desarrollo de masa muscular en los jugadores se relacionan más con la calidad de la alimentación y la distribución de macronutrientes que con el aporte calórico total, junto con factores propios de la adolescencia, como crecimiento y maduración. En conclusión, aunque la composición corporal general es adecuada, se evidencia una calidad alimentaria deficiente que requiere intervenciones nutricionales orientadas al rugby juvenil.

## Introduction

Rugby is a contact sport that demands high levels of strength, speed, and endurance—qualities that depend largely on a player's body composition. In youth categories, these requirements are complicated by the unique context of adolescence, a stage of life characterized by significant changes in body composition, such as an increase in muscle mass and a redistribution of body fat. These processes, which are influenced by hormonal, genetic, environmental, and nutritional factors, have a direct impact on athletic performance, injury prevention, and the player's overall physical development (1).

Muscle mass is a key factor in rugby players' performance, as it is directly linked to strength, power, and the ability to absorb the impacts typical of the sport (2).

On the other hand, body fat—although necessary in certain proportions for the body's proper metabolic and hormonal functioning—must be maintained at optimal levels to avoid adverse effects on speed, agility, and athletic performance. The balance between these two components is particularly important during adolescence, when the body is in the midst of development and energy and nutritional needs increase significantly (3).

These players' dietary intake must be tailored to the demands of training and competition, ensuring an adequate supply of energy and nutrients to meet metabolic needs and promote recovery. However, in many cases, this intake may be inadequate, which negatively affects both body composition and performance in young people (4).

According to the United Nations Children's Fund (UNICEF), most adolescents do not consume the foods that would provide them with the foundation for a long, healthy, and productive adult life. About 21% of adolescents in school eat vegetables less than once a day; 34% eat fruit less than once a day; 42% drink sugary beverages daily; 46% eat fast food at least once a week; and, in general, they skip breakfast. There are external influences that have a significant impact on the food choices made by adolescents, including peer pressure, the desire to fit in with their peers, and the marketing and widespread availability of fast food and industrially produced beverages, especially in schools and their surrounding areas (5).

Adolescents are in a vulnerable stage of life and are sensitive to stimuli related to changes in diet; this is particularly true for adolescents who participate in sports, as it is directly linked to changes in body weight or the use of sports supplements aimed at improving their performance (6).

Athletic performance in rugby is influenced by many factors, with body composition and nutrition playing a decisive role. The proper distribution of body fat and muscle mass is key to players' athletic performance, as it directly affects strength, speed, and endurance. In addition, caloric intake and a balanced consumption of macronutrients play a key role in optimizing performance and recovery, as well as in preventing fatigue and injuries (1).

Among amateur youth rugby players, there is a preference for fast food, sugary drinks, and foods high in saturated fat, as well as low consumption of fruits and vegetables; there is also an inability to meet their necessary energy requirements. This can affect body composition, compromising both athletic performance and overall physical development. However, the scientific literature provides little evidence regarding the relationship between dietary intake and body composition in this age group (7).

In the context of amateur rugby in the province of Salta, where assessments of players' body composition—specifically fat mass and muscle mass—as well as nutritional planning by a professional may be limited, it is common to find imbalances (excesses or deficiencies) in one or both of these variables, which compromises both the players' performance on the field and their overall health.

Therefore, this study aims to analyze the body composition of male youth amateur rugby players in the U15 and U16 divisions of the "Tigres Rugby Club," with a special focus on body fat and muscle mass and their relationship to dietary intake.

# Method

## *Body Composition*

To assess body composition, anthropometric measurements were taken according to the restricted profile recommended by ISAK 2019 (8).

After obtaining institutional authorization from the club, as well as informed consent from the guardians and assent from the players, the evaluation of the adolescents was coordinated with the physical trainer for each division.

The participants were evaluated in the gym's examination room at that facility, wearing as little clothing as possible to facilitate the identification of anatomical landmarks. All measurements were taken with the subject in a standardized anthropometric position on the right side of the body.

### *Basic Measurements*

Weight

Instrument: Digital/electronic scale. Accuracy: 100 to 50 g. Cormillot.

Method: The subject, wearing as little clothing as possible, stood in the center of the scale with his weight evenly distributed between both feet, allowing the measurement to be taken.

Size

Instrument: Self-adhesive height chart with millimeter markings. Accuracy of 0.1 cm. Argentine Gauges.

Method: The subject stood with his back to the height rod in an anthropometric position, barefoot, with his feet firmly planted on the floor, his heels touching the wall, and his head in the Frankfort plane. In this way, the distance between the vertex and the soles of the feet was measured.

### *Skin folds*

Instrument: Plastic pleat gauge. 50 mm range and 0.2 mm accuracy. Argentine Gauges.

Method: To measure all the skinfolds, the corresponding anatomical point for each area—which had been marked beforehand—was used as a reference. To do this, the crease between the thumb and index finger of the left hand was used. With his right hand, he picked up the device and placed it 1 cm below that crease; after two seconds, he took the reading.

### *Perimeters*

Instrument: Flexible steel anthropometric tape. Accuracy of 0.1 cm. Argentine Gauges.

Method: Once the perimeter to be measured had been encircled, the tape measure was held with enough tension to keep it in this position against the body and take the reading, directly in line with the zero mark to avoid errors caused by tilting.

*Diameters*

Instrument: Plastic caliper. Accuracy of 0.1 cm. Argentine Gauges.

Method: The first arm of the caliper was placed at the anthropometric point and the second arm at the other point on the short bones, and the corresponding measurement was taken.

*Body Fat*

To calculate body fat mass (BFM), the sum of 6 skinfold thicknesses (SP6) in mm and the Z-score for body fat were used to plug both values into Kerr's (1991) mathematical formula—an equation used in both scientific studies and the ISAK 2019 software—to estimate BFM in kilograms.

*Muscle Mass*

To calculate muscle mass (MM), the following variables were considered: corrected relaxed arm circumference, corrected mid-thigh circumference, and corrected calf circumference; in addition to the subject's height in meters, age, sex, and race. This allowed us to express these values using Lee's (2000) mathematical formula—an equation used in both scientific studies and the ISAK 2019 software—and to estimate the dry matter (kg).

An average was calculated for the anthropometric profile of fat mass and muscle mass in kilograms for the youth URBAREF players, broken down by playing position (forwards-backs) and division (M15-M16).

The obtained values were then analyzed in relation to the formulas for estimating body fat and muscle mass in the players, calculating an average of both by playing position (forwards-backs) and division (M15-M16), and subsequently compared with the average standards developed in-house based on the URBAREF youth guidelines.

*Food Intake*

A semistructured dietary survey was administered using the R24 questionnaire; to validate the questionnaire, a pilot study was conducted among adolescents who engage in regular physical activity and were not part of the sample. Once the necessary corrections were made, three R24 (9) codes were applied to all players who participated in the study: two for weekdays and one for weekends.

In this way, the daily amount of food consumed was estimated, using as a reference the household measurements expressed in grams proposed by Lic. Lucía Batrouni (2016) and the Photographic Atlas of Foods and Food Preparations by Agustina Lotufo Haddad, et al. (2022) (10,11).

To convert the data into calorie and macronutrient values, we used the food composition tables from the Food Analysis and Registration System (SARA; 2022) and the Institute of Nutrition of Central America and Panama (INCAP; 2012); for foods not listed in these tables, we used the corresponding nutritional labeling.

Next, an average of the caloric intake and macronutrient intake of the participants over the three days analyzed was calculated. Tables were created based on playing position (forwards-backs) and age group (M15-M16) to ultimately compare these values with the required amount of calories and macronutrients and determine the percentage of adequacy.

The IOM (2002) formula was used to establish the estimated reference energy requirement, as it is one of the most up-to-date formulas and takes the adolescent population into account, allowing for the addition of a caloric factor for growth.

To establish the reference macronutrient requirements, the standards cited in the theoretical framework by Marcia Onzari, B.A., in her book *Fundamentals of Sports Nutrition; 2021* (12) were used.

Finally, to analyze the frequency of habitual consumption of the main food groups reported based on the three R24s, they were represented in a stacked bar chart according to the number of days on which they were consumed by the players, making it possible to identify those included in a single R24, in two R24s, or in all three R24s evaluated.

## Results

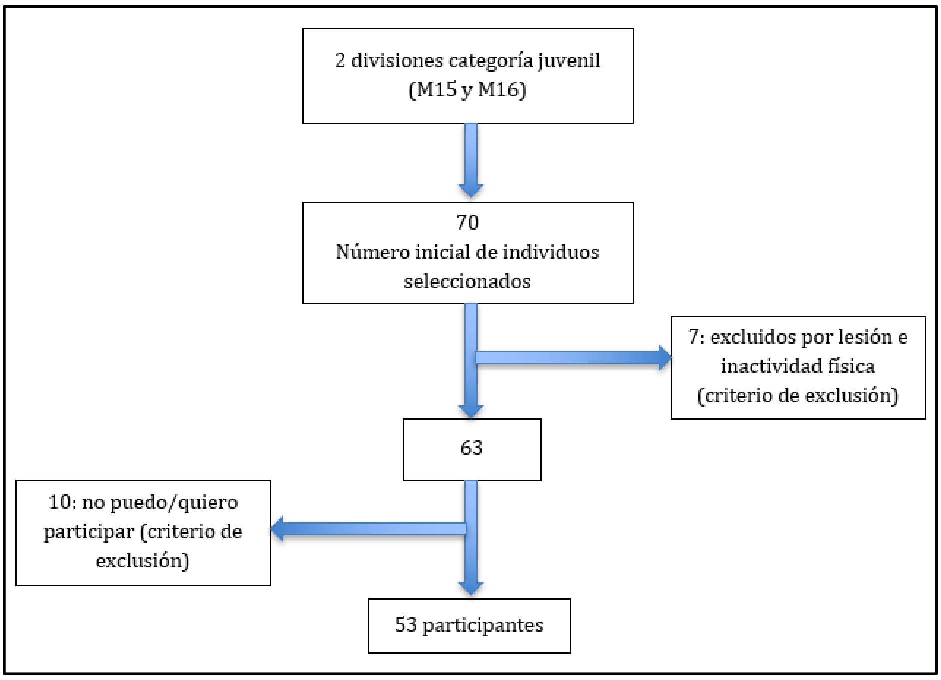


**Figure 1**. Flowchart for Participant Selection.

**Table 1.** Body Composition Statistics for Fat Mass and Muscle Mass by Division and Playing Position Among Male Youth Players of the "Tigres Rugby Club," San Lorenzo 2025.

| Variables | M15 (n=26) | | | | | | M16 (n=27) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Backs (n=14)** | | | **Forwards (n=12)** | | | **Backs (n=11)** | | | **Forwards (n=16)** | | |
| | **M** | **Min** | **Max** | **M** | **Min** | **Max** | **M** | **Min** | **Max** | **M** | **Min** | **Max** |
| Kg MA | 14,83 | 12,39 | 21,31 | 21,90 | 14,44 | 37,20 | 18,20 | 13,56 | 21,90 | 24,04 | 14,14 | 38,55 |
| Kg MM | 25,56 | 21,38 | 30,60 | 27,75 | 24,59 | 33,40 | 30,47 | 26,60 | 34,77 | 31,93 | 26,45 | 38,30 |

Shapiro-Wilk: MA W=0,86; p<0,0001 (n=53). MM W=0,90; p=0,66 (n53).

**Table 2.** Assessment of Body Fat Mass by Position and Playing Role Among Male Youth Players of the "Tigres Rugby Club," San Lorenzo 2025.

| Valoración MA | M15 (n=26) | | | | M16 (n=27) | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Backs** | | **Forwards** | | **Backs** | | **Forwards** | | | |
| | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| **Adecuado** | 10 | 19 | 9 | 17 | 6 | 11 | 9 | 17 | **34** | **64** |
| **Exceso** | 4 | 8 | 3 | 6 | 5 | 9 | 7 | 13 | **19** | **36** |
| **Total** | 14 | 27 | 12 | 23 | 11 | 20 | 16 | 30 | **53** | **100** |

**Table 3.** Assessment of Muscle Mass by Position and Playing Role Among Male Youth Players at "Tigres Rugby Club," San Lorenzo 2025.

| Valoración MM | M15 (n=26) | | | | M16 (n=27) | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Backs** | | **Forwards** | | **Backs** | | **Forwards** | | | |
| | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| **Adecuado** | 13 | 24 | 11 | 21 | 11 | 21 | 9 | 17 | **44** | **83** |
| **Déficit** | 1 | 2 | 1 | 2 | 0 | - | 7 | 13 | **9** | **17** |
| **Total** | 14 | 26 | 12 | 23 | 11 | 21 | 16 | 30 | **53** | **100** |

**Table 4.** Caloric and Macronutrient Intake Statistics by Position and Playing Position for Male Youth Players of the "Tigres Rugby Club," San Lorenzo 2025.

| Variables | M15 (n=26) | | | | | | M16 (n=27) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Backs (n=14) | | | Forwards (n=12) | | | Backs (n=11) | | | Forwards (n=16) | | |
| | M | Min | Max | M | Min | Max | M | Min | Max | M | Min | Max |
| Cal kcal/d | 2974 | 2354 | 4370 | 3117 | 2329 | 3756 | 3217 | 3049 | 3795 | 3277 | 1861 | 5239 |
| HC g/kg/d | 5,48 | 4,26 | 8,69 | 4,51 | 3,41 | 5,37 | 4,70 | 3,54 | 6,40 | 4,07 | 1,37 | 4,88 |
| Prot g/kg/d | 2,28 | 1,70 | 2,84 | 1,92 | 1,40 | 2,76 | 1,92 | 1,63 | 2,76 | 1,67 | 1,35 | 2,82 |
| Grs g/kg/d | 2,49 | 1,86 | 2,96 | 2,10 | 1,57 | 2,79 | 2,06 | 1,89 | 3,01 | 2,16 | 1,10 | 3,17 |

Shapiro-Wilk: Cal W=0,93; p=0,01. HC W=0,94; p=0,05. Prot W=0,90; p<0,0001. Grs W=0,98; p=0,78.

**Table 5.** Assessment of Caloric Intake by Position and Playing Role Among Male Youth Players at "Tigres Rugby Club," San Lorenzo 2025.

| Ingesta Calórica | M15 (n=26) | | | | M16 (n=27) | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Backs | | Forwards | | Backs | | Forwards | | | |
| | n | % | n | % | n | % | n | % | n | % |
| **Insuficiente** | 0 | 0 | 2 | 4 | 1 | 2 | 5 | 9 | **8** | **15** |
| **Adecuada** | 7 | 13 | 9 | 17 | 7 | 13 | 10 | 19 | **33** | **62** |
| **Exceso** | 7 | 13 | 1 | 2 | 3 | 6 | 1 | 2 | **12** | **23** |
| **Total** | 14 | 26 | 12 | 23 | 11 | 21 | 16 | 30 | **53** | **100** |

**Table 6.** Assessment of Carbohydrate Intake by Division and Playing Position Among Male Youth Players at "Tigres Rugby Club," San Lorenzo 2025.

| Ingesta HC | M15 (n=26) | | | | M16 (n=27) | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Backs | | Forwards | | Backs | | Forwards | | | |
| | n | % | n | % | n | % | n | % | n | % |
| **Insuficiente** | 6 | 11 | 10 | 19 | 7 | 13 | 16 | 30 | **39** | **73** |
| **Adecuado** | 7 | 13 | 2 | 4 | 4 | 8 | 0 | 0 | **13** | **25** |
| **Exceso** | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | **2** |
| **Total** | 14 | 26 | 12 | 23 | 11 | 21 | 16 | 30 | **53** | **100** |

**Table 7.** Assessment of Protein Intake by Position and Playing Role Among Male Youth Players at "Tigres Rugby Club," San Lorenzo 2025.

| Ingesta Prot | M15 (n=26) | | | | M16 (n=27) | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Backs** | | **Forwards** | | **Backs** | | **Forwards** | | | |
| | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| **Adecuado** | 4 | 7,5 | 9 | 17 | 7 | 13 | 14 | 26 | **34** | **63,5** |
| **Exceso** | 10 | 19 | 3 | 6 | 4 | 7,5 | 2 | 4 | **19** | **36,5** |
| **Total** | 14 | 26,5 | 12 | 23 | 11 | 20,5 | 16 | 30 | **53** | **100** |

**Table 8.** Assessment of Fat Intake by Position and Playing Role Among Male Youth Players at "Tigres Rugby Club," San Lorenzo 2025.

| Ingesta Grs | M15 (n=26) | | | | M16 (n=27) | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Backs** | | **Forwards** | | **Backs** | | **Forwards** | | | |
| | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| **Adecuado** | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | **2** | **4** |
| **Exceso** | 14 | 26 | 12 | 23 | 11 | 21 | 14 | 26 | **51** | **96** |
| **Total** | 14 | 26 | 12 | 23 | 11 | 21 | 16 | 30 | **53** | **100** |

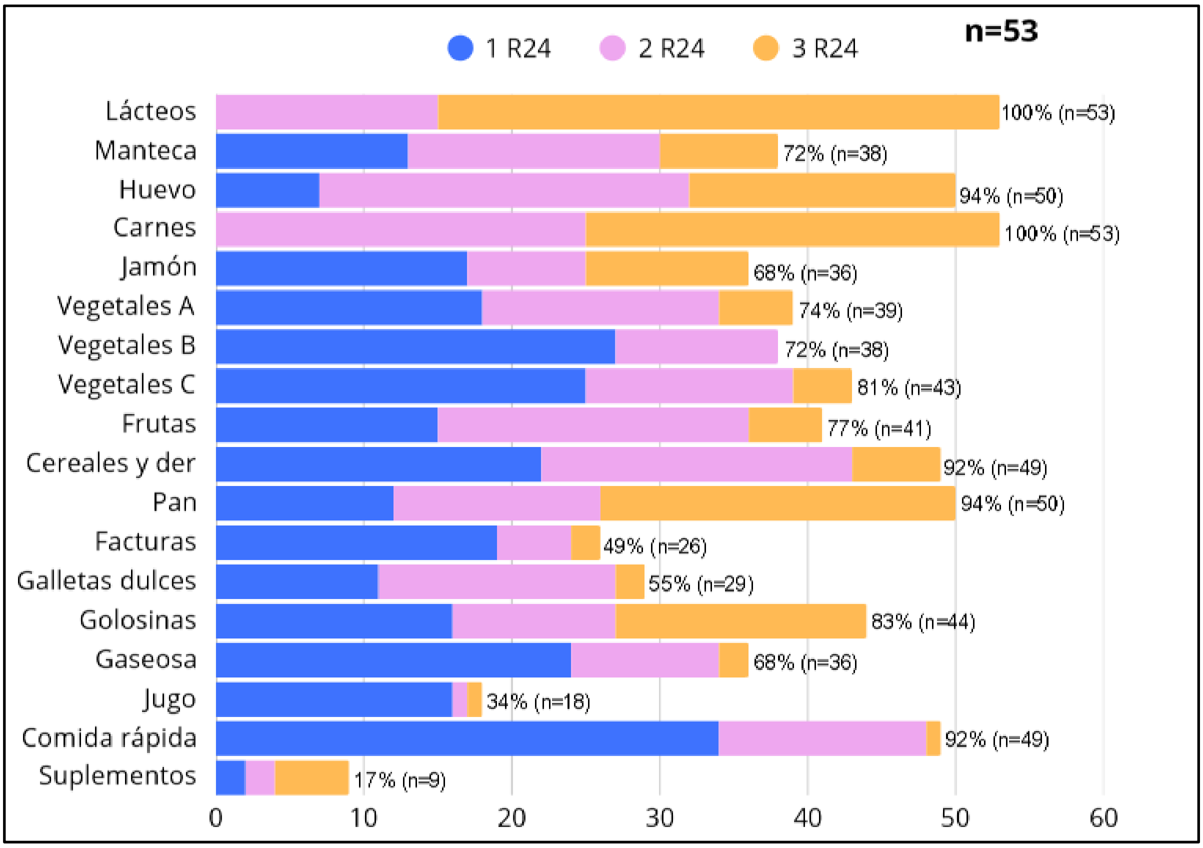


**Figure 2**. Typical food consumption identified in the R24s of male youth players from "Tigres Rugby Club," San Lorenzo 2025.

**Table 9.** Relationship Between Body Fat and Caloric Intake Among the Backs of the "Tigres Rugby Club" U15 and U16 Teams, San Lorenzo 2025.

| Ingesta calórica | Masa Adiposa | | TOTAL | p=0,09 (*) |
|---|---|---|---|---|
| | Adecuado | Exceso | | |
| Adecuado | 7 | 7 | 14 | |
| Inadecuado | 9 | 2 | 11 | |
| TOTAL | 16 | 9 | 25 | |

*Test de Fisher

**Table 10.** Relationship Between Body Fat and Caloric Intake Among the Forwards of the "Tigres Rugby Club" U15 and U16 Teams, San Lorenzo 2025.

| Ingesta calórica | Masa Adiposa | | TOTAL | p=0,06 (*) |
|---|---|---|---|---|
| | Adecuado | Exceso | | |
| Adecuado | 10 | 9 | 19 | |
| Inadecuado | 8 | 1 | 9 | |
| TOTAL | 18 | 10 | 28 | |

*Test de Fisher

**Table 11.** Relationship between Body Fat Mass and Intake in Grs Among the Backs of the "Tigres Rugby Club" M15 and M16 Teams, San Lorenzo 2025.

| Ingesta de Grs | Masa Adiposa | | TOTAL | p=0,16 (*) |
|---|---|---|---|---|
| | Adecuado | Exceso | | |
| Adecuado | 0 | 0 | 0 | |
| Inadecuado | 16 | 9 | 25 | |
| TOTAL | 16 | 9 | 25 | |

*Test de Fisher

**Table 12.** Relationship Between Body Fat and Grs Intake Among the Forwards of the "Tigres Rugby Club" U15 and U16 Teams, San Lorenzo 2025.

| Ingesta de Grs | Masa Adiposa | | TOTAL | p=0,66 (*) |
|---|---|---|---|---|
| | Adecuado | Exceso | | |
| Adecuado | 1 | 1 | 2 | |
| Inadecuado | 17 | 9 | 26 | |
| TOTAL | 18 | 10 | 28 | |

*Test de Fisher

**Table 13.** Relationship Between Muscle Mass and Protein Intake Among the Backs of the "Tigres Rugby Club" U15 and U16 Teams, San Lorenzo 2025.

| Ingesta de Prot | Masa Muscular | | TOTAL | p=0,36 (*) |
|---|---|---|---|---|
| | Adecuado | Déficit | | |
| Adecuado | 11 | 0 | 11 | |
| Inadecuado | 13 | 1 | 14 | |
| TOTAL | 24 | 1 | 25 | |

*Test de Fisher

**Table 14.** Relationship Between Muscle Mass and Protein Intake Among Forwards on the "Tigres Rugby Club" U15 and U16 Teams, San Lorenzo 2025.

| Ingesta de Prot | Masa Muscular | | TOTAL | p=0,63 (*) |
|---|---|---|---|---|
| | Adecuado | Déficit | | |
| Adecuado | 16 | 7 | 23 | |
| Inadecuado | 4 | 1 | 5 | |
| TOTAL | 20 | 8 | 28 | |

*Test de Fisher

**Table 15.** Relationship Between Muscle Mass and Carbohydrate Intake Among the Backs of the "Tigres Rugby Club" U15 and U16 Teams, San Lorenzo 2025.

| Ingesta de HC | Masa Muscular | | TOTAL | p=0,24 (*) |
|---|---|---|---|---|
| | Adecuado | Déficit | | |
| Adecuado | 10 | 1 | 11 | |
| Inadecuado | 14 | 0 | 14 | |
| TOTAL | 24 | 1 | 25 | |

*Test de Fisher

**Table 16.** Relationship Between Muscle Mass and Carbohydrate Intake Among Forwards on the "Tigres Rugby Club" U15 and U16 Teams, San Lorenzo 2025.

| Ingesta de HC | Masa Muscular | | TOTAL | p=0,35 (*) |
|---|---|---|---|---|
| | Adecuado | Déficit | | |
| Adecuado | 2 | 0 | 2 | |
| Inadecuado | 18 | 8 | 26 | |
| TOTAL | 20 | 8 | 28 | |

*Test de Fisher

## Discussion and Conclusions

When the players are categorized by age group, it is observed that 49% (n=26) belonged to the U15 division and 51% (n=27) to the U16 division. This similar distribution between the two divisions is desirable because it matches the minimum number expected to form a rugby roster that includes both starters and substitutes.

In terms of playing position, forwards accounted for 53% (n=28) of the total, compared with 47% (n=25) for backs. This result is consistent with the typical on-field formation, where most players tend to be positioned as forwards—a strategic balance, as forwards provide the necessary stability in static phases of the game, such as the scrum and the lineout, while the backs demonstrate speed and agility in dynamic phases (13).

Table 1 shows that, for most players in both divisions and positions, the median MA (kg) values fell within the reference range according to URBAREF for youth. However, maximum values above the standard were observed. These results are consistent with those reported in the study by Gayol Flores, M., and Sillero Quintana, M. (2019), who also found subgroups of adult players with MA levels higher than recommended; this could compromise performance on the field (14).

As for the mean MM (kg), a large proportion of the players fell within the reference ranges. However, when analyzing minimum values, M15 backs and forwards from both divisions were identified as having below-average results; a situation similar to that described in the study by Báez-San Martín, E., et al. (2019); which could interfere with the development of the strength and power required for each position (15).

It is worth noting that the forwards in both divisions had higher mean values for MA (kg) and MM (kg) compared to the backs. This difference is consistent with the results obtained in adult players in studies conducted by Báez-San Martín, E., et al. (2019) and Hernández Camacho and Rodríguez Bies (2020), who note that forwards tend to have greater body mass than backs, in response to the demands for contact and strength inherent to their position (15,16).

On the other hand, when comparing across age groups, it was found that the U16 players had higher medians for MA (kg) and MM (kg) than the U15 players. This result could be related to each player's biological maturation process and the growth typical of adolescence (17).

Table 2 shows that 64% (n=34) of the players evaluated had MA values within the URBAREF youth reference ranges according to Francis Holway (n.d.); This compliance was primarily seen among backs in the U15 division at 19% (n=10), followed by forwards in both divisions at 17% (n=9), respectively.

On the other hand, the remaining 36% (n=19) showed an excess of this trait, primarily among forwards in the U-16 division (13%, n=7), followed by backs in the same category (9%, n=5). The greater tendency of forwards to accumulate MA is consistent with the findings of Báez-San Martín, E., et al. (2019), who point out that the characteristics specific to this position—related to size and strength—are often accompanied by greater body mass. However, as Hernández Camacho and Rodríguez Bies (2020) point out, when there is a significant excess of MA, it can affect a player’s power, speed, and agility, which would directly impact performance on the field (15,16).

Table 3 shows that the majority of the players evaluated—83% (n=44)—had adequate MM values, according to the URBAREF youth reference values. The largest percentage was accounted for by the backs in both divisions, at 24% (n=13) and 21% (n=11), respectively.

However, 17% (n=9) of the players showed a MM deficit, primarily among U-16 forwards, at 13% (n=7). This finding is striking because this position requires a greater amount of skeletal muscle to meet the demands for strength and power inherent in the game. A similar result was reported in the study by Báez-San Martín, E., et al. (2019), who identified adult forwards with lower-than-expected muscle development. Similarly, variations in the timing of puberty could explain why some players have not yet reached the peak of muscle gain typical of adolescence (15,17).

Table 4 shows the medians for caloric intake, carbohydrates, protein, and fat. With regard to caloric intake, the median value obtained for the players fell within the recommended ranges for the youth population according to the IOM (2002). However, when taking data variability into account, it became evident that the backs in both divisions had energy intakes higher than those recommended for their playing positions, while the forwards had energy intakes lower than those recommended for their positions. Compared with previous studies on adult players by Barale and Perovic (2014) and Posthumus et al. (2021), the caloric intakes of this sample of male youth athletes are lower, which is to be expected given the difference in age group and competitive level (18,19).

Regarding carbohydrate intake, the medians were found to be below the recommendations for youth rugby according to Onzari (2021); this was particularly true for forwards in both divisions, a situation that could compromise energy availability during practices and games, as well as interfere with growth and recovery (12).

In contrast, the median protein intakes were in line with the recommendations for youth rugby established by Onzari (2021), and even exceeded this value, especially among the backs in both divisions; this finding is similar to that reported in the study by Gayol Flores, M., and Sillero Quintana, M. (2019). Although this intake promotes growth and recovery, low carbohydrate intake could limit its anabolic effects (12,14).

Finally, it was observed that the median carbohydrate intake (in grams) far exceeded the recommendations for youth rugby established by Onzari (2021) for all players evaluated, consistent with findings in amateur adults; this could explain the high proportion of players with excessive carbohydrate intake in this sample.

Table 5 shows that 62% (n=33) of the athletes evaluated had an adequate caloric intake according to the recommendations for adolescents (IOM, 2002), which is a favorable result in terms of meeting the energy requirements associated with growth and athletic training. However, 23% (n=12) showed excessive caloric intake, concentrated mainly among the backs in both divisions at 13% (n=7) and 6% (n=3), respectively, which could be linked to the frequent consumption of ultra-processed foods and sugar-sweetened beverages; a finding that is consistent with the observations of Gayol Flores, M., and Sillero Quintana, M. (2019) and Hernández Camacho and Rodríguez Bies (2020) regarding adult players (14,16).

In contrast, 15% (n=8) of the players had an insufficient caloric intake, primarily among the forwards in both divisions, at 4% (n=2) and 9% (n=5), respectively. This finding was concerning, as energy deficiency could limit growth and recovery, as well as explain the skeletal muscle mass deficit observed in forwards in the U16 division; which is consistent with the findings of Onzari (2021), who emphasizes that in amateur youth categories, the typical diet is often insufficient to support both growth and development as well as the specific energy demands of rugby (12).

Table 6 shows that 73% (n=39) of the players evaluated had an insufficient carbohydrate intake relative to the recommendations for youth rugby according to Onzari (2021), a situation that is more prevalent among forwards in both divisions, at 30% (n=16) and 19% (n=10), respectively.

This finding is significant because carbohydrates are the primary source of energy in high-intensity intermittent sports such as rugby, and a deficiency in carbohydrates could not only compromise performance during training and games but also limit recovery and skeletal muscle development (5,14). This finding is consistent with the results reported in studies of adult players by Barale and Perovic (2014) and Posthumus et al. (2021), where low HC contributions were also observed, especially among forwards (18,19). However, among adolescents, this deficiency becomes even more significant, as it compounds the demands inherent in growth and pubertal maturation (17).

Table 7 shows that 36.5% (n=19) of the players—primarily backs from both divisions, accounting for 19% (n=10) and 7.5% (n=4), respectively—had an excessive intake of this substance. This finding is consistent with the results reported for adult players by Barale and Perovic (2014) and Gayol Flores, M., and Sillero Quintana, M. (2019), who found that backs tend to consume more protein than forwards (14,18). While a higher protein intake could support recovery processes, in this context it may be displacing carbohydrate intake, which was found to be insufficient in most players. This imbalance could affect energy availability during training sessions and games, as well as limit the anabolic utilization of proteins (20).

Table 8 shows that 96% (n=51) of the players evaluated had a carbohydrate intake in grams that exceeded the recommendations for youth rugby according to Onzari (2021), with no significant differences between divisions or playing positions. This finding is similar to that of the study by Gayol Flores, M., and Sillero Quintana, M. (2019), who identified excessive fat intake among some adult players; which could lead to reduced performance on the field, an increase in body fat at the expense of muscle mass, long-term metabolic risks, and a displacement of specific nutrients such as fiber, minerals, and vitamins (5,20).

Figure 2 shows the average frequency of regular consumption of the main food groups reported based on the three R24s. The results show that, with regard to foods that are sources of carbohydrates, most of the players (94%; n=50) included bread in their diet, and 92% (n=49) consumed grains and grain products such as rice, pasta, and semolina during the days evaluated. As for vegetables, consumption of those in Group C—especially potatoes and corn—was most common, at 81% (n=43), followed by those in Group A, such as spinach, lettuce, and tomatoes, at 74% (n=39). Meanwhile, fruit consumption was reported in 77% of cases (n=41). However, it should be noted that, as with grains, fruit and vegetable consumption was concentrated mainly on a single day out of the three evaluated. On the other hand, the consumption of sugary beverages stands out, with soft drinks accounting for 68% (n=36) and artificial juices for 34% (n=18).

With regard to protein-rich foods, those from AVB were the most common. 100% (n=53) of the players reported consuming dairy products, including milk, yogurt, and cheese; it is worth noting that most of them consumed these products on all three days of the study. Similarly, 100% (n=53) reported eating meat—primarily beef and chicken—on two or three of the days evaluated. In addition, 94% (n=50) included eggs in their diet.

With regard to foods that are sources of Grs, it is noteworthy that 92% (n=49) of the players consumed fast food on at least one of the days evaluated, such as empanadas, pizza, lomito or milanesa sandwiches, and hamburgers. Similarly, 72% (n=38) consumed lard, and 68% (n=36) included ham in their diet. It was also noted that 83% (n=44) chose sweets for their snack, with alfajores, chocolates, and sweet cookies being the most popular choices.

Overall, these results reflect a dietary pattern similar to that described by UNICEF (2020) among adolescents, characterized by high consumption of foods rich in fats and simple sugars and low intake of fruits, vegetables, and complex carbohydrates (5). This profile could help explain the findings regarding the players' body composition, particularly their excess body fat and low muscle mass. The prevalence of ultra-processed foods in the diet could displace the consumption of fresh foods with higher nutritional density, limiting the availability of nutrients essential for growth and recovery, as well as promoting the accumulation of fat mass at the expense of muscle mass.

These findings are consistent with those reported in studies conducted on adult amateur players (Gayol Flores, M., and Sillero Quintana, M., 2019; Báez-San Martín, E., et al., 2019). However, they are particularly important among young people, whose eating habits are still developing and can influence both athletic performance and health in adulthood.

Table 9 shows the relationship between MA and caloric intake among backs in both divisions. Although the Fisher's exact test yielded a p-value of 0.09, which was not statistically significant, it was observed that among the players with adequate caloric intake (n=14), half of them had excess body fat (n=7), while the other half (n=7) fell within the reference ranges. In contrast, among players with inadequate caloric intake (n=11), most maintained an adequate MA (n=9), while only a minority had an excess MA (n=2).

Table 10 shows the relationship between average weight and caloric intake among forwards in both divisions. Although the p-value of 0.06 is not statistically significant either, it was observed that among players with adequate caloric intake, nearly half had an excess of MA (n=9), while the other half maintained an adequate MA (n=10). In contrast, among players with inadequate caloric intake, most had an adequate MA (n=8), and only one player had an excessive MA (n=1).

These results indicate that, as with the backs, excess body mass does not appear to be related solely to the number of calories consumed, but also to food choices and macronutrient distribution, as well as variability in growth and pubertal maturation. This is consistent with the findings of Onzari (2021), who states that for adolescents, it is not enough to simply adjust caloric intake to meet their requirements; rather, priority should be given to the quality and proportion of nutrients (12). Similarly, the results are consistent with those described by Gayol Flores, M., and Sillero Quintana, M. (2019) in adult amateur athletes, where excess body fat is more closely related to the types of foods consumed than to total dietary energy intake.

Table 11 shows the relationship between MA and gram intake among the backs in both divisions. Given that the p-value of 0.16 did not indicate statistical significance, it can be observed that although all players in this position (n=25) had an inadequate intake of Grs due to excess consumption, the majority maintained MA values within the appropriate range (n=16). However, there were also players identified who had excessive levels of it (n=9).

Table 12 analyzes the relationship between MA and Grs intake among forwards in both divisions. As with the backs, although most of the forwards (n=26) had an inadequate intake of Grs due to excess consumption, a large proportion of them had an adequate MA (n=17). However, a considerable number of cases with elevated levels were also identified (n=9). Statistical analysis (p=0.66) did not reveal a significant association, but the data are consistent with what was previously observed in the total sample.

These results reinforce the notion that the amount of grams consumed far exceeds the recommended values for youth rugby, and that this excess does not always directly translate into increased body fat. Factors such as high energy expenditure during training, variability in pubertal maturation, and overall diet quality may explain why some players with excessive protein intake did not show excess body fat (17).

Table 13 analyzes the relationship between MM and protein intake among backs in both divisions. The Fisher's exact test yielded a p-value of 0.36, which was not statistically significant. Even so, the data showed that most players had an adequate MM (n=24), regardless of whether or not they had an adequate protein intake. This result could be explained by the expected protein intake of 1.2 to 2 g/kg/day, as well as by the growth and maturation phase characteristic of adolescence, during which protein intake naturally increases.

Table 14 shows the relationship between body mass and protein intake among forwards in both divisions. The p-value of 0.63 indicated that there is no statistically significant association. However, it was observed that most players with adequate protein intake (n=23) had a body mass index (BMI) within the reference range (n=16), although several cases of deficiency were recorded (n=7). Among those who had an inadequate protein intake due to excessive intake (n=5), the majority still maintained an adequate body mass index (n=4).

As with the backs, these results suggest that protein intake, on its own, does not appear to directly explain the players' muscle mass. This is consistent with the findings of Onzari (2021), who notes that, once protein requirements are met, excess protein does not have an additional effect on muscle development, especially if there is a deficit in carbohydrate intake that forces the body to use protein as an energy source. Furthermore, as noted by Torresani (2022) regarding adolescents and by Báez-San Martín, E., et al. (2019) In adults, the development of muscle mass depends not only on protein intake but also on total energy availability, carbohydrate consumption that allows protein to be conserved for anabolic functions, and each player’s stage of biological maturation.

Table 15 shows the relationship between body mass and carbohydrate intake among backs in both divisions. Although the p-value of 0.24 does not indicate statistical significance, it is observed that most players had an adequate MM (n=24), even though a large proportion of them had an inadequate HC intake due to insufficiency (n=14). These results suggest that, in this sample, there is no direct relationship between body mass and HC intake. However, it is important to note that carbohydrates are the primary energy substrate during physical exertion, and that insufficient intake may force the body to use protein as an energy source, reducing its availability for muscle synthesis (12).

Table 16 shows the relationship between body mass and carbohydrate intake among forwards in both divisions. The statistical analysis with p = 0.35 did not indicate a significant association. However, nearly all players had an inadequate carbohydrate intake due to insufficient intake (n=26), and within this group, the majority maintained adequate muscle mass levels (n=18); although some players were also found to have a muscle mass deficit (n=8). In contrast, the few players with adequate carbohydrate intake had MM values within the expected range (n=2).

As with the backs, the high proportion of players with adequate muscle mass despite insufficient carbohydrate intake (n=18) could be linked to factors such as age and the growth stage typical of adolescence, as well as training volume, which stimulate muscle development even under suboptimal nutritional conditions (17). However, the number of players with deficits (n=8) highlights the risk of maintaining this condition in the long term, as it could limit their ability to generate strength and power—key aspects for this position. These results are consistent with those reported in studies of adults by Báez-San Martín, E., et al. (2019), who emphasize that an insufficient intake of carbohydrates can compromise muscle mass even in athletes with adequate protein intake.

## Conclusions

The distribution of players was similar in both divisions, with forwards making up the majority.

With regard to body composition, most players were found to have an appropriate body mass (kg). However, there were instances of overuse, particularly among M16 users. On the other hand, when considering body mass (kg), most of the adolescents evaluated were found to be within the normal range, although some forwards on the U-16 team were below the normal range.

With regard to dietary intake, the players generally had an adequate caloric intake, but there were cases of backs with excessive energy intake and forwards with insufficient caloric intake.

With regard to macronutrient distribution, the study highlighted insufficient carbohydrate intake among the majority of players, who had a limited variety of fruits and vegetables in their diets. In addition, excessive protein intake was observed, mainly among the backs, with a diet consisting of high-protein foods; and higher-than-expected fat intake among most participants, with a diet consisting of foods high in saturated fats such as alfajores, facturas, buns, butter, and fried foods, among others.

Upon analyzing the relationship between body composition and food intake, no statistically significant association was found; therefore, the proposed hypothesis is rejected. However, the results indicated that excess body fat and the development of metabolic syndrome are not determined solely by the number of calories consumed, but also by the quality of food choices, macronutrient distribution, and factors specific to the players' stage of growth and pubertal maturation.

Proposals for Continuity

Conduct studies that include the players' maturational or biological age as a variable, since it is a key factor in body composition during this growth stage.

Expand the sample to include different clubs or categories in order to enrich the analysis and prevent the results from being limited to a single club or cohort, thereby promoting a more comprehensive view of body composition and dietary intake throughout the training process.

Conduct a longitudinal study that takes into account the different stages of the season, which would allow for an assessment of changes in body composition and food intake during the preseason, competition, and postseason, given that energy demands vary depending on the time of the athletic year.

Implement nutrition education workshops for players, families, guardians, and coaches, with the aim of promoting healthy habits that support the athletic and personal development of adolescent players.

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## Conflict of Interest

It is hereby declared that there is no conflict of interest.

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