AN ANALYTICAL STUDY OF NUTRITIONAL INTAKE OF FEMALE FOOTBALL PLAYERS

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ABSTRACT

The aim of the study was to find out the nutritional practices of female football players. The nutritional intake of 24 female football players of Kurukshetra University Kurukshetra was recorded by the players them self for a period of one week. Participants were provided with written and verbal guidelines for the completion of the diaries. During this one week period the training imparted to the players were also recorded. This was used in combination with BMR predictions to calculate daily energy expenditure. Results suggest that energy intake was low (1735 ± 250.4 kcal) in relation to previous recommendations for football players. Energy expenditure (1915.6 ± 410.4 kcal) was not significantly different ($p > 0.05$) from intake, suggesting energy balance was achieved. Carbohydrate (47.6 ± 5.4%), protein (12.6 ± 1.9%) and fat (22.7 ± 5.4%) intakes were in line with recommendations. Fluid intake (2150 ± 847.7 ml per day) was sufficient to meet baseline recommendations, but would need to be higher to meet the additional requirement of training and competition. With the exception of vitamin A and iron, all micronutrient intakes were higher than the DRI. With the help of this study it is recommended that female football players should increase the intake carbohydrate and take more fluid and ensure sufficient iron rich foods to meet out the required intake volume.

Keywords: *Football, Carbohydrate, Protein and Fluid*

INTRODUCTION:

Female players at International level reported to cover total distances of 8.5 km, 9.5km (Bangsbo, 1994) and 12.4km (Holmes, 2002) with a maintained relative exercise intensity of 70% VO2max (Brewer, 1994) despite spending 76% and 11% of their time in low and high intensity activities respectively (Holmes, 2002). Such high metabolic and energy demands of football training and competition must be met by adequate nutritional intake.

The aim of the present study was to investigate the nutritional practices of female football players by reporting diet and activity records over a period of seven days.

METHODS:

Participants

Twenty four female football players (Age = 20.4 ± 2.4 yrs) of Kurukshetra University Kurukshetra attending coaching camp of the University participated in this study. Players were fully informed of the purpose and procedures of the investigation and provided consent at the outset.

Dietary and activity collection

The participants' dietary intake and activity levels were collected via self-reporting diaries during the coaching camp of Kurukshetra University team when all players were participating in full training and competition. Participants were required to record all food and beverage intake and any training matches or other physical activities for a period of seven days.

During this time they were issued with a food and activity diary along with verbal and written instructions for its completion. Information provided focused on average portion sizes for a range of common foods (e.g. rice, cereals) and a guide to universal household measures (e.g. teaspoon, tablespoon, cup) to improve the estimation of daily intake.

The food section of the diary included the following headings to facilitate accurate analysis:

i) Meal
ii) Food/beverage description
iii) Portion size/quantity
iv) Brand
v) Food type
vi) Cooking method

The activity section requested that participants record the type, duration, and approximate intensity of each activity on a daily basis. Participants were requested to follow their customary eating patterns during the prospective recording days and were asked to confirm this via a series of brief questions at the end of the food and activity diary. Finally space was provided for

participants to include any other information including details of any dietary supplements consumed.

On completion of the seven-day recording period, participants were requested to return their completed diary for analysis. Dietary analysis was undertaken by using the computerized package 'Dietmaster 4.0' (Stuart Dyson Associates, London, UK). Estimation of energy expenditure was undertaken by calculating BMR (COMA, 1991) alongside analysis of reported activities using the computerized package 'Diet Organizer 2.0' (Mulberrysoft, USA).

Data analysis

A seven-day average for total energy intake (kcals), total energy expenditure (kcals), macronutrients (g/kg, %), and fluid intake (L) was determined for each participant. Descriptive statistics were determined for all variables. Paired samples t-tests were used to assess energy balance (energy intake vs. energy expenditure) and to identify possible nutrient deficiencies via comparison to Reference Nutrient Intakes (COMA, 1991).

RESULTS:

Energy balance

The average daily intake from the 7 day analysis was 1904 ± 366 kcal, and the mean energy expenditure was 1735 ± 250.4 kcal. This represents a 670 kcal energy deficit, though statistical analysis reveals no significant difference between intake and expenditure ($p > 0.05$), suggesting average energy balance was achieved.

Table 1

Comparison of macronutrient and fluid intake to recommendations

Nutrient	Intake (g·kg-1)	Recommended [a] (g·kg-1)	Intake (% of total)	Recommended [b] (% of total)
Carbohydrate	4.1 (1.0)	4.0-6.0	47.6 (5.4)	60-70
Protein	1.2 (.3)	1.2-1.4	12.6 (1.9)	12

Fat (total)	.9 (.2)	-	22.7 (5.4)	18-28

Data are means (±SD)

[a] Devlin and Williams, 1991, [b] Williams, 1995

The relative energy intake of 29.8 ± 5.4 kcal/kg/day falls below the recommendations for female football players of 47-60 kcal/kg/day (Economos et al., 1993). This reported intake was significantly lower ($p < 0.05$) than the lower end of this recommended range. Average daily training time was 115.4 ± 32.6 minutes, which represents 32.6 ± 6.1% of the total daily energy expenditure. There was no significant difference ($p > 0.05$) in body mass recorded before and after the 7 day report period (61.5 ± 5.3kg vs. 61.6 ± 5.3kg).

Macro-nutrients

The mean intakes of the energy producing macronutrients were 47.6 ± 5.4%, 22.7 ± 5.4% and 12.6 ± 1.9% for carbohydrate, fat and protein, respectively. When reported as a percentage of total calories, carbohydrate and protein intakes were significantly lower and higher ($p < 0.05$) respectively of the recommended levels. Fat intake was significantly higher ($p < 0.05$) than the lower value in the recommended range (18%), but significantly different ($p > 0.05$) to the upper end of this range (28%). When macro-nutrient intake is expressed asg/kg/day (Table 1), carbohydrate and protein intakes fell within their recommended ranges.

Mean fluid intake was 2150 ± 847.7 ml/day, which represents 99% of the baseline daily requirement proposed by Maughan (2000).

DISCUSSION:

Energy

The results of this nutritional analysis of women football players shows an average daily intake, recorded over 7 days, to be 1735 ± 250.4 kcal. This is lower than previously reported values for female football players (Clark et al., 2003).

Energy expenditure data (1915.6 ± 410.4 kcal) present a 180 kcal/day energy deficit to intake (1735 ± 250 kcal/day). Statistical analysis revealed no significant difference between intake and expenditure ($p > 0.05$), suggesting average energy balance was achieved. The current

findings are similar to those previously reported. Fogelholm et al. (1994) reported daily energy intake of 2131 ± 400 kcal with a 111 ± 450 kcals energy deficit in normal weight female football players.

Macro-nutrients

Carbohydrate is the primary fuel substrate during football, and consequently high dietary intakes of 60- 70% of total calorific intake have been recommended for athletes (Devlin and Williams, 1995) and footballers (Schokman et al., 1999). In the present study carbohydrate intake was significantly lower than these recommendations (47.6 ± 5.4%), but fall near the range previously reported for female football players 47.8 ± 9.8 to 55.0 ± 7.5% (Clark et al., 2003; Scott et al., 2003). The current data provide further evidence to the commonly observed low carbohydrate intakes that are insufficient for adequate glycogen re- synthesis in female athletes (Nutter, 1991; Tanaka et al., 1995). Based upon these recommendations, players in the current study reported carbohydrate intakes that are likely to be inadequate to replace muscle and liver glycogen stores.

To alleviate this, it appears that players in the current study need to consider increasing their daily carbohydrate intake. This would need to be done carefully particularly since the players are statistically in energy balance, however there are a range of high carbohydrate foods that could be used to replace the moderate carbohydrate/high fat foods that players reported in their diaries. This would enable carbohydrate intake to be increased without simultaneously increasing energy intake.

In the present study protein intake (12.6 ± 1.9%) of daily intake was close to the 12% intake recommended by Devlin and Williams (1995). The reported intake of the current players (1.2g/kg/day) is in line with the recommended range of 1.2-1.4 g/kg/day for elite and professional athletes (Maughan and Burke, 2002) and players should be encouraged to continue this practice.

In comparison to the recommendations made by Devlin and Williams (1995) fat intake was significantly higher ($p < 0.05$) than the lower value (18%), significantly different ($p > 0.05$) to the upper end of this range (28%). Consequently, whilst current fat intakes meet

recommendations these are towards the higher end for athletic performance and health and players should be advised that further increases in fat intake would be detrimental.

Water

The observed fluid intake of 2150 ± 847.7 ml/day is slightly below the baseline recommendation of 2500ml/day (Maughan, 2000), however this value does not consider additional requirements to replace fluid losses during training and matches. Convertino et al. (1996) state that during exercise 600-1200ml fluid needs to be consumed per hour to replace sweat losses. The reported average daily training duration of 115.4 ± 32.6 minutes would therefore require a minimum of 1200 ml, suggesting a total daily requirement of 3700 ml, although exact fluid needs are highly individual and depend upon intensity and duration of exercise, body size and composition, body surface area, individual sweat rates, clothing and environmental conditions (Broad et al., 1996, Maughan et al., 2004). The current data indicate a shortfall in daily fluid intake. This would have implications for performance since dehydration increases the thermal load of exercise and results in elevated heart rate and earlier onset of fatigue due to an increased rate of glycogenolysis and decreased performance of football skills. To ensure adequate fluid replacement during and after exercise, players should consume prescribed volumes of fluid. Furthermore, players in the current study did not report regular consumption of carbohydrate- electrolyte drinks post-exercise. This would be a further recommendation since the inclusion of energy substrate helps to maintain the desire to drink whilst initiating glycogen re-synthesis in the active muscle and would be a simple and practical strategy to increase carbohydrate and fluid intakes in the players.

CONCLUSIONS:

Despite limitations of the self-reporting techniques used, dietary intakes of female football players in the present study are in agreement with those previously reported and meet the recommendations for carbohydrate, fat and protein intakes. From a performance perspective an adjustment of the relative intakes of each macronutrient is recommended to enhance rates of glycogen and protein resynthesis during recovery. A non- significant calorie deficit and shortfall

in fluid intake were observed and consumption of carbohydrate-electrolyte fluids during/after training is recommended to increase carbohydrate intake, increase fluid intake and to help players to remain in energy balance.

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