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Poonam Misal

MSc., Department of Exercise Science and Sports Nutrition, Sir Vithaldas Thackersey College of Home Science (Empowered Autonomous Status), S.N.D.T. Women's University, Mumbai, Maharashtra, India

Dr. Rekha Battalwar

Professor, Department of Food, Nutrition and Dietetics, Sir Vithaldas Thackersey College of Home Science (Empowered Autonomous Status), S.N.D.T. Women's University, Mumbai, Maharashtra, India

Corresponding Author:

Poonam Misal

MSc., Department of Exercise Science and Sports Nutrition, Sir Vithaldas Thackersey College of Home Science (Empowered Autonomous Status), S.N.D.T. Women's University, Mumbai, Maharashtra, India

A study on the effectiveness of nutrition education program on nutrition knowledge, dietary intake, body composition, fitness, and performance in Mallakhamb athletes

Poonam Misal and Dr. Rekha Battalwar

Abstract

Introduction: Adolescence marks a critical period of physical and cognitive development. By identifying effective strategies for enhancing athletes' nutritional literacy and dietary behaviours, this study aims to contribute valuable insights that can inform evidence-based interventions and training protocols.

Aim: To study the effectiveness of nutrition education programs on nutrition knowledge, dietary intake, body composition, fitness, and performance in mallakhamb athletes.

Methodology: A quasi-experimental research design was used and a sample size of 50 Mallakhamb athletes were recruited from sports academies in Mumbai. The nutrition education program was implemented in 6 weeks in 3 sessions. The parameters measured were nutrition knowledge, dietary intake, body composition, fitness, and performance pre- and post-intervention. The data was analyzed using SPSS version 25 for Windows (version 25, 2017, IBM Corporation, Armonk, New York, United States).

Result: The mean age of the adolescent athlete was 12.3 years. Mallakhamb athletes initially reported low consumption of energy, carbohydrates (CHO), protein, fiber, and essential micronutrients like calcium and iron. Post-intervention, there was a significant increase in their intake of protein ($p=0.028$), fiber ($p=0.001$), calcium ($p=0.001$), and iron ($p=0.001$). Nutrition knowledge was low initially but the results showed significant improvement post-intervention ($p=0.001$). While the total fluid intake did not show significant improvement, fluid intake during training increased significantly post-intervention ($p=0.001$). There was also significant improvement in muscular endurance ($p=0.003$) and power ($p=0.013$).

Conclusion: The nutrition education program produced significant improvement in nutritional knowledge, dietary intake, and performance in Mallakhamb athletes. Therefore an effective nutrition education program may improve athletes' dietary intake and nutritional status and enhance athletic performance.

Keywords: Adolescent, nutrition education, mallakhamb, athletic performance, dietary intake

Introduction

Optimal nutrition is vital in fostering growth, and development, and ensuring peak athletic performance in adolescent athletes. Nutrition education interventions are specific programs designed to assist target populations in modifying their eating habits and enhancing their nutrition knowledge, which can increase performance (Sanchez-Diaz., 2022) [12]. Nutritional education involves the communication of information and the utilization of tools related to food characteristics and nutritional content, aiming to enhance dietary habits and, consequently, overall health (Aguilo *et al.*, 2021) [2]. Adolescence, typically from ages 10 to 19, represents a significant life phase where future adult health patterns, such as the development of dietary habits and lifelong connections with food, are frequently established (Foo *et al.*, 2021) [6]. The nutritional needs of adolescent athletes are distinct because they engage in daily training and competitions, all while experiencing the demands of growth and development (Desbrow *et al.*, 2014) [4]. Adolescent athletes who consume inadequate nutrition may experience compromised growth, diminished performance, heightened injury vulnerability, nutrient deficiencies, and decreased energy levels for competition, highlighting the importance of comprehensive nutrition education (Aaron Kyle Schwartz., 2014) [1]. Therefore, athletes need to receive appropriate nutrition education.

Mallakhamb is a traditional ancient Indian sport. Elite athletes' health and performance are strongly affected by their dietary habits and training and competing at professional levels requires optimal body function, which relies on adequate dietary intake providing sufficient energy as well as macro- and micronutrients (Villa *et al.*, 2021) [17]. 'Malla' means wrestler and 'Khamb' means pole, together mallakhamb means wrestling on the pole. Mallakhamb involves performing gymnastic postures and aerial yoga on a stationary vertical pole, hanging pole, or rope. This sport requires ample strength, flexibility, muscle coordination, agility, and balance. (Sharma *et al.*, 2015) [13]. The practice of gymnastics positively impacts various health-related aspects of physical fitness and contributes to the favourable physical development of children. Compared to international norms for their peers, female and male artistic gymnasts exhibited superior physical fitness in most parameters. Research findings propose the use of body fat percentage over BMI in the evaluation of gymnasts' body composition for enhanced accuracy. (Kolimechkov *et al.*, 2021) [8]. Many factors motivate food selection and dietary behaviour. Common factors like cultural background, taste preferences, appetite, and attitude towards nutrition. Furthermore, changes in body composition or aesthetics can influence the dietary behaviour of an athlete and finally, peer pressure and teammates' choices are important influencing elements, with easily accessible technology athletes, also rely on other sources like media, parents, friends, peers, and coaches, all these sources can influence the dietary behaviours of athletes, sometimes providing limited or inaccurate nutritional information (Vazquez-Espino K *et al.*, 2022). If a conclusive relationship between nutrition knowledge (NK) and nutrition practice (NP) is established, it could lay the foundation for targeted nutritional education interventions, ultimately enhancing both nutritional status and athletic performance (Monalisa Debnath *et al.*, 2023) [11]. The study aimed to determine the effectiveness of nutrition education programs on dietary intake, body composition, fitness, and performance in mallakhamb athletes.

Methodology

A quasi-experimental research design was used and a sample size of 50 Mallakhamb athletes was recruited from sports academies in Mumbai the nutrition education program was implemented for 6-weeks in 3 sessions. The parameters measured were nutrition knowledge, dietary intake, body composition, fitness, and performance pre- and post-intervention the dietary intake was analyzed using 24-hr diet recall, and the nutrients were calculated using Ntuitive software. Physical fitness was assessed using tests for muscular endurance, flexibility, balance, and power. The data was analyzed using SPSS version 25 for Windows (version 25, 2017, IBM Corporation, Armonk, New York, United States). The study results are presented as Mean \pm SD or frequency (percentage). Changes in anthropometry, dietary intake, and physical fitness post-intervention were assessed using the Paired Sample T-test. Changes in binomial data post-intervention were assessed using the McNemar sign rank

test. In Results, when $p \leq 0.05$ it was considered to be significant and highly significant when $p \leq 0.01$.

Results

Table 1: General Characteristics of Adolescent Athletes

Characteristics	% (N)
Gender	
Boys	22 (11)
Girls	78 (39)
Education status	
4th std	2 (1)
5th std	32 (16)
6th std	20 (10)
7th std	28 (14)
8th std	16 (8)
9th std	2 (1)
Other parameters	
Weight (kg)	Mean (SD) 35.8 (6.3)
Height (cm)	142.6 (8.7)
Age (yrs)	12.3 (1.1)
BMI (kg/m ²)	17.5 (2.0)
Fat (%)	18.6 (4.7)
BMR (kcal)	1166 (85)

Values are represented in percentage (%) and frequency (N), mean and standard deviation (SD)

In Table 1, of the 50 adolescents in the study, 11 (22%) were boys, whereas 39 (78%) were girls and the mean age was 12.3 years. The average weight was 35.8kg, and the Body Mass Index (BMI) was 17.5, representing that the athletes were underweight. Body Fat % was 18.6%, higher than ideal

Eating patterns of Mallakhamb adolescent athletes

Figure 1 shows the comparison between the consumption of meals pre-intervention and post-intervention. Pre-intervention 3 athletes had 3 meals/day, 13 had 4 meals a day, 16 had 5 meals a day, 13 had 6 meals a day, 2 had 7 meals a day, and 3 had 8 meals a day. Post-intervention, only 1 athlete had 4 meals a day, 25 athletes had 5 meals a day, and 24 had 6 meals a day.

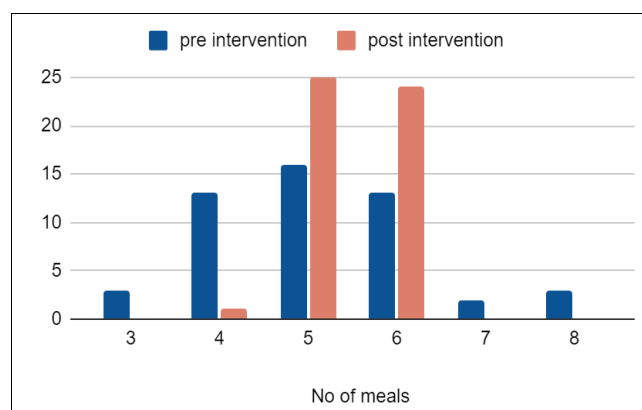


Fig 2: Consumption of meals per day by the athletes

Table 2: Dietary Intake of the Mallakhamb Athletes

Nutrients	Pre-intervention			Post-intervention			P value
	Average Intake	% Distribution Mean (SD)	Dietary Recommended intake (%)	Average Intake Mean (SD)	% Distribution Mean (SD)	Dietary Recommended intake (%)	
Energy (kcal)	1125		90.4	1132		90.5	0.736
Protein (g)	36.5	13.0	88.6	37.6	13.2	90.7	0.028*
CHO(g)	163.5	58.6	78.3	165	58.8	78.9	0.633
Fats (g)	33.8	27.0	121.8	32.5	25.7	117.4	0.027*
Fibre (g)	19.5		52.4	21.2		56.8	0.001**
Calcium (mg)	293.6		29.3	329.7		32.9	0.001**
Iron (mg)	7.6		54.7	9.0		64.5	0.001**

CHO- carbohydrate

Values are represented in mean and standard deviation (SD)

* Indicates statistically significant ($p < 0.05$)

** Indicates statistically significant ($p < 0.001$)

Table 2 shows changes in macronutrient and micronutrient intake pre and post-intervention. Among the macronutrients, Protein intake increased significantly post-intervention ($p = 0.028$). However, it was still under recommended intake, and fat intake reduced significantly ($p = 0.027$); however, it was more than the recommended value post-intervention. Significant changes were also observed in the fibre, calcium, and iron intake post-intervention ($p = 0.001$)

Table 3: Dietary and hydration strategies pre- and post-training

Meal Consumption	Pre-intervention (n=50)		Post-intervention (n=50)		P value
	N	%	N	%	
Pre-training meal	28	56	39	78	0.001**
Post-training meal	17	34	34	68	0.000**
Fluid Choices					
Water	35	70	18	36	-
Nimbu Pani	15	30	32	64	0.000**

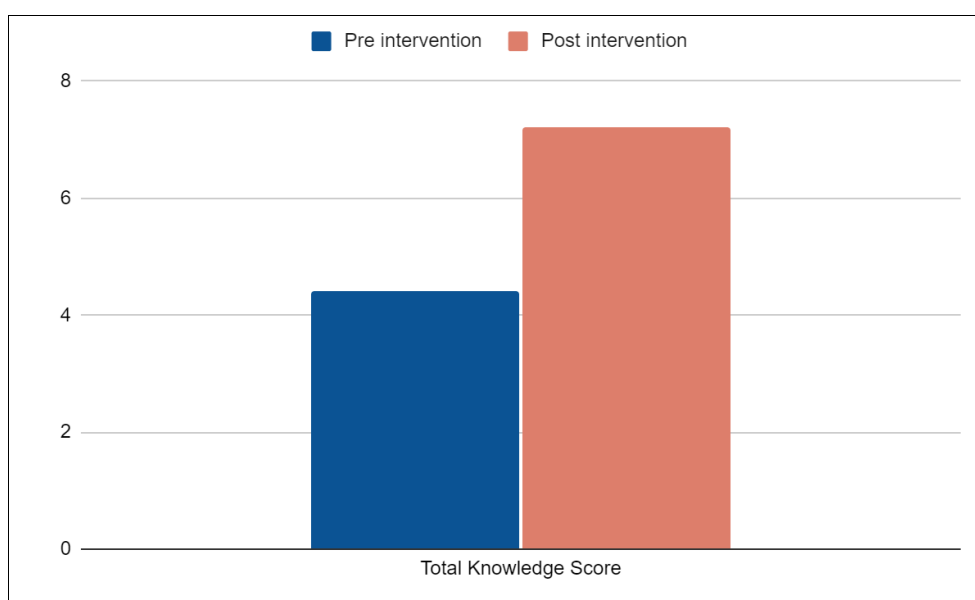
Values are represented in percentage (%) and frequency (N)

** Indicates statistically significant ($p < 0.001$)

In Table 3 Post-intervention, there was a significant difference in consumption of pre-training meal ($p = 0.001$) and post-training meal ($p = 0.000$). In pre-intervention, 28 athletes had pre-training meals, which significantly increased to 39 post-intervention. 17 athletes had post-training meal pre-intervention, which significantly increased to 34 post-intervention. pre-intervention, most of the athletes, 70%(35), were having just water for 3 hours of training, and 30%(15) of athletes were having Nimbu pani as a sports drink during training, post-intervention there was a significant increase, i.e., 64%(32) in Nimbu pani consumption as a sports drink during training ($p = 0.000$)

Nutrition knowledge of Mallakhamb athletes

In Figure 2, the Total Nutrition knowledge questionnaire results show that there was an increase in nutrition knowledge among Mallakhamb athletes, and the total knowledge score increased from 4.48 to 7.72 ($p = 0.001$)

**Fig 2:** Total Nutrition Knowledge Score pre- and post-intervention

Fitness test of Mallakhamb athletes

Table 4: Comparison of fitness test pre- and post-intervention

Fitness Test	Pre-intervention (N=50)	Post-intervention (N=50)	P value
	Mean (SD)	Mean (SD)	
Flexibility (inch)	19.4 (2.2)	19.6 (2.0)	0.056
Muscular Endurance (sec)	18.1 (6.4)	18.7 (6.0)	0.003*
Balance (sec)	30 (0)	30 (0)	-
Power (cm)	21.3 (13.4)	21.4 (12.6)	0.013*

Values are represented in mean and standard deviation (SD)

* Indicates statistically significant ($p < 0.05$)

Table 4 shows the Fitness test scores pre- and post-intervention. There was a significant increase in muscular endurance ($p=0.003$) and power ($p=0.013$) post-intervention.

Discussion

The Primary objective was to assess the effect of the nutrition education program on the nutritional knowledge, dietary intake, and nutritional practices of Mallakhamb athletes, and the secondary objective was to compare the impact of the nutrition education program on body composition, fitness, and performance in Mallakhamb athletes post-intervention. It was hypothesized that Nutrition knowledge would be enhanced after a 12-week interventional intervention in Mallakhamb athletes. In the present study, in the Nutrition Knowledge, the score of the athlete was 4.47 out of 8 questions, which increased to 7.2 post-intervention. In previous research investigations Foo *et al.*, 2021^[6] studied the impact of offline 7-week nutrition education which was conducted every week for 30 minutes on swimmers and Tan *et al.*, 2022^[15] carried 8-week nutrition education strategies online in triathletes, the results showed increased improvements in the nutrition knowledge of the athletes post-intervention.

In the present study, dietary intake improved significantly post-intervention. The athletes reported a significantly higher energy, protein, and fiber intake and a reduced fat intake post-intervention. Past research in nutrition intervention for 8 weeks on an online module in male and female high school athletes did not produce significant results in body composition and athletic performance (Shoemaker *et al.*, 2019)^[14]. A study conducted by Mohd Elias *et al.*, 2018^[10] and Aguilo *et al.*, 2021^[2] found significant improvements in energy intake and macronutrients such as protein, CHO, and fat. In the present study, there was no significant difference in CHO intake but a slight increase in CHO intake was seen.

There was a significant change in the food selection choice for pre-and post-training meals; pre-intervention, there was more consumption of biscuits and chai and less of fruits for the pre-training meal, while post-intervention, there was more consumption of fruits, cornflakes and milk. While pre-intervention most athletes skipped the post-training meal, significantly post-intervention athletes reported having either boiled eggs, sprouts, or boiled chicken for the post-training meal. In a previous study author Debnath *et al.*, 2023^[11] found that in a controlled modification of dietary intake of young male athletes, significant adherence to the recommendations was reported.

In the present study, there was no significant difference in the daily fluid intake but a significant increase was seen in the fluid intake during training, also the choice of fluid intake during training was mostly plain water but post-intervention major participants were consuming nimbu pani as a sports drink. Kutlay *et al.*, 2012^[9] stated that hydration is a major

concern in adolescent athletes. These athletes have low sweat rates and produce more heat, their core body temperature rises faster than adults and acclimatizes slower in hot conditions, and hence adolescents are at a higher risk of dehydration during training. In a study by Erdman *et al.*, 2013^[5] the author found that athletes consume 5-6 meals per day with three main meals 1 snack, and 1 pre-training or post-training meal. In the present study, during pre-intervention athletes were having 3-8 meals per day while post-intervention, most athletes had 5-6 meals per day.

The current research shows no significant difference in anthropometry and body composition of the adolescent athletes, this may be due to the limitation in the duration of the study or the frequency of education sessions. The present study was conducted for 6 weeks in 3 sessions of 2 hrs each. In sports, the Body Mass Index (BMI) is not a reliable measure of body composition. Instead, Body Fat % can be a more accurate method to predict the body composition of athletes. A previous study on nutrition intervention study was conducted to assess the impact of a nutrition education program on the body composition of young female endurance athletes the duration of the study was 6 nutrition education sessions in 6 months in which an inverse relationship between sports nutrition knowledge scores body fat percentage, and fat mass was observed for all athletes, and BMI and fat % significantly reduced. Among women athletes, those with higher body weight, Body fat %, and BMI were more prone to prioritize weight loss as their body weight goal. Athletes also consistently underestimated their energy and carbohydrate requirements about the demands of their sport, irrespective of gender (Jagmin 2021)^[7]. Cholewa *et al.*, 2015^[3] Conducted a study for 12 weeks that suggested Enhancements in nutritional status correlated with reductions in body fat percentage, potentially linked to higher protein intake.

The present study found a significant change in the fitness levels of adolescent athletes in terms of muscular endurance and power post-intervention. In another study by Cholewa *et al.*, 2015^[3] found significant improvement in vertical jump, broad jump, and back squat after 12 weeks of intervention.

The present study highlights the need to include tailored nutrition education programs in every sports organization for athletes to highlight the importance of nutrition on growth, development, body composition, and performance.

Conclusion

The study findings reveal that adolescent athletes consume insufficient carbohydrates, protein, iron, and calcium compared to recommended athlete guidelines which can impact growth and development and can also hamper sports performance. The present study indicated a positive change after a 6-week nutrition education program on nutritional knowledge, dietary intake, and performance in Mallakhamb athletes. The significance of strategic intervention planning to achieve impactful outcomes is underscored by the need to align with sport-specific nutritional requirements, enabling clear interpretation and reporting by sports nutrition professionals and researchers. Given the role of nutrition education as a key strategy for enhancing athletes' dietary intake and the considerable initiatives across sports, there is a pressing need for future research to guide best practices.

References

1. Schwartz AK. The Effect of a Nutrition Education Program on Nutrition Knowledge, Dietary Intake, Body Composition and Perceived Sport Performance among

- High School Athletes. Theses and Dissertations-- Nutrition and Food Systems; c2014, 21. Available from: https://uknowledge.uky.edu/foodsci_etds/21
2. Aguilo A, Lozano L, Tauler P, Nafria M, Colom M, Martínez S. Nutritional Status and Implementation of a Nutritional Education Program in Young Female Artistic Gymnasts. *Nutrients*. 2021;13(5):1399. DOI:10.3390/nu13051399
 3. Cholewa J, Landreth A, Beam S, Jones T, MacDonald C. The effects of a sports nutrition education intervention on nutritional status, sport nutrition knowledge, body composition, and performance in NCAA Division I baseball players. *Journal of the International Society of Sports Nutrition*. 2015;12:44. DOI:10.1186/1550-2783-12-S1-P44
 4. Desbrow B, McCormack J, Burke LM, Cox GR, Fallon K, Hislop M, *et al.* Sports Dietitians Australia position statement: sports nutrition for the adolescent athlete. *International Journal of Sport Nutrition and Exercise Metabolism*. 2014;24(5):570-584. DOI:10.1123/ijsnem.2014-0031
 5. Erdman K, Tunnicliffe J, Lun V, Reimer R. Eating Patterns and Composition of Meals and Snacks in Elite Canadian Athletes. *International Journal of Sport Nutrition and Exercise Metabolism*. 2013;23:210-9. DOI:10.1123/ijsnem.23.3.210
 6. Foo WL, Faghy MA, Sparks A, Newbury JW, Gough LA. The Effects of a Nutrition Education Intervention on Sports Nutrition Knowledge during a Competitive Season in Highly Trained Adolescent Swimmers. *Nutrients*. 2021;13(8):2713. DOI:10.3390/nu13082713
 7. Jagim AR, Fields JB, Magee M, Kerksick C, Luedke J, Erickson J, *et al.* The Influence of Sport Nutrition Knowledge on Body Composition and Perceptions of Dietary Requirements in Collegiate Athletes. *Nutrients*. 2021;13(7):2239. DOI:10.3390/nu13072239
 8. Kolimechikov S, Petrov L, Alexandrova A. Artistic Gymnastics Improves Biomarkers Related to Physical Fitness and Health at Primary School Age. *International Journal of Applied Exercise Physiology*. 2021;10:115-128.
 9. Kutlay E, Ergün M. Fluid intake profile of elite rhythmic gymnasts. 2012;47:115-122.
 10. Mohd Elias SS, Abu Saad H, Taib M, Jamil Z. Effects of sports nutrition education intervention on sports nutrition knowledge, attitude and practice, and dietary intake of Malaysian team sports athletes. *Malaysian Journal of Nutrition*. 2018;24:103-116.
 11. Debnath M, Dey SK, Datta G, Bandyopadhyay A. Impact of nutrition education programme and controlled dietary modification on nutritional status in young male athletes. *Human Nutrition & Metabolism*. 2023;34:200230. DOI:10.1016/j.hnm.2023.200230
 12. Sanchez-Díaz S, Raya-Gonzalez J, Javier Y, Castillo D. The influence of nutrition education intervention combined with FIFA11+ program on physical fitness attributes, physical activity behaviors, eating habits and nutritional knowledge in young basketball players. *European Journal of Human Movement*. 2022;48:4-20. DOI:10.21134/eurjhm.2022.48.11
 13. Sharma R. The Sport of Mallakhamb Is A Traditional Game Of Indian Culture.
 14. Shoemaker M, Gillen Z, McKay B, Fischer J, Hansen C, Bohannon N, *et al.* Effects of Sports Nutrition Education on Athletic Performance and Iron Status in High School-Aged Youth Athletes. 2019;2:010-018.
 15. Tan X, Rogers N, Brown N, MacDonald M, Bowler AL, Cox GR. The Impact of a 'Remotely-Delivered' Sports Nutrition Education Program on Dietary Intake and Nutrition Knowledge of Junior Elite Triathletes. *Nutrients*. 2022;14(24):5203. DOI:10.3390/nu14245203
 16. Vázquez-Espino K, Rodas-Font G, Farran-Codina A. Sport Nutrition Knowledge, Attitudes, Sources of Information, and Dietary Habits of Sport-Team Athletes. *Nutrients*. 2022;14(7):1345. DOI:10.3390/nu14071345
 17. Villa M, Villa-Vicente JG, Seco-Calvo J, Mielgo-Ayuso J, Collado PS. Body Composition, Dietary Intake and the Risk of Low Energy Availability in Elite-Level Competitive Rhythmic Gymnasts. *Nutrients*. 2021;13(6):2083. DOI:10.3390/nu13062083