Summary and Conclusion
5. SUMMARY AND CONCLUSION

The major objective of the present study is to assess the food and nutrition security of school children who were engaged in various sports, to conduct nutrition intervention programme to empower the selected sports personnel with knowledge, practice, nutrition security by education and carbohydrate supplementation and finally to evaluate the impact of nutrition intervention programme on knowledge, practice, food and nutrition security and their impact on physical and field performance.

General background information of selected sports personnel: The total number of male players was 87 and female players were 85 students. The age of the male and female high school players was between 13-16 years. Twenty percent, 54% and 26% of female players belonged to the standard of 8th, 9th and 10th respectively. Forty four percent of male players and 24% of female players were from Government school, more than 50 per cent of sports personnel i.e. 56% and 76% of male and female players belonged to the private school.

Majority of the players were from nuclear family and they played usually team games like football, basketball, kabaddi and volleyball. Players practiced their specialization game daily where as female players practiced after the selection for the sports. They practiced for two hours, one hour in the morning and one hour in the evening.

There is significant difference in all the physical parameters among male and female players except in hemoglobin and chest circumferences. The mean height of male players’ was 162.14 cm and female players were 151.2 cm. The mean weight of male players was 46.80 and female players were 44 kg. The BMI found to be 17.96 and 19.16 for male and female respectively. Mid arm circumferences and chest circumferences of male and female players were 24.31 cm, 75.70 cm and 23.26 cm, 74.58 cm respectively. Biceps and triceps measurements were found to be more among female than male players.
Body composition findings revealed that female players had more body percent than male players where as male players had higher amount of fat free mass than female players.

Forty-five percent of male players were vegetarians where as 73% of female players were vegetarians. Fifty five percent of the male players were nonvegetarians where as only 27% of female players were nonvegetarians. Majority of male (70%) and female (60%) players have the pattern of two meals and two snacks.

Cereals were staple food for both the players. Food consumption pattern revealed that consumption of protective foods was lacking in their daily diet. There is significant difference in the intake of food and nutrients between both the players.

**Anthropometric and hemoglobin measurements of selected sports personnel:** The mean height of female khokho players was 148.81 cm where as volleyball players were 153.46 cm; there was significant difference in the height of the both players. The mean height of male kabaddi players was 162.53 cm and 161.22 cm for football players.

The mean weight of female khokho players was 41.76 kg where as for volleyball players 45.93kg. In male kabaddi players the mean weight was 46.41kg and 46.52kg for football players. The mean BMI of khokho players was 18.81, volleyball 19.48, football 18.05 and kabaddi 17.78.

The mean percentage body fat of female khokho players was 17.89±6.16, volleyball (18.14), football (13.53), kabaddi (14.21). The mean fat mass (kg) of female khokho players was 7.76 volleyball 8.37, football 6.51, kabaddi 6.69. The mean fat free mass (kg) of female kho players was 34, volleyball 37.55, football 40.03 and kabaddi 39.71. The mean mid arm circumferences (cms) of female khokho players was 22.89±2.21, volleyball (23.61), football (25.46) kabaddi (22.84). The mean chest circumferences (cm) of khokho players was 73.43,volleyball (75.63), football (75.04), kabaddi (75.09). The mean triceps and biceps (mm) of khokho players was (9.75, 4.75), volleyball (10.75, 5.5), football (7.2 4), kabaddi (6.21, 3.66). Generally males have lower
skin folds than females. The mean hemoglobin level (g%) of khokho players was (9.75) volleyball (11.91), football (10.67) and kabaddi (10.83).

**Physical performance of selected team game players:** The findings of physical performance parameters of male and female players revealed that the speed performance of male players was 8.25 sec and in female 9.19 sec. Strength performances of male players was 38.99 cms and female players were 22.3 cms. The mean flexibility performance of male and female players was 7.23 cm, 8.7 cm respectively. Agility performances of male players were found to be 11.09 sec and female players was 12.6 sec. The mean endurance (m) performance of male players was 902 where as female players were 941.

**Knowledge and practice of selected team game players:** The comparison of knowledge and practice among four team game players revealed that the general nutrition knowledge of male kabaddi and football players was 43% (9.0), 47% (10.0) respectively. Whereas the sports nutrition knowledge score was 50% (2.5) and 44% (2.2) for kabaddi and football players. The general nutrition practice and sports nutrition practice was found to be 42% (6.3) and 40% (6.1) and 44% (2.2), 46% (2.3) of kabaddi and football players. The overall knowledge was found to be 45% (11.6) and practice 43% (8.5) for kabaddi and 47% (12.2) 43% (8.5) for football players respectively. In the same way the general nutrition knowledge of female khokho and volleyball players was 40% (8.4), 45% (9.5) respectively. Whereas the sports nutrition knowledge score was 46% (2.3) and 48% (2.4) for khokho and volleyball players. The general nutrition practice and sports nutrition practice was found to be 46% (7.0) and 32% (4.8) and 44% (2.2), 46% (2.3) of khokho and volleyball players. The overall knowledge was revealed to be 41% (10.7) and practice 45% (9.0) for khokho and 46% (11.9) and practice 36% (7.1) for volleyball players.

**Food and nutrition security of selected team game players:** The adequacy of fruit, green leafy vegetables, other vegetables, roots and tubers and milk was less than 65% among both male and female players, where as fat and sugar adequacy exceeded the RDA.
The mean calorie intake of khokho players was 1498 for volleyball players 1668. The mean calorie intake male kabaddi player was 1738 and football players 1976. The mean protein intake female khokho players were 41g whereas volleyball players’ 51g as there was no significant difference was observed in the intake of protein between players. The mean protein intake of male kabaddi players was 54g whereas as football players 60g. The mean intake of fat in female khokho players was 38g whereas as volleyball 40g. The mean intake of fat among male kabaddi players was 47g and football players were 50g. The calcium intake of female khokho players was 264 mg volleyball 302 mg. The calcium intake of male kabaddi players was 400 mg and football 429 mg. The carbohydrate intake female khokho players were 223 (59%), volleyball players’ 249 (59%). The mean intake male kabaddi players were 242 (55%) and football players 271 (55%). There was significant difference in the intake of selected nutrients like protein and fat among female players whereas as among male players there was significant difference in the intake of calorie only.

Impact of intervention on food and nutrition security and performance: The intervention programme was framed based on the student’s knowledge on nutrition and sports nutrition and practice before, during sports and after the sports. It was evident from the results that overall knowledge and practice of male players were only 46 per cent and 43 per cent and female player were 44 per cent and 40 percent respectively. The average intake of majority of the nutrients was also found to be below the RDA for sport persons. It was also evident from the present study that the subjects were not aware of sports nutrition and especially the carbohydrate loading, which improves the performance of sports persons, and also other benefits like delayed fatigue.

The intervention programme consisted of two parts. The first part was imparting of nutrition education classes to the sports personnel and second part was of supplementation of carbohydrate snack and beverage before and during the tests and field events. The four games were selected for the study purpose i.e., kabaddi, football for boys, khokho,
volleyball for girls subjects respectively. The team game subjects were divided into two groups like control and experimental group. The findings of the impact of nutrition intervention are expressed under the following heads

**Impact of intervention on food and nutrition security:** There was significant improvement in both the gender regarding general nutrition practice, sports nutrition practice and overall nutrition practice scores. In both the players knowledge on sports nutrition and practice was higher than the general nutrition knowledge and practice, but compared to knowledge, practice was less. The overall knowledge gain in male players was 26% and 22% in female players; where as gain in practice was 10% and 9% in male and female players. The positive outcomes of intervention could be attributed to the fact that student were interested in improving their performance by under standing better knowledge and practice in general and sports nutrition.

Before intervention the players did not consume many food groups or they consumed on weekly or monthly basis. After nutrition education, there was great improvement in consumption of some food groups like pulses, green leafy vegetables, fruits and other vegetables. These findings indicate that nutrition education has influenced the players to choose right kind of food groups to improve performance in sports

To evaluate the impact of nutrition education programme, all the selected sports personnel both male, female and control, experimental groups were evaluated for food intake. On each day, when the dietary intake of control and experimental compared there was significant difference in the choice/selection of the foods, quantity, and beverages in both the groups

The mean of three-day food and nutrient intake of all four games was evaluated after nutrition intervention programme. There was a significant difference in the intake of all the nutrients namely protein, fat and carbohydrate between all the players.

There was significant increase in carbohydrate intake in experimental group when compare to control. It was obvious that the intake of carbohydrate before the in
intervention was less than 60% for all the players and this was elevated to 60-70% after nutrition education. Further carbohydrate supplementation increased the carbohydrate intake to more than 70% in all players, which was desirable level to increase the glycogen level.

Impact of carbohydrate supplementation on performance: The impact of carbohydrate supplementation on male and female players revealed that, among 5 tests conducted i.e., speed, strength, flexibility agility and endurance, strength, agility and endurance showed highly significant improvement (P<0.01) whereas speed and flexibility did not show any improvement in performance on carbohydrate supplementation. Muscle size apparently has very little influence on flexibility so in the present study speed is high intensity and short duration activity; hence there was no improvement after supplementation. The result indicates that speed and flexibility performance does not depend on carbohydrate loading whereas energy dependent performance parameters found are strength, agility and endurance.

The performance of repeated strength before carbohydrate supplementation of male and female players was 40.0 to 47.15cm and 18.0±5.45 to 30.1 in experimental group. There is significant improvement in strength after carbohydrate supplementation by 7.15 cms and12.1cm respectively. The agility performance of male and female players after carbohydrate supplementation significantly improved from11.1 to9.75and12.25 to10.7 (by1.35 sec in male and1.55 sec in female) respectively. The endurance performance of experimental group improved significantly after carbohydrate supplementation in both the genders from 911 to1266 in male and 907 to1210 meters in female (by 355 and 303mts).

Impact of carbohydrate supplementation on field (game) performance: Evaluation by coaches: When observed the findings of all the team games under real match situation, carbohydrate supplementation group performed well in all the games than the control group. This may be attributed that the carbohydrate supplementation and fluid replacement
(beverage) during and after the match in the present study was very effective in improving the performance in all the games.

**Evaluation by subjects:** The evaluation subjects regarding role of nutrition in sports performance by all the subjects and revealed that it is interesting to note that more than 50% of majority of players had graded 3 before intervention, after intervention more than 50% of subjects graded 1 and 2.

As per the opinion of the players, 90%, 75% expressed that their overall performance was good due to carbohydrate supplementation. 37% and 35 % and 11%, 39% of male and female players graded their performance as grade 1 and grade 2. All the players informed that nutrition education classes were very useful for them. Majority 81%, 68% of both players opined that supplementation of snack and drink (81% and 64%) improved their performance.

The findings of multivariate analysis revealed that, in addition to carbohydrate intake, protein intake followed by fat intake after the intervention also showed positive association with sports performance. Further, physical fitness parameters exhibited considerable association with performance. The association between overall nutrition knowledge after the intervention and performance was less associated than the nutrient intake and physical fitness parameters. No association was observed between practice after nutrition education intervention and performance. Since sustainable type of nutrition education would help the players to practice better nutritional habits than short period nutrition education intervention.

Thus in the light of present investigation it could be concluded from the baseline study that, sports personnel do not achieve sound nutritional practices to optimize their sports performance. Factors may include poor nutrition knowledge, poor practical skills in choosing meals and reduced access to food due to frequent touring.
Based on the results of the intervention study, the food and nutrition security of sports personnel could be improved with appropriate intervention programmes. In the present study, nutrition education as an intervention did improved in the choice of dietary habits, food intake and nutrient intake before during and after the events. Carbohydrate serves as the fuel source for working muscle for most sports. Carbohydrate supplementation no doubt improved selected physical parameters and field match performance among team game players of male and female.

In the present study, kabaddi and football for male players, khokho and volleyball game for female players were selected to study the game inter effect, as two of four games i.e. kabaddi and khokho are Indian traditional games where as other two are western games. However, significant difference was not observed among any parameters except in physical measurements.

Considering the results, the present study has some implications, to produce a good sports man, catch them at young is the present trend so the present study throws light on youngsters, identifying their talents at school level and training them in a specialized event so as to bring maximum performance, hence nutritionists and physical education teachers as well as coaches at both school and college levels need to consider including a basic nutrition course in their professional preparation to provide more accurate, adequate and practical nutrition education to sports persons. So that in future they can perform to their full potential at national or international competitions, hence the preparation should start from school age itself.