REVIEW OF LITERATURE

The researcher of this study has done extensive review to find out the related literature in various libraries as well as he has gone through various websites. The relevant studies by the research scholar are enumerated in this chapter.

Malousaros et al. (2009) described the morphological characteristics of competitive female volleyball players. For this purpose, body weight and height, breadths and girths as well as skinfold thickness at various body sites were assessed in 163 elite female volleyball players (age: 23.8 +4.7 years, years of playing: 11.5 +4.2, hours of training per week: 11.9 +2.9, means+S.D.). Seventy-nine of these players were from the A1 division and the rest form the A2 division of the Greek National League. Two-way ANOVA was used to compare the differences in these characteristics between competition level and playing position. Body height ranged from 161cm to 194cm, and the mean value (177.1 +6.5cm) was not inferior to that of international players of similar caliber. Adiposity of these players (sum of 5 skinfolds: 51.8 +10.2mm, percent body fat: 23.4 +2.8) was higher than that reported in other studies in which, however, different methodology was used. Volleyball athletes of this study were mainly balanced endomorphs (3.4-2.7-2.9). The A1 division players were taller and slightly leaner with greater fat-free mass than their A2 counterparts. Significant differences were found among athletes of different playing positions which are interpreted by their varying roles and physical demands during a volleyball game. The volleyball players who play as opposites were the only subgroup of players differing between divisions; the A2 opposites had more body fat than A1 opposites. These data could be added in the international literature related to the anthropometric characteristics of competitive female volleyball players.

Zetou et al., (2007) conducted a study with the aim to present the playing characteristics of the teams in complex I and to attempt to determine which of these characteristics led to victory and to the final ranking of the teams. The subjects were 38 Olympic Volleyball men’s games. In every game, teams were characterized according to the result of the game (win of lose). The games were video-recorded and analyzed with the “Data Volleyball Project Sport Software” program. It recorded every skill of the complex I of the game, for each player of each team. There was a five level scale protocol according to the effectiveness of the skill (Eom & schutz,
1992; Eom, 1989). Discriminant analysis was conducted to the prediction of winning or losing in Olympic Volleyball teams. Among the five variables of service-reception: two variables “Best reception, 1st set attack” and “Good reception, high set attack” were entered into the final model yielding, standardized coefficient 1.22 and .78 respectively. Among the five “attack from reception” categories, only one variable, “ace-point” was selected to enter into the final model. These results conclude that the “best” and “good reception” and the “ace-point” in the attack remain powerful aggressive tools for high level teams and were predictors to win.

Bayios et al. (2006) conducted a study with the aims a) to determine the anthropometric profile, body composition and somatotype of elite Greek female basketball (B), volleyball (V) and handball (H) players, b) to compare the mean scores among sports and c) to detect possible differences in relation to competition level. Methods: A total of 518 female athletes, all members of the Greek first National League (A1 and A2 division) in B, V and H sport teams participated in the present study. Twelve anthropometric measures required for the calculation of body composition indexes and somatotype components were obtained according to the established literature. Results: V athletes were the tallest (p<0.001) among the three groups of athletes, had the lowest values of body fat (p<0.001) and their somatotype was characterized as balanced endomorph (3.4-2.7-2.9). B athletes were taller (p<0.01) and leaner (p<0.001) than H players, with a somatotype characterized as mesomorph-endomorph (3.7-3.2-2.4). H athletes were the shortest of all (p<0.01), had the highest percentage of body fat (p<0.001) and their somatotype was mesomorph-endomorph (4.2-4.7-1.8). In comparison with their A2 counterparts the A1 division players were taller (p<0.001) and heavier (p<0.01), but at the same time leaner (p<0.001), and exhibited higher homogeneity in somatotype characteristics (p<0.05). Conclusions: Anthropometric, body composition and somatotype variables of Greek female elite team ball players varied among sports; selection criteria, hours of training and sport-specific physiological demands during the game could explain the observed differences. More data are certainly needed to define the anthropometric profile of B, V and H female athletes internationally.

Gualdi-Russp and Zaccagin (2001) examined the importance of the somatometric components of elite male and female volleyball players in relation to their different game roles and levels of performance. Methods: Two hundred and thirty-four male athletes (aged 24.7+/-4.4 years) and 244 female athletes (aged 23.1+/-4.4 years) from the Italian A1 and A2 volleyball
leagues underwent anthropometric measurements during the 1992-1993 and 1993-1994 seasons. Somatotypes were estimated with the Heath-Carter method. Results: Marked sexual dimorphism in somatotype was observed in the total sample. The average somatotype for men was 2.2-4.2-3.2 (SD 0.7-0.9-0.9), and for women it was 3.0-3.3-2.9 (SD 0.8-1.0-0.9). The somatotype was significantly different in players at different levels of performance (A1 vs A2 leagues), as it follows: 2.1-4.1-3.3 (SD 0.6-0.8-0.7) vs 2.3-4.3-3.0 (SD 0.7-1.0-0.8) in males; 2.9-3.1-3.0 (SD 0.8-1.0-0.9) vs. 3.1-3.5-2.7 (SD 0.8-0.9-0.8) in females. The somatotype was also significantly different in players in different roles. In male sex the mean somatotypes for setters were 2.4-4.5-2.8 (SD 0.7-0.9-0.8), for centers they were 2.0-4.0-3.5 (SD 0.6-1.0-0.8), for spikers they were 2.2-4.3-3.0 (SD 0.6-0.9-0.7), for opposites they were 2.2-4.3-3.1 (SD 0.6-0.9-0.8). In female sex mean somatotype for setters were 3.1-3.6-2.5 (SD 0.8-1.0-1.0) for centers they were 2.8-3.1-3.1 (SD 0.8-0.9-0.7), for spikers they were 3.0-3.5-2.8 (SD 0.9-1.0-0.9) and for opposites they were 3.0-3.2-3.0 (SD 0.7-0.9-0.8). Conclusions: The physique of athletes in the A1 league is characterized by higher ectomorphy and lower endomorph and mesomorphy. There is also a slight tendency of male players to greater homogeneity in somatotype within the group at the maximum level of performance. Moreover somatotype differs in relation to game role in volleyball players of both sexes: the mesomorphic component is maximal in setters, while the ectomorphic component is maximal in centers.

Gabbett and Georgieff (2007) investigated the physiological and anthropometric characteristics of junior volleyball players competing at the elite, semi-elite, and novice levels and to establish performance standards for these athletes. One hundred and fifty-three junior national (n = 14 males; n = 20 females), state (n = 16 males; n = 42 females), and novice (n = 27 males; n = 34 females) volleyball players participated in this study. Subjects underwent measurements of standard anthropometry (body mass, height, standing reach height and sum of 7 skinfolds), lower-body muscular power (vertical jump and spike jump), speed (5-m and 10-m sprint) agility (t-test), and estimated maximal aerobic power (multistage fitness test) during the competitive phase of the season, after obtaining a degree of match fitness. Significant differences (p < 0.05) were detected among junior national, state, and novice volleyball players for height, reach height, skinfold thickness, lower-body muscular power, agility, and estimated maximal aerobic power, with novice volleyball players for height, reach height, skinfold thickness, lower-body muscular power, agility, and estimated maximal aerobic power, with the
physiological and anthropometric characteristics of players typically improving with increases in playing level. Male players were taller, leaner, and had greater standing reach height, speed, agility, muscular power, and estimated maximal aerobic power than female players. These findings provide normative data and performance standards for junior volleyball players competing at the elite, semi-elite, and novice levels. Given the improvements in lower – body muscular power, agility, and estimated maximal aerobic power with increased playing level, and given the importance of these qualities to competitive performances, conditioning coaches should train these qualities to competitive performances, conditioning coaches should train these qualities to improve the playing performances of junior volleyball players.

Duncan Woodfield and al-Nakeeb (2006) investigated the anthropometric and physiological characteristics of junior elite volleyball players. Method: Twenty five national level volleyball players (mean (SD) age 17.5(0.5) years were assessed on a number of physiological and anthropometric variables. Somatotype was assessed using the Heath-Carter method, body composition (% body fat, %muscle mass ) was assessed using surface anthropometry, leg strength was assessed using a leg and back dynamometer, low back and hamstring flexibility was assessed using the sit and reach test, and the vertical jump was used as a measure of lower body power. Maximal oxygen uptake was predicted using the 20 m multistage fitness test. Results: Setters were more ectomorphic (p<0.05) and less mesomorphic (p<0.01) than centers. Mean (SD) of somatotype (endomorph, mesomorph, ectomorph) for setters and centers was 2.6 (0.9), 1.9 (1.1), 5.3 (1.2) and 2.2(0.8) , 3.9 (1.1) , 3.6 ( 0.7) respectively. Hitters had significantly greater low back and hamstring flexibility than opposites. Mean (SD) for sit and reach was 19.3 (8.3) cm for opposites and 37 (10.7) cm for hitters. There were on other significant differences in physiological and anthropometric variables across playing positions (all p<0.05). Conclusion: Setters tend to be endomorphic ectomorphs, hitters and opposites tend to be balanced ectomorphs, whereas centers tend to be ectomorphic mesomorphs. These results indicate the need for sports scientists and conditioning professionals to take the body type of volley ball players into account when designing individualized position specific training programmes.

Tsunawake et al (2003) evaluated the body (underwater weighing) and cardiorespiratory function (VO(2) max and O(2) debt max measured by the treadmill exercise test) in 12
members of the women’s volleyball team (mean age 17.4 years) and 11 members of the women’s basketball team (mean age 17.6 years) that won the championship in the Japan Interschool Meeting. We also examined differences in the physical abilities between the members of the top teams of different events. The following results were obtained.

(1) The mean values of the height and body weight were 168.7+/−5.89cm and 59.7+/−5.73 kg in the volleyball players and 166.5+/−7.87 cm and 58.8+/−6.85 kg in the basketball players.

(2) The mean % Fat was 18.4+/−3.29% in the volleyball players and 15.7+/−5.05 in the basketball players, and was similar to the reported values in elite adult players.

(3) The mean VO2 max was 2.78+/−0.32 L x min−1 (46.5+/−2.90 ml x kg−1 x min−1) in the volleyball players and 3.32+/−0.31 L x min−1 (56.7+/−4.17 ml x kg−1 x min−1) in the basketball players and was similar to the reported values in elite adult players.

(4) The mean O2 debt max was 6.18+/−1.15 L (103.2+/−12.40 ml x kg−1) in the volleyball players and 7.92+/−1.80 L (134+/−23.24 ml x kg−1) in the basketball players. These values were 2.6 times as high as the average values in high school students in general.

(5) No significant difference was observed in any measured item of the physique, skinfold thickness, or body composition between the volleyball players and basketball players.

(6) The VO2 max and O2 debt max were 22% and 28% higher in the basketball players than in the female volleyball players. The female volleyball players and basketball players evaluated in this study had the physical abilities needed to win the championship in the Japan Inter-high School Meets, i.e. a large FFM and excellent aerobic and anaerobic work capacities. Also basketball appears to require higher aerobic and anaerobic work capacities than volleyball.

Fleck et al., (1985) conducted a study with the purpose to compare various physical and performance characteristics of two elite groups of athletes, the 1980 U.S. Women’s National Volleyball Team and the collegiate players who composed the 1979 U.S. Women’s University Games Volleyball Team. The characteristics compared were age, height, weight, body composition determined via hydrostatic weighing, vertical jumping distance, vertical jumping height, maximal oxygen consumption, heart rate max and respiratory exchange ratio. Significant differences (p less than 0.05) in age (23. +/-2.6 yr. 21.5+/−0.7 yr.), percent of body fat (11.7 +/-3.7% and 18.3+/-3.4%) and vertical jumping distance (52.4 +/- 4.5 cm and 45.5+/− 6.4 cm) between the two teams were demonstrated, with the National Team being significantly older, having a lower percentage of body fat and possessing a larger vertical jumping distance. These results indicate trainers of elite (national and international caliber) women volleyball players
should consider including techniques to reduce percentage of body fat and increase vertical jumping distance.

Bandopadhyay (2007) selected 50 sedentary males and 128 sports persons (volleyball = 82, soccer = 46) of 20-24 years from West Bengal, India, to evaluate and compare their anthropometry and body composition. Skinfolds, girth measurements, body fat percentage (%fat), and endomorph were significantly higher among sedentary individuals, but lean body mass (LBM) and mesomorphy were significantly (p<0.001) higher among the sports persons. Soccer and volleyball players were found to be ectomorphic mesomorph, whereas sedentary subjects were endomorphic mesomorph. The soccer and volleyball players had higher % fat with lower body height and body mass than their overseas counterparts % fat exhibited a significant correlation with body mass index (BMI) and thus prediction equations for % fat from BMI were computed in each group. The present data will serve as a reference standard for the anthropometry and body composition of Indian soccer and volleyball players and the prediction norms for % fat will help to provide a first-hand impression of body composition in the studied population.

Palao, Gutierrez and Frideres (2008) tried to find out the height, weight, Body Mass Index (BMI), and age of peak performance beach volleyball players with regard to their level of play and their role. Methods: The men’s and women’s pairs that classified in the World Tour and in the Olympic Games during seasons 2000-2006 were analyzed (625 males and 617 females). A descriptive, correlational, and longitudinal design was used the variables studied were: height, weight, age, BMI, level (World Tour ranking), and player role (blocker, defense specialist, or no specialization). The data were obtained from the webpage of the international Federation of Volleyball. Results: The average characteristics for males were 1.93 m, 88-89 kg, a BMI of 23.8-24.1, and an age range of 29-31 years, and for females, they were 1.77-1.79 m, 66-68 kg, a BMI of 19.2-21.1, and an age range of 27-29 years. Conclusion: Beach volleyball players are older and have smaller anthropometric characteristics when compared to indoor volleyball player. Male players present similar values for age and height across rankings. For both genders, with regard to weight and BMI, the higher the level, the larger the value. For women, the players at a higher level presented higher values of age, height, weight, and BMI. With regard to role, the blocking specialists were taller than toe defense specialists. The pairs that share the blocking and defense responsibilities have intermediate values.
In order to collect data on the physique of “amateur” female volleyball players, 50 athletes (VP) were measured by Viviani and Baldin (1993) according to the health / Cater anthropometric somatotype method. They were divided into two subgroups: juniors (JVP <18 years old) and seniors (SVP<18). Their somatotype scores were respectively: 4.9- 3.8-2.6 and 4.7-3.9-2.3. No significant differences emerged for any of the components of the somatotype between the two subgroups. JVP and SVP resulted as being taller and stouter than the mean of the Italian girls of the same age, but their menstrual function parameters (such as : age at onset of menarche, but their menarche, cycle and flux lengths) did not differ. Centers were much taller and heavier than other players. For the whole VP sample, the values of anthropometric measures and somatotype scores resulted as being congruent with those ascertained for other cohorts of amateur VP found in relevant literature.

Volleyball has been described as an ‘interval’ sport with both anaerobic and aerobic components. At the higher skill levels, technical performance may be limited by physical characteristics as well as physical fitness, and performance characteristics such as speed and vertical jump. Hence, Smith, Roberts and Watson (1992) compared teams at the two uppermost levels of men’s volleyball in Canada for differences in physical physiological and performance characteristics. The subjects were members of the national ( n=15) and Universidad teams (n= 24). The parameters examined included percent body fat maximal oxygen uptake (VO2 max) anaerobic power bench 20-m sprint time and vertical jumping ability. The only significant difference in physical characteristics between the two teams was in age. Despite similarities in standing and rich height the national team players had significantly higher block (3.27 vs. 3.21 m) and spike (3.43 vs. 3.39 m) jumps. An evaluation of anaerobic power measures produced similar power outputs during a modified Wingate test yet the national team members had higher scores (P less than 0.05 ) for spike and block jump differences as well as 20-m sprint time. The large aerobic component of elite volleyball play was supported by the high VO2 max value recorded for the national team players ( 56.7 vs 50.3 ml kg-1 min -1). The results suggest that either years of specific physical conditioning and playing or the selection of individuals for the national team who possess more desirable characteristics as a consequence of genetic endowment, plays a significant role in the preparation of genetic endowment, plays a significant role in the preparation of international caliber volleyball players.
Gabbett (2008) investigated the specificity of skill-based conditioning games and compared the effectiveness of skill-based conditioning games and international training for improving physical fitness and skill in junior elite volleyball players. Twenty-five junior volleyball players (mean age +/- SE, 15.6+/- 0.1 years) participated in this study. Heart rate data were collected on all players during the Australian Junior Volleyball Championships. After the competition, players were randomly allocated into a skill-based conditioning games group (n=12) or an instructional training group (n=13). Each player participated in a 12-week training program that included 3 organized court training sessions per week. No significant differences (p>0.05) were detected between competition and skill-based conditioning games for the percentage of time spent in low-intensity moderate- intensity, and high – intensity activities. Skill-based conditioning games induced improvements in vertical jump, spike jump, speed, agility, upper-body muscular power, and estimated maximal aerobic power, whereas technical instruction improved only spike jump and speed. Conversely, instructional training induced meaningful improvements in all measurements of skill, whereas improvements in technical skill after skill-based conditioning games were uncommon and typically small. The results of this study show that skill-based conditioning games offer a specific training stimulus to simulate the physiological demands of competition in junior elite volleyball players. Although the improvements in physical fitness after training were greater with skill-based conditioning games, instructional training resulted in greater improvements in technical skill in these athletes. These findings suggest that a combination of instructional training and skill-based conditioning games is likely to confer the greatest improvements in fitness and skill in junior elite volleyball players.

Kaarma et al. (2005) described two Estonian anthropometric cross-sectional studies of 1549 ordinary schoolgirls (aged 7-18) and 46 girls, who regularly practiced volleyball (aged 13-16). Date are presented on 22 basic anthropometric measurements and 6 body composition characteristics. (body mass index, mean skinfold, body density, relative mass of fat by Siri, absolute mass and relative mass of subcutaneous adipose tissue). All anthropometric variables were classified into five height-weight SD classes. Schoolgirls were divided into six age groups (7-8, 9-10, 11-12, 13-14, 15-16, 17-18). Volleyball were observed as one group as their age in SD classes did not differ significantly. The classification consisted of five categories : three height-weight concordant categories : I-small (small height, small weight), II-medium (medium height, medium weight), III- large-(big height, big weight) and two height/weight discordant categories:
IV – so-called pyknomorphs, V-so-called leptomorphs. To assess the differences between classes the Scheffe-test was used (alpha = 0.05). It proved likewise possible to comparatively systematize length, breadth and depth measurements, circumferences and body composition characteristics in all six age groups (7-18 years) of ordinary schoolgirls and in 13-16 year old volleyball as in their case the average age did not differ significantly between the classes.

To date, there is very little information about the effects of ageing and sport selection on the characteristics of former athletes. Therefore, Zaccagni, Onisto and Gualdi-Russo (2008) analyzed anthropometric and physiological characteristics of 146 former elite volleyball players in Italy. The possible effect of an active or inactive lifestyle on ageing was assessed by comparing the biological profiles of subsamples former athletes with and without regular sport activity. All the formers athletes underwent measurements of standard anthropometry (height, sitting height, and body mass; skin fold thicknesses; bi-acromial and bi-Cristal breadths; upper limb length; upper arm, calf and chest girths), cardio-respiratory function (vital capacity, forced vital capacity, forced expiratory volume in 1s; systolic and diastolic blood pressures and heart rate), muscle strength (handgrip strength), and cognitive function (visual and auditory simple reaction times; Digit-symbol subtest). Body composition parameters were estimated form anthropometric measurements. Data on lifestyle were collected by questionnaires. The results show that the former players differ from current players in several anthropometric and physiological traits. Selection pressure seems to be more responsible for these differences than ageing. This study underlines the particular performance of former players in cognitive functions. Moreover, it confirms that an active lifestyle has beneficial effects on the biological age profiles of former athletes.

Gaebbett et. (2006) investigated the effect of a skill-based training program on measurements of skill and physical fitness in talent-identified volleyball players. Twenty-six talented junior volleyball players (mean+/SE age, 15.5+/0.2 years) participated in an 8-week skill-based training program that included 3 skill-based court sessions per week. Skills sessions were designed to develop passing, setting, serving, spiking and blocking technique and accuracy as well as game tactics and instructional coaching, coupled with skill-based games to facilitate learning. Subjects performed measurements of skill (passing, setting, serving, and spiking technique and accuracy), standard anthropometry (height, standing-reach height, body mass, and
sum of 7 skinfolds), lower-body muscular power (vertical jump, spike jump), upper-body muscular power (overhead medicine–ball throw), speed (5-and 10-m sprint), agility (T-test), and maximal aerobic power (multistage fitness test) before and after training. Training induced significant (p< 0.05) improvements in spiking, setting, and passing accuracy and spiking and passing technique. Compared with prêt raining, there were significant (p<0.05) improvements in 5-and 10-m speed and agility. There were no significant differences between prêt raining and post training for body mass, skinfold thickness lower-body muscular power, upper-body muscular power, and maximal aerobic power. These findings demonstrate that skill-based volleyball training improves spiking, setting and passing accuracy and spiking and passing technique, but has little effect on the physiological and anthropometric characteristics of players.

It is often recommended that in-season training programs aim to maintain muscular strength and power developed during the off-season. However, improvements in performance may be possible with a well-designed training regimen. Therefore, Marques et al., (2008) conducted a study with the purpose to describe the changes in physical performance after an in-season training regimen in professional female volleyball players in order to determine whether muscular strength and power might be improved. Apart from normal practice sessions, 10 elite female volleyball players completed 2 training sessions per week, which included both resistance training and plyometric exercises. Over the 12-week season, the athletes performed 3-4 sets of 3-8 repetitions for resistance and plyometric exercises during each training session. All sessions were supervised by one of the investigators as well as by the team head coach. Muscular strength and power were assessed before and after the 12-week training program using 4 repetition maximum bench press and parallel squat tests, an overhead medicine ball throw (BTd), as well as unloaded and loaded countermovement jumps (CMJs). Strength improved by 15% and 11.5% in the bench press and parallel squat, respectively (p<0.0001). Distance in the BTd improved by 11.8% (p<0.0001), whereas unloaded and loaded CMJ height increased between 3.8 and 11.2%. The current findings suggest that elite female volleyball players can improve strength and power during the completion season by implementing a well-designed training program that includes both resistance and plyometric exercises.

Melrose et al., (2007) conducted a study with the objective to examine the physical and performance characteristics of adolescent club volleyball players. Twenty-nine adolescent girls,
aged 12 to 17 years (14.31+/-.1.37) were participants in this investigation. All athletes were members of a competitive volleyball club. The following group values were obtained: height (HT) = 1.69+/-.08m, weight (WT) = 59.6+/-.8.2 kg, body fat percentage (BF%) = 20.9+/-.4.5, lean body mass (LBM) = 46.7+/-.4.9kg, modified sit-and-reach (MSR) = 38.7+/-.7.1 cm, shoulder rotation (SR) = 29.4+/-.5.6cm, isometric hand grip (IHG) = 34.5+/-.5.5 kg, isometric leg strength (ILS) = 77.4+/-.18.1 kg, vertical jump (VJ) = 35.5+/-.6.2 cm, standing broad jump (SBJ) = 178.8+/-.20.3 cm, 1-minute sit-ups (SU) = 47.0+/-.6.7, T-test (TT) = 11.2+/-.0.8 seconds. Shuttle test (SHT) = 9.7+/-.0.4 seconds, stork stand (SS) = 8.1+/-.4.1 seconds, serving velocity (SVV) = 16.1+/-.4.5 m.s(-1), and spiking velocity (SKV) = 16.9+/-.2.4 m.s(-1). For purposes of analysis, players were divided into 2 age groups: 12 to 14 years (group A) and 15 to 17 years (group B). Significant differences (p<0.05) were found between age groups for the following values: HT, WT, IHG, ILS, SBJ, and SVV. Value for group B were greater for each variable. Significant correlations include age and IHG (r = 0.75), age and ILS (r = 0.51), age and SBJ (r = 0.67), age and SVV (r = 0.71), LBM and IHG (r = 0.90), LBM and ILS (r = 0.62), LBM and SVV (r = 0.58), SVV and IHG (r = 0.60), and SKV and SS (r = 0.60). Our results suggest that age, experience, LBM, shoulder, hip, and thigh girths, strength, and balance are key physical performance characteristics of adolescent girls who play volleyball. Potentially, this type of information will allow coaches and athletes to identify physical and performance data specific to age groups for purposes of evaluation and player development.

Abnormal imaging in the patellar tendon reveals pathology that is often associated with knee pain. Anthropometric measures of body size and mass, such as height, weight and waist-to-hip ratio (WHR), have been individually associated with abnormal imaging. Therefore, Malliaras, Cook and Kent (2007) investigated the anthropometric factors that have the strongest relationship with abnormal imaging in volleyball players. Methods: Height, weight, body mass index (BMI), waist girth hip girth and WHR where measured in a cohort of 113 competitive volleyball players (73 men, 40 women). The universal (ANOVA) and multivariable (discriminant function analysis) association between abnormal imaging and these anthropometric factors where investigated. Results: No significant associate was found in the female volleyball players. A significant univariate association was observed between abnormal imaging and heavier weight greater BMI larger WHR in the male volleyball players. Waist girth was the only factor that retained this associated in a multivariable model (p<0.05). Conclusions: Men with a
waist girth greater than 83 cm seem to be at greater risk of developing patellar tendon pathology. There may be both mechanical and biochemical reasons for this increased risk.