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UEFA model in identification of types, severity and mechanism of injuries among footballers in the Nigerian Women's Premier League

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ABSTRACT

Objective To prospectively investigate the injury profile and the incidence rate per 1000 hours exposure during training and actual league matches in the Nigerian Women's Premier League (NWPL) and to develop an adequate information pool, using the UEFA injury study model in order to develop appropriate injury prevention strategies.

Methods 241 women footballers from the eight football clubs that participated in the 2015/2016 Nigerian Women Premier league (NWPL) season were selected for the study and prospectively followed for a period of 6 months. The UEFA injury report forms and Competitive Aggressiveness and Anger Scale were sent to the various clubs, and the forms administered on them as at when due. The forms were analysed using descriptive statistics.

Results There was a high incidence rate per 1000 hours of exposure during training sessions (10.98 injuries/1000 hours) and matches (55.56 injuries/1000 hours); the predominant injury type was muscle rupture/strain injuries (35.49%), while moderate severity injuries were the most frequent. The predominant injury mechanism was traumatic injuries caused by contact with other players as a result of a tackle by other players (14.5%). No statistical association was established between the level of aggression and the prevalent types of injury (p=0.63).

Conclusions The organisers of the league and indeed the referees should ensure that the rules of the game are upheld, and foul or overly aggressive play is penalised. Medical staff and coaches should consider evidence-based injury prevention strategies to reduce the risk of the common injuries sustained in the NWPL.

What are the new findings?

- There was a high incidence rate per 1000 hours. During training 10.98 injuries per 1000 and 55.56 injuries per 1000 hours during matches.
- The predominant injury type was muscle rupture/strain injury.
- The predominant injury mechanism was traumatic injuries caused by contact with other players as a result of tackling.

How might it impact on clinical practice in future?

- Medical staff and coaches should consider evidence-based injury prevention strategies to reduce the risk of the common injuries sustained in the NWPL.

Association football is the most popular spectator sport.[1] In a survey carried out by the world football governing body (FIFA) in 2006, as cited in Tegnander *et al*,[2] there were about 265 million footballers all over the world, 40 million women footballers, while 6,653,710 are the number of players in Nigeria, with 58 710 identified as officially registered.[3] Though women constitute a fewer percentage of these players, they have shown increased participation from the grassroots to the elite level like their counterparts all over the world. According to Biedert and Bachmann,[4] women football is fast growing in popularity, with an increasing number of women football tournaments organised both locally and internationally, and more women players getting licensed. Women football in Nigeria started in 1978 with the foundation of the Nigerian Female Football Organizing Association, renamed Nigeria Female Football Proprietors Associations in 1979, and the first championship was organised by the Nigerian Football Association in 1990.[5] During the 2013/2014 league season, it was restructured and renamed the Nigerian Women Premier League (NWPL) in which 12 teams played in a single division to allow a promotion and relegation format. High injury incidence rate and a wide variety of injuries are known to be associated with football.[6] This as a result would likely have a public health impact in terms of the burden on healthcare systems and productivity of the players.[7] Therefore with the high popularity and probable public health impact associated with football, prevention strategies

are essential in order to reduce threats to the well-being of footballers. A model by van Mechelen,[8] proposed that sports injury prevention should follow a process which begins by determining the incidence of injury and thereafter determining the mechanism of each injury so as to design effective prevention strategies.

Epidemiological studies done so far on football injuries to determine the incidence and other related factors leading to injuries have mostly used varying methods thus making them difficult to compare. This has therefore made it difficult to propose prevention strategies that are encompassing. However, a guideline was proposed by UEFA to correct the problem of the inconsistent manner in which epidemiological studies in football were conducted,[9] including the inconsistencies ranging from the definition of football injury, the study design, the materials used for data collection, to when and where the data collection is done. The UEFA study model is thus a policy model and a practical guideline specifically made for conducting epidemiological studies of injuries among professional football players so as to allow comparison and global aggregation of data on football injuries. With the NWPL being the bedrock of women football in Nigeria, there is paucity of information on the injury profiles of women footballers in the NWPL which has made the adequate monitoring of injury preventive measures, treatment and injury rehabilitations difficult. This has therefore necessitated the use of the UEFA model/guideline for this study. The Competitive Anger and Aggressiveness Scale (CAAS) is a short scale specifically designed to measure anger and aggressiveness in competitive athletes. It was created because the existing measurements available at the time were said to have insufficient validity, were not sport specific, and reflected moods rather than anger or aggression traits.[10] The existing measurement systems at the time were the Bredemeier Athlete Aggression Inventory and the Buss and Durkee Hostility Inventory. Gencheva stated that the scale appears to be a useful measure of athletic anger and aggressiveness. He also stated that it had the ability to discriminate aggressive from non-aggressive athletes.[11]

MATERIALS AND METHODS

The study was a prospective cohort survey. The players were followed for the course of the 6-month long season.

Population

540 women footballers (30 players per club), who played for the 18 clubs that participated in the 2015/2016 NWPL Season, organised by the Nigerian Professional League Board constituted the population for the study.

The sampling technique

Proportionate stratified random sampling was used for this study.

Sample size

A total of 241 women from eight football clubs that participated in the 2015/2016 NWPL Season, organised by the Nigerian Professional League Board constituted the sample size. All the players that were registered for the season but were not available for team trainings and matches during the duration of the study and injuries that were sustained prior to the commencement of the study were excluded in this study.

Confidentiality

To maintain confidentiality of data throughout the data collection period, the contact person in each club replaced the names of individual players with a code and deleted the players' names before sending the forms to the investigators.

Method/procedures for data collection

The researcher contacted the various clubs by visiting each of the selected clubs in their camps. During those visits, the researcher educated the medical personnel in various clubs on the purpose of the research, how to make use of the various forms. The researcher also recruited eight physiotherapists to serve as research assistants. The purpose, procedures and ethical components of the research were duly explained to the various participants including the footballers. The researcher and the research assistants frequently visited the clubs, supervised and monitored the filling of these forms regularly. The injury forms were completed on ad hoc basis as and when injuries arose. At the end of every month, the researcher retrieved the forms from various clubs.

Definition of injury

An injury was defined as any event occurring during a scheduled training session or a match, resulting in the player leaving that session/match or missing a subsequent session/match. Recurrent injury was defined as any event occurring during a scheduled training session or match in sequel to an injury that was not adequately rehabilitated, resulting in the player leaving that session/match or missing a subsequent session/match.

Muscle rupture was defined as damage, like tears (part or all the fibres of a muscle or its attaching tendons.

Severity of injuries and illnesses

The severity of an injury or illness episode was evaluated by the length of absence from football participation.

Instrument for data collection

The UEFA Injury Report Forms and Competitive Aggressiveness and Anger Scale (CAAS) questionnaires were used for data collection.

The UEFA Injury Report Forms was used for data collection. The instrument has a reliability coefficient of 0.80, and a validity coefficient of 0.89. It comprises a 'declaration of consent form' which was also used to for the bio-data of the footballers, an 'injury card' administered to any injured player during the course of the season and

an 'illness card' for any case of ill health during the study period. The model also proposed the use of an attendance register for trainings and matches.

To assess the level of aggression, CAAS was used. The CAAS is a 12-item scale consisting of two subscales, aggressiveness and anger, measuring athlete trait aggressiveness and anger. The anger subscale consisted of items 1, 3, 5, 7, 9 and 11, while the aggression subscale consisted of items 2, 4, 6, 8, 10 and 12. Aggressiveness items are related to the acceptance and willingness to use both physical and verbal abuse to gain a competitive edge. The anger items are related to the acceptance and willingness to use both physical and verbal abuse to gain a competitive edge. The CAAS reports good internal consistency (α=0.70) and good test–retest reliability (α=0.88). The items were assigned severity level ratings which were multiplied by the participant responses and then summed to get the subscale scores and a total score. Higher scores on the aggressiveness subscale indicates greater acceptance of aggression during sports and vice versa.

The information collected includes the players anthropometric data, exposure types, game situations, training/match surface, injury side, playing position at injury, cause of injury, type of training/match where injury occurred, injury type, injury locations, mechanism of injury, severity, referee sanctions and level of aggression of the footballers.

Method of data analysis

Descriptive statistics of mean, SD, bar chart were used as statistical tools to describe the footballers' anthropometric characteristics. Percentages and frequencies were used to answer the research questions. Inferential statistics of χ^2 were applied at 0.05 alpha level of significance to test the hypothesis. The prevalence rate was calculated using the formula,

Prevalence=number of injuries recorded/sample size x 100.[12]

While the incident rate/1000 hours of player exposure was calculated using the formula,

Match-related injury incidence=number of injuries/player exposure hours x 1000.[13]

RESULTS

The footballers mean age, height and weight was 21.80 years±4.55, 1.55 m±9.83 and 55.59 kg±8.69 respectively. Players who played more with their right leg (n=134) had the highest number of injuries.

The prevalence of injuries among women footballers in the NWPL

There were 62 injuries recorded within the study period giving an injury prevalence of 25.73%.

The incidence rate per 1000 hours exposure during training and actual league matches

33 injuries occurred during actual league matches with a player exposure hours of 594 amounting to 55.56 injuries/1000 incidence rate while 29 injuries were reported during trainings sessions with player exposure hours of 2640, this resulted in 10.98 injuries/1000 incidence rate.

Table 1 Showing the predominant type of injuries in the NWPL for the 2015/2016 season

Injury type	Frequency	Percentage
Conclusion	1	1.61
Fracture	4	6.45
Muscle rupture/strain	22	35.49
Abrasion	2	3.23
Other bone injury	4	6.45
Tendon rupture/tendinosis	4	6.45
Laceration	2	3.23
Dislocation	4	6.45
Sprain/ligament injury	18	29.03
Other injury	1	1.61
Total	62	100

The predominant type of injuries, body parts and sides affected, reinjury among women footballers in the NWPL.

Of the injury types recorded, muscle rupture (n=22) had the highest number of occurrence representing 35.5% of injuries, with the lowest score observed for concussion (n=1). The most frequently affected body part was the ankle (n=10) representing 16.1% of affected body part. The least frequently affected body part was the forearm. There were only 3 cases of reinjury throughout the course of the 2015/2016 season out of 62 documented injuries (table 1).

The predominant injury mechanism, type of illness and severity of illness among footballers in the NWPL.

The predominant injury mechanism for trauma/overuse injury was trauma with 55 cases while overuse was the less predominant with only seven cases. The predominant injury mechanism for contact/no contact with other players was 39 cases and the less predominant being contact with object (n=1). The predominant injury mechanism for activity involved was 'tackled by other player' with nine cases. The less predominant was 'unknown mechanism' with one case.

The prevalence of injuries among professional footballers in the NWPL

Out of 241 female footballers sampled in this study, there were 62 injuries recorded within the study period giving an injury prevalence of 25.73%.

The predominant type of injuries, body parts and sides affected, reinjury and referees sanction among professional footballers in the NWPL

Table 1 showed the predominant type of injuries among the respondents. Of the injury types recorded, muscle rupture (n=22) had the highest number of occurrence

Table 2 Showing the affected body parts/location of the injuries

Body part affected	Frequency	Percentage
Head/face	4	6.45
Shoulder/clavicle	5	8.07
Forearm	1	1.61
Hip/groin	3	4.84
Lower leg/achilles tendon	3	4.84
Upper arm	1	1.61
Wrist	7	11.29
Thigh	8	12.90
Ankle	10	16.13
Elbow	1	1.61
Hand/finger/thumb	1	1.61
Knee	7	11.29
Foot/toe	6	9.68
Abdomen	3	4.84
Low back/pelvis	2	3.23
Total	62	100

representing 35.5% of injuries recorded, with the lowest number of occurrence observed for concussion (n=1) and other injury (n=1) with 1.6%. In table 2, the frequently affected body part was the ankle (n=10) representing 16.1% of affected body part. The least frequently affected body part was the forearm, the upper arm, the elbow, the hand/fingers/thumb (n=1) representing 1.6%. Out of the 62 injuries sustained by the footballers both during training and actual match, there was an equal number of no fouls to fouls (26) sanctioned by the referees' of which 12 of the fouls resulted to yellow cards and 2 red cards.

The association between level of aggression and prevalent types and mechanism of injury among professional footballers in the NWPL

Tables 3 and 4 shows the association between aggression and prevalent types of injury. The result showed no association between them. Out of 241 footballers sampled in this study, it was noticed that the level of aggression was high as 179 of them had a higher tendency to be aggressive representing 74.27% of the footballers.

The association between types of playing turf and injury mechanism among professional footballers in the NWPL

Table 5 shows the association between playing surface and injury mechanism. The result showed that there was an association between them.

The severity of injuries, playing turf/surface where injury occurred, type of match/training and role of play among professional footballers in the NWPL

The highest frequency was for moderate severity of injuries (n=34) followed by minor (n=17), slight (n=7) and the lowest frequency for severe injuries (n=4). Most of the injuries occurred on artificial turf (n=36), while other surfaces presented with the least with just five cases occurring there. Most injuries occurred during actual matches representing 53.23% of injuries (tables 6 and 7) .Regarding severity of injury and injury types, the most injured players were the defenders followed by midfielders and then strikers, the goal keepers were the least injured. Although not statistically significant (tables 8 and 9).

Table 3 Association of level of aggression and prevalent injury types, injury mechanism (trauma/overuse, activity involved)

	Level of aggression (N=241)				
Injury type	AO	AG	Total	X^2	P value
Concussion	–	1	1	7.98	0.63
Fracture	–	4	4		
Muscle rupture/strain	3	19	22		
Abrasion	–	2	2		
Other bone injury	1	3	4		
Tendon rupture/tendinosis	–	4	4		
Laceration		2	2		
Dislocation	1	3	4		
Sprain/ligament injury	4	14	18		
Other injury	–	1	1		df=10
Total	9	53	62		
Injury mechanism (trauma/overuse)					
Overuse	1	6	7	5.47	0.7
Trauma	8	47	55		df=2
Total	9	53	62		
Injury mechanism (activity involved)					
Running	–	4	4	15.55	0.41
Dribbling	–	4	4		
Sliding	2	4	6		
Heading	1	2	3		
Twisting/turning	–	5	5		
Jumping/landing	2	2	4		
Tackled by other player	1	8	9		
Shooting	–	3	3		
Falling/diving	1	1	2		
Hit-by-ball	–	2	2		
Tackling other player	–	2	2		
Stretching	–	4	4		
Collision	–	6	6		
Kicked by other player	2	5	7		
Unknown mechanism	–	1	1		df=15
Total	9	53	62		

AG, tendency to aggression; AO, tendency to anger.

Table 4 Association of level of aggression and injury mechanism (contact/no contact), re-injuries and severity of injuries

Injury mechanism (contact)	AO	AG	Total	X^2	P value
No contact	1	21	22	10.37	0.02
Contact with player	7	32	39		
Contact with object	1	–	1		df=3
Total	9	53	62		
Re-injury					
Yes	–	3	3	1.10	0.30
No	9	50	59		df=1
Total	9	53	62		
Severity					
Slight	–	7	7	7.03	0.13
Minor	3	16	19		
Moderate	6	26	32		
Severe	–	4	4		df=4
Total	9	53	62		

AG, tendency to aggression; AO, tendency to anger.

trainings. This later observation was also consistent with the result of this study. In comparison with the studies carried out by Owoeye, *et al*[17] in Nigeria using semiprofessional female footballers, a high incidence rate was also reported in their study. The result as seen in Nigeria was probably due to the observed low sponsorship of the female football league teams thus making it difficult to hire well-trained fitness coaches who would help to condition the players before training and actual matches. It may also be due to poor officiating during matches, thus leading to excessive fouling by the players.

Furthermore, the study revealed a prevalence of 25.73%. This showed a low prevalence of injuries when compared with works done by Hagglund *et al*,[15] Faude *et al*,[18] Jacobson *et al*.[14] This might be due to the fact that the women football league in Nigeria had no lower tier, and as a result, the women footballers were not well motivated to put their best efforts due to palpable fear of relegation.

This study revealed that the predominant type of injury was muscle rupture/strain (35.5%). This result was consistent with the result of the study carried out by Jacobson *et al*[14] and Owoeye et al[17] but differed from the findings of Faude,[18] Jacobson,[19] Junge *et al*,[20] Hagglund *et al*,[15] Mufty

Table 5 Association of playing surface and injury mechanism (contact/no contact), re-injury and severity of injuries

Contact/no contact	AR	GR	OR	Total	X^2	P value
No contact	16	6	–	22	264.62	0.001
Contact with player	19	15	5	39		
Contact with object	1	–	–	1	df=9	
Total	36	21	5	62		
Re-injury						
Yes	–	3	–	3	32.11	0.001
No	36	18	5	59	df=3	
Total	36	21	5	62		
Severity						
Slight	4	3	–	7	260.64	0.001
Minor	10	5	2	17		
Moderate	21	10	3	34		
Severe	1	3	–	4		df=12
Total	36	21	5	62		

AR, artificial turf; GR, grass; OR, other surfaces.

DISCUSSION

The study revealed that the incidence rate per 1000 hours was 55.56 during actual league matches and 10.98 during the training sessions for the league season. This meant that there was a higher injury incidence during actual matches than during training sessions. It was different from the works done by Jacobson *et al*,[14] Hagglund *et al*[15] and Ross *et al*[16] who all reported lower incidence rate both during training and matches in European and American leagues. Comparatively though, all these works reported higher incidence rate during actual matches than during

et al,[21] Tayebi *et al*,[22] Ross *et al*,[16] who reported sprains as being the predominant type of injury. This might be due to the above stated poor muscle conditioning among the female footballers prior to matches and football training. It may also be as a result of the current increased intensity of matches, in modern professional women football.

In addition, the study revealed moderate severity injury as the most predominant injury among players who stayed away from football activities from between 8 and 28 days in the event of injury. This result was in

Table 6 Association of type of match/training and prevalent injury types, injury mechanism (trauma/overuse and activity involved)

Training/match type (N=241)										
Injury type	**FT**	**FOT**	**FM**	**LM**	**NTT**	**OCM**	**NTM**	**Total**	**X^2**	**P value**
Concussion	–	–	–	1	–	–	–	1	420.02	0.001
Fracture	1	–	–	3	–	–	–	4		
Muscle rupture/strain	10	1	1	9	–	1	–	22		
Abrasion	2	–	–	–	–	–	–	2		
Other bone injury	3	–	–	–	–	–	1	4		
Tendon rupture/tendinosis	1	–	–	2	–	1	–	4		
Laceration	–	–	1	1	–	–	–	2		
Dislocation	1	–	–	3	–	–	–	4		
Sprain/ligament injury	8	–	2	7	1	–	–	18		
Other injury	1	–	–	–	–	–	–	1		df=70
Total	27	1	4	26	1	2	1	62		
Injury mechanism										
Overuse	4	–	–	3	–	–	–	7	248.81	0.001
Trauma	23	1	4	23	1	2	1	55		df=14
Total	27	1	4	26	1	2	1	62		
Injury mechanism (activity involved)										
Running	4	–	–	–	–	–	–	4	536.90	0.001
Dribbling	2	–	1	1	–	–	–	4		
Sliding	5	–	0	1	–	–	–	6		
Heading	1	–	1	1	–	–	–	3		
Twisting/turning	3	–	1	1	–	–	–	5		
Jumping/landing	2	–	–	1	1	–	–	4		
Tackled by other player	3	–	1	4	–	–	1	9		
Shooting	2	–	–	1	–	–	–	3		
Falling/diving	–	–	–	2	–	–	–	2		
Hit-by-ball	2	–	–	–	–	–	–	2		
Tackling other player	–	–	–	2	–	–	–	2		
Stretching	–	–	–	3	–	1	–	4		
Collision	2	–	–	4	–	–	–	6		
Kicked by other player	–	1	–	5	–	1	–	7		
Unknown mechanism	1	–	–	–	–	–	–	1		df=105
Total	27	1	4	26	1	2	1	62		

FM, friendly match; FOT, football and other training; FT, football training; LM, league match; NTM, national team match; NTT, national team training; OCM, other cup match.

agreement to the result of the works done by Jacobson *et al*,[14] Hagglund *et al*,[15] Tayebi *et al*,[22] who all reported higher frequency of time–loss injuries lasting between 8 and 28 days. However, this differed from the result of the work done by Faude *et al*,[18] who found that majority of the injuries were minor/slight in severity. The difference observed from Faude *et al*[18] was probably because of the teams had better medical staff, treatment and rehabilitative measures which were put in place. During the course of this study, observed that most of the sampled teams did not have well-trained medical personnel while a few had only team nurses, who catered for all the medical needs of the footballers, and some of those that even had, were not always present during team football activities but instead visited periodically.

In the UEFA model injury questionnaire, injury mechanism was divided into three segments which included; injuries as a result of contact with either a player or an object and "no contact", injuries as a result of trauma or overuse, and the particular activity the player was involved in during the injury event. This study revealed that most of the injuries were as a result of contact with other

Table 7 Association of type of match/training and injury mechanism (contact/no contact), re-injuries and severity

Training/match type (N=241)										
Injury mechanism (contact/no contact)	**FT**	**FOT**	**FM**	**LM**	**NTT**	**OCM**	**NTM**	**TOTAL**	**X^2**	**P value**
No contact	16	–	–	5	–	1	–	22	300.73	0.001
Contact with player	11	1	4	20	1	1	1	39		
Contact with object	–	–	–	1	–	–	–	1		df=21
Total	27	1	4	26	1	2	1	62		
Re-injury										
Yes	1	–	1	1	–	–	–	3	23.66	0.001
No	26	1	3	25	1	2	1	59		df=7
Total	27	1	4	26	1	2	1	62		
Severity										
Slight	3	–	2	2	–	–	–	7	317.93	0.001
Minor	8	–	–	6	1	1	1	17		
Moderate	16	1	2	14	–	1	–	34		
Severe	–	–	–	4	–	–	–	4		df=28
Total	27	1	4	26	1	2	1	62		

FM, friendly match; FOT, football and other training; FT, football training; LM, league match; NTM, national team match; NTT, national team training; OCM, other cup match.

players, and that traumatic injuries were more frequent than overuse injuries while the predominant activity involved during injury was "tackle by other players which happened 14.5% of the time. A work done by Faude *et al*,[18] Junge *et al*,[20] found similar results of contact with another player being the most predominant mechanism of injury. Similar results of higher predominance of traumatic injuries were also reported in works done by Faude *et al*,[16] Jacobson *et al*,[14] Jingzhen *et al*.[23] Faude *et al*,[18] also reported that being tackled by another player was the most frequently reported activity involved. That result was similar to that of this study. However, Hagglund *et al*,[15] on the other hand, found that overuse injuries were more frequent among the female players. The result obtained in this work might be due to the overtly physical tactics adopted by the coaches during games.

This study revealed that the level of aggression was not significantly associated with the prevalent types of injury, injury mechanism (trauma/overuse and activity involved), severity of injuries and incidence of re-injury. A similar study on male youth soccer players found that inhibition, aggression and risk taking did not predict injury risk.[24] This result was similar to the observed results in that work, which failed to identify any significant association between level of aggression and prevalence of injury, incidence of re-injury, severity, type of injury and injury mechanism (trauma/overuse and activity involved). Though in this study, most female footballers accepted aggression as part of the game, the lack of association between these variables might be due to other unknown psychological factors. Injury mechanism (contact/no contact) was however significantly associated with level of aggression in contrast with the study carried out by Schwebel *et al*.[24] This was probably because the players saw football as contact sports, which may have injurious effects when followed through aggressively. This can be seen in this study as most of the injuries were as a result of contact with other players. It may also be as a result of poor officiating thereby encouraging the players to take advantage to excessively foul players.

There was also a significant association between prevalent types of injury and playing surface. Though the previous works on female professional footballers did not statistically test this association, a work done by Soligard *et al*[25] on youth female footballers in contrast with this study revealed that the injury rates for most subcategories of injury types and locations were similar on both artificial and grass playing surfaces while this study reported slight differences in injury rates of the subcategories on artificial surface when compared with grass. Likewise Steffen *et al*[26] in contrast also stated that there was no difference in the overall risk of acute injury in youth female footballers playing on artificial turf. This association might be as a result of higher intensity of play on artificial surfaces due to their smoothness when compared with grass turfs as noted by Meyers[27] thereby leading to more strain on the muscles and sprain on the ligaments as seen in their higher rates when compared with grass surfaces.

The study further revealed that there was a significant association between injury mechanism and types of surface. No identified previous study statistically tested the association between these injury mechanisms and type of surface. But a study done by Meyers[28] on male footballers reported that fewer traumatic injuries occurred on artificial turf when compared with those on natural grass. He also reported higher contact injuries on grass surface than on artificial surfaces and that there were less tackle injuries on artificial than on grass. The

Table 8 Association of role/position of play and prevalent injury types, injury mechanism (trauma/overuse, activity involved)

Injury type	GK	DF	MF	ST	Total	X^2	P value
Concussion	–	1	–	–	1	36.90	0.18
Fracture	–	–	2	2	4		
Muscle rupture/strain	1	8	9	4	22		
Abrasion	–	–	–	2	2		
Other bone injury	–	3	1	–	4		
Tendon rupture/tendinosis	–	4	–	–	4		
Laceration	–	1	1	–	2		
Dislocation	–	2	0	2	4		
Sprain/ligament injury	5	5	4	4	18		
Other injury	–	1	–	–	1		
Total	6	25	17	14	62		
Injury mechanism (trauma/ overuse)							
Overuse	–	4	2	1	7	2.47	0.87
Trauma	6	21	15	13	55		df=6
Total	6	25	17	14	62		
Injury mechanism (activity involved)							
Running	1	–	1	2	4	38.38	0.75
Dribbling	–	–	1	3	4		
Sliding	–	3	2	1	6		
Heading	–	1	2	–	3		
Twisting/turning	1	1	3	–	5		
Jumping/landing	1	2	–	1	4		
Tackled by other player	1	3	2	3	9		
Shooting	–	2	1	–	3		
Falling/diving	–	–	–	2	2		
Hit-by-ball	–	1	1	–	2		
Tackling other player	–	1	1	–	2		
Stretching	–	2	1	1	4		
Collision	1	4	–	1	6		
Kicked by other player	1	4	2	–	7		
Unknown mechanism	–	1	–	–	1		df=45
Total	6	25	17	14	62		

DF, defender; GK, goalkeeper; MF, midfielder; ST, striker.

result of that study differed from what was seen in this study where it was observed, that a higher level of traumatic injuries occurred on artificial turf than on natural grass, with tackle injuries occurring on both surfaces. Players also had more contact injuries with other players on artificial surface than on natural grass. The association might be due to the increased speed of players while playing on artificial surfaces. As a result contact between players also became more injurious to the players, than it would have been on grass where the intensity of play was lower on uneven surfaces which are evident on most grass surfaces in Nigerian stadia. It may also be because players whose body structures have adapted to the slower paced training sessions on grass and other surfaces, ended up playing competitive matches on artificial surfaces where play were faster paced, thereby stressing their body structures in a way they were not accustomed to.

There was also a significant association between re-injury and type of surface. No identified previous study was found to have statistically tested the association between re-injury and type of surface nor made reference to the number of re-injuries recorded in each surface per time. The association seen in this study was probably due to the nature of grass surfaces which were sometimes uneven, due to poor maintenance and could be very challenging for players, as all cases of re-injuries occurred on grass surfaces.

Table 9 Association of role/position of play and injury mechanism (contact/no contact), re-injuries and severity

Injury mechanism (contact)	GK	DF	MF	ST	Total	X^2	P value
No contact	2	7	8	5	22	4.87	0.85
Contact with player	4	17	9	9	39		
Contact with object	–	1	–	–	1		df=9
	6	25	17	14	62		
Re-injury							
Yes	–	1	2	–	3	2.28	0.52
No	6	24	15	14	59		df=3
Total	6	25	17	14	62		
Severity							
Slight	–	3	2	2	7	7.18	0.85
Minor	1	5	6	5	17		
Moderate	4	16	9	5	34		
Severe	1	1	–	2	4		df=12
Total	6	25	17	14	62		

DF, defender; GK, goalkeeper; MF, midfielder; ST, striker.

A significant association was found between the severity of injuries and playing surface. A work done by Soligard *et al*[25] on youth female footballers in contrast to this study reported that there was no difference in the injury rate for subcategories of expected absence from matches and training sessions on different playing surfaces as there was a noticeable difference in the injury rates especially for minor and moderate injury severity. Soligard *et al*[25] also reported that there was no difference in the overall risk of time loss injury, between artificial turf and grass. Though this study did not statistically test the risk of time loss injuries on either surface, there were obviously higher number of time loss injuries on artificial surfaces when compared with grass. This also points to the fact that injuries sustained on artificial surfaces might actually pose more threat to players due to the higher impact of contact between the footballers or probably overexerting themselves due to the faster paced games played on artificial surfaces. Although the effect of good medical care cannot be overemphasised.

The study revealed that there was a significant association between the type of injury and the type of match or training sessions. No previous study statistically tested the association between types of injury and type of training or match. A study by Fuller *et al*[29] reported that there was no significant difference in the nature of injuries sustained in both training sessions and actual matches although they had higher sprain/ligament injuries during matches and muscle rupture/strain injuries during training sessions which was contrary to this study that had equal number of sprain and strain injuries in training sessions and in actual matches. This might be because of similar efforts being put into training sessions as well as matches thereby exposing the players to similar type of injuries. Also a study done by Mufty *et al*[21] revealed that there were significantly more injuries sustained during competition or actual matches than during training sessions which was similar to this study. This might be due to the higher tempo of matches during competitions than during training sessions. This study revealed that there was a significant association between severity of injuries and type of training/match. Although no previous study statistically tested the association between severity of injuries and the type of match/training, a work done by Almutawa *et al*[30] found that for all levels of injury severity, incidence data was higher during matches, than during trainings despite having fewer matches than training sessions. This contrasted to this study which reported an almost equal number of slight, minor and moderate injuries during matches and during training sessions. This association may probably be due to the desire of the players to ensure that they were selected during the training sessions for matches, those desires may have metamorphosed into a desperate need to win at all costs. The study also revealed a significant association between incidence of re-injury and type of training/match. When the percentages were compared, it differed from the work done by Jacobson *et al*[14] who reported that 74% of re-injuries occurred during training sessions, while this work revealed that 66.67% of re-injuries occurred during actual matches. This association might be due to the fact that injured players were made to play matches which were more competitive than training sessions earlier than they were supposed to.

This study revealed that there was no significant association between the type of injury and the footballer's role/position. Although other previous works on women footballers did not statistically test this association, a work done by Ani *et al*[31] on Nigerian male footballers found a significant association between the type of injury and role of players. In their work, the most predominant injury type was sprain which occurred more at the defense and striking positions. This study on the other hand, reported more of muscle rupture/strain injuries which occurred more in the midfield and defense positions. This was probably due to the usual fight for supremacy and possession of the ball at the midfield area by midfielders in order to dictate the flow of games during matches and the pressure on the defenders, to deprive the strikers from goal scoring opportunities.

There was no significant association between injury mechanism and the footballers' role/playing positions. Hence, they all aimed at performing creditably without any regard to their roles/positions. Hence, they were all equally susceptible to re-injuries in all positions. This therefore puts every player in a position, where she could easily sustain injuries without any regard to her role or position. The work done by Soligard *et al*[25] stated that players skilled at ball receiving, passing and shooting and heading balls, tackling, decision making when in ball possession or in defense, and physically

strong players sustained significantly more injuries (overall, acute injuries and contact injuries) than their less skilled teammates in youth female football. The result obtained in this work could not significantly associate injury mechanism with the footballers role in defense, midfield (more skilled in passing, shooting, ball receiving, decision making when in ball possession) or in any other position. The result of this study revealed that, re-injury among female footballers in the NWPL was not significantly associated with the role/playing position of players. Hence, they all aimed at performing creditably without any regard to their roles/positions. Hence, they were all equally susceptible to re-injuries in all positions.

These results reveal the peculiarity of the female premiership league in Africa. It reveals that injury is high when compared with those of developed nations and should be prevented. No study before now has ventured into injury classification in Nigeria, using the UEFA mode of classification for the purpose of consistency and comparison with results obtained in other parts of the world. It must be noted that Nigeria is a developing nation and association football at premiership level is not as sophisticated as those of developed nations. Officiating in developed nations include the use of advanced technology for detecting fouls and aggressive tacklings which may not be available in developing African continents. These findings however, adds to the pool of information available from developing countries on injury classification and form basis for further studies as association football develops in the African continent especially on injury and re-injury prevention.

Limitation

During the 2015/2016 premiership, the Northeast zone became unsafe because of insurgency in Northern Nigeria. This influenced the distribution of the selected footballers to the rest of Nigeria and North central which was relatively safe.

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