UNIVERSITY OF ZIMBABWE

AN ASSESSMENT OF THE LEVEL OF KNOWLEDGE ON BRAIN CONCUSSION IN HIGH SCHOOL FIRST TEAM SOCCER PLAYERS IN HARARE, ZIMBABWE DURING THE 2017 SEASON

Dissertation submitted in partial fulfilment of the degree of Masters in Medicine

(Neurosurgery)

BY

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DECLARATION

I certify that this dissertation is my original work and I am submitting it in fulfillment of part of the requirements for the Masters in Medicine (Neurosurgery) Degree. It has not been submitted in part or in full to any University and or for any publication.

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I have supervised and read this dissertation; I am satisfied that this is the original work of the author in whose name it is being presented. I confirm that the work has been completely satisfactory for presentation in the examination.

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“I miss my mind and my body….. “ the post-concussion torment of an Olympian and law student (1).

DEDICATION

This thesis is dedicated to my lovely wife Tapiwa, our children, Simbarashe and Kunashe, for the unfailing encouragement and support. .

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I have no conflict of interest.

ABBREVIATIONS

AAN	American Academy of Neurology
ACEI	Acute Concussion Evaluation Inventory
ATLSP	Advanced Trauma Life Support Protocol
ATP	Adenosine Triphosphate
Ca	Calcium
ICT	Information and Communication Technology
K+	Potassium
FIFA	Federation International de Football Association
LOC	Level of Consciousness
MNDA	Motor Neurone Disease Association
SCAT 3	Sports Concussion Assessment Tool
S1	Elite schools located in urban low density areas and upper class boarding schools regardless of location
S2	Schools located in urban high density areas and boarding schools in the rural areas
S3	Schools that are neither in S1 nor S2 classes including some in rural areas

ABSTRACT

Background: Concussion is a very common form of mild traumatic brain injury. It may occur with head to head or head to ball collision most common in contact sports. Soccer is the most popular contact sport in Zimbabwe with over 90% of high schools participating. Level of knowledge on concussion signs, symptoms and return to safe play has been postulated to be associated with some different demographic factors such as school's categorization and sex. The level of knowledge on brain concussion in High school first team soccer players in Harare, Zimbabwe is unknown.

Objectives: To evaluate high school first team soccer players' concussion knowledge on signs, symptoms and safe return to play among children from different school classification categories in Harare, Zimbabwe in 2017.

Methods: A descriptive, cross-sectional study was carried out on different school categories based on the per-capita grant in accordance with the Zimbabwe Ministry of Education's Annual Statistical Report of 2013. S1 schools are the elite schools which include private schools whilst S2 are found in high density suburbs. S3 schools are found in rural areas. This follows a randomization of participants (n=881) who were divided into S1 (n=451), S2 (n=343) and S3 (n=82) categories. A self-administered modified RoCKAS-ST questionnaire was used to evaluate the concussion and safe return to play knowledge among participants under supervision.

Data analysis: Data was analyzed using Statistical package for Social Scientist (SPSS) version 16. 0. Descriptive statistical analysis was carried out using Z test for proportions, for testing the differences in proportions between the groups. Student's t-test for independent groups was used to check relationships on continuous variables while categorical variables were expressed as percentages and frequencies , and compared using the Chi-square test to compute a p-value. Logistic regressions was used to estimate odds ratios and 95 % confidence intervals for the risk factors. Results were presented as means ± SEM, and comparisons between multiple groups will be made using ANOVA. All statistical tests were considered statistically significant if $p< 0.05$.

Results: A minority of high school soccer players (2%) demonstrated adequate concussion knowledge on signs, symptoms and safe return to play. Females were significantly more knowledgeable than their male counterparts (p=0.01). There was no difference in knowledge scores among S1, S2 and S3 schools (p=0,812). The most popular concussion source of information were teachers (55.6 %).

Conclusion: The majority of high school first team soccer players in Harare, Zimbabwe lack adequate knowledge on signs, symptoms and safe return to play post-concussion. Loss of consciousness is the most correctly recognized sign in 61% of participants. The majority of players have a misconception on the importance of mental rest. Teachers remain pivotal on concussion knowledge transfer. There is no difference in concussion knowledge level among S1, S2 and S3 schools.

Keywords: Concussion, concussion knowledge, sports injury, high school Zimbabwe soccer players

CHAPTER ONE - INTRODUCTION

1.1 INTRODUCTION

Concussion is a derivative of the Latin *word concussus which* means to shake violently and is a form of mild traumatic brain injury (2). It is a common head injury that occurs in motor vehicle accidents, falls and contact sport which includes rugby, martial arts, boxing and soccer (3). Concussion has emerged as a global public health concern (2). Soccer has been noted to have a 50% 10-year concussion risk and accounts 25% of all injuries (26). On field concussion assessment can easily miss the diagnosis leading to detrimental effects like neurological decline and death.

Despite the existence of the Sports and Recreation Commission (SRC) and its increased involvement in promoting high school soccer, there are no existent concussion awareness programs and guidelines. Anecdotally, in Zimbabwe only a few schools have been noted to offer on field medical assistance which is usually limited to competitive matches. This raises increased risk of late diagnosis and unsafe return to play.

Concussion is a complex patho-physiological process affecting the brain caused by traumatic - biomechanical forces (4). It results in a wide spectrum of clinical symptoms that range from mild headache through amnesia to a total loss of consciousness with subsequent regain (5). Diagnosis of concussion is difficult to make as some signs are subtle which include dizziness, fogging and poor concentration (6). Therefore, in the absence of obvious clinical signs, player reporting which is largely influenced by knowledge forms the linchpin of the diagnosis (7).

This study examined knowledge on concussion among school soccer players in Harare, Zimbabwe. Soccer is a high intensity sport that involves outscoring one's opponent. Its popularity has increased and so is the expectation on players. Therefore, it has turned to be a very competitive game with tackling, jumping and acceleration. Importantly, concussions are sustained from heading the ball and head to head contacts as players tussle for the ball. Using the right ball size for age and gender has been noted to prevent concussions.

Soccer is the most popular game worldwide and the Fėdėration Internationale de Football Association (FIFA) estimates about 270 million participants worldwide (8). Soccer players are therefore at high risk of sustaining concussions. High profile concussion cases that are potentially career ending have been reported e.g. the Hugo Lloris' case, a French goal keeper at the world cup 2018. Due to continued play following a concussion, the player had an awful performance against Croatia and ultimately gifted the opponents with their second goal (9). To avert such complications, an accurate on-field assessment and adherence to concussion management guidelines that include the graduated return to safe play must be followed (12).

Patient recuperation from concussion may last from days to weeks depending on the severity of the concussion (13). Unreported and improperly managed cases may deteriorate to deleterious complications such as Second Impact Syndrome, post concussive syndrome and even death (14;15). Adequate player knowledge is pivotal in the reporting of symptoms as it equips the player. Diagnosis of concussion largely rests on self-report of symptoms by athletes to responsible medical personnel.

1.2 PROBLEM STATEMENT

Concussion is an underestimated public health issue with up to 50 % of cases unreported (17;18). This poses a higher risk of suffering the Second Impact, Post- concussion Syndrome and even death. Lack of knowledge is a pivotal factor in influencing player's deleterious decision of not reporting symptoms (40).

1.3 JUSTIFICATION OF THE STUDY

The level of knowledge on concussion has not been established on high school soccer players in Zimbabwe and there are no concussion guidelines in the country. Findings of this study will give an insight on the current status quo and associated factors. This may influence increased awareness, reporting and policy formulation culminating into better case management.

It is widely agreed that the science of concussion is evolving hence constant checks on the efficacy of methods of knowledge transfer and continued player education are pivotal. The primary purpose of this study is to assess the level of knowledge concerning concussion signs, symptoms and safe return to play in high school first team soccer players in Harare, Zimbabwe and to evaluate some of the associated factors. A quantitative cross-sectional study with a self-administered questionnaire under supervision was used to assess the level of knowledge high school soccer players in Harare, Zimbabwe.

CHAPTER TWO – LITERATURE REVIEW

Soccer is the modernized aftermath of the primitive kicking game that dates as far back as the 14th century (19). Historically, it has a murky establishment though it is said that kings would kick decapitated heads in celebration of victory over enemies. 1863, saw the birth of a soccer code of play and rules at the University of Cambridge, England. The game spread across the world and in Europe its synonym became football.

It is a high intensity sport that involves outscoring one's opponent. Its popularity has increased and so is the expectation of players, therefore it has turned to be a very competitive game with tackling, jumping and acceleration. According to Holmes et al, soccer is the most popular game attracting the greatest viewership (20). This has been further confirmed through the big count done by the International Federation of Football Association (FIFA) estimating about 270 million participants worldwide (21). In line with world trends, Zimbabwe has 99% of secondary schools participating in soccer compared to the 7 % that have rugby (16).

High profile concussion cases that are potentially career ending have been reported for example the Loris Karius case, a Liverpool goal keeper whose delayed concussion diagnosis result in a three goal Champions league final loss against Real Madrid (22;72). Cognitive impairment and error in judgement are known consequences following a concussion which could account for the player's poor performance during the match.

Zimbabwe demography

According to the Zimbabwe Statistical Annual Report for 2013, secondary schools are grouped into 3 classes namely S1, S2 and S3 (16). This classification is based on the affordability of their parents to send them to such schools and the classes of per capita grant, which is the amount of money for subsidy given per student by the government. S1 group is made up of those upper-class schools located in urban low-density areas and elite boarding schools regardless of their location. S2 schools are located in urban high-density areas and boarding schools in the rural areas. S3 schools are the rest of schools which are located in the rural areas.

The report states that a trained school health teacher is available in 27.5 % of secondary schools compared to the 36.9% in primary schools. Health clubs are found in 22, 8 % of secondary schools relative to that of primary schools which is 60.6% (16). Such scarcity of health trained teachers might have been influenced by the unfavorable hyperinflatory economic status in this third world country as reported by the Federal Reserve Bank of Dallas (23).

Although most schools have poor access to health provision nationwide, those in Harare province are located within 2.2 km of a health service provider (16). It can be postulated that large distance would prohibit access to health information and other medical services.

In Zimbabwe, the Sports Recreation Commission (SRC) is the highest authority governing and fostering sports development from the community to provincial level (24). It has advanced soccer involvement through the establishment of Youth Education through Sport (YES) program.

Epidemiology of soccer injuries

Football has a higher injury rate compared to other team sports like basketball, American football and rugby (9). The incidence of injury in male soccer players can go up to 35 per 1 000 match hours with head and neck injuries accounting for 15% (3;25). Although head injuries constitute a lower proportion of reported sports injuries, they are of great concern due to their long-term sequel.

Concussion is a form of mild traumatic brain injury leading to disruption of normal brain function (17). It's difficult to estimate its prevalence as noted by Veliz et al although an estimation of up to 20% has been recorded in the United States (11). Interestingly, only 4-5 % of cases present in emergency department thus at least 16 % may go unaccounted (27). In one study by Harmon et al, up to 50 % of concussions went unreported (18;27). It therefore follows that concussion is an underrated public health issue (18).

A blow to the head or any cause of sudden acceleration- deceleration of the brain within the skull causes a cytoskeletal and biochemical deformation observed in neurons, glia and associated vasculature (12;13). At cellular level, there is an increase in glutamate leading to a high energy demand by the brain (28). This is complicated by a calcium induced mitochondrial dysfunction hence inefficient Adenosine Triphosphate production (29). This results in a crisis causing an imbalance between brain energy demand and production. Secondly, a network problem ensues owing to the disruption of neurotransmission (5). This leads to different manifestations resulting from differential brain involvement hence psychomotor retardation (28).

Clinical diagnosis of Concussion

The most important, yet difficult starting point for clinicians is the timely diagnosis of sports related concussion (30). This is due to its variable and sometimes subtle presentation. Therefore, the identification of the potential injury and prompt player evaluation are of outmost importance at all playing levels of contact sports (31). A Sports Concussion Assessment Tool 5 has been designed to assist with diagnosis of concussion (70). Lack of definitive diagnostic markers and imaging characteristics in a condition that mimics other neuropsychological conditions makes its diagnosis of concussion a difficult and a clinical one (32).

Therefore, the trigger point for a sport related concussive injury is when a player is identified as having experienced a forceful, direct or indirect impact that is transmitted to the head coupled to:

- Clinical suspicion by medical staff
- Symptom(s) reported by athlete
- Visible signs

Depending on the level of competition, some match officials may be trained to pick up the signs of concussion and may report to the clinicians. The strategy at some community levels is that dedicated observers should be ready to take the player off the field of play on the slightest suspicion (32). In the absence of such personnel, players have the sole mandate of self-reporting stigmata of concussion. The signs and symptoms of concussion can be summarized in the Table 2.1.

Table 1: Signs and Symptoms of Concussion

• Loss of consciousness
• Headache
• Dizziness
• Confusion
• Balance problems
• Double or blurred vision
• Intracranial pressure
• Anterograde amnesia
• Retrograde Amnesia
• Difficulty in concentrating
• Drowsiness
• Fatigue
• Nausea and vomiting
• Irritability
• Personality change

Management of Concussion

Sports related concussion management in children and adolescents is largely based on a salad of observational studies amongst college and high school athletes, clinical experience and consensus guidelines (34). Due to paucity of data on concussions of other etiological mechanisms, the same principles can be inferred. Strict adherence to the Advanced Trauma Life Support protocol is mandatory to rule out life threatening injuries. Furthermore, it is very important to limit further traumatic exposure by withdrawing from continued play. An American study, done on college football players in 2018 showed that 45% of respondents correctly understood the importance of immediately withdrawing from play following a concussive injury (35).

Cognitive and physical rest are the fundamental principles upon which the management of sports related concussion rest (37;38). Observational studies by Marjerskee et al have noted prolonged recovery periods in those who engage in early strenuous and mentally demanding activities than those with a more docile conservative approach (39). Vigorous activity exacerbates symptoms with risk of prolonged poor function and death (37). Consequently, players who happen to be in school may have challenges in learning. A graduated return to play should be instituted which challenges player activity to the limits of tolerance (71). This cancels the potential complications like isolation and depression that come with prolonged cognitive and physical rest. Less than half of football players in the university study had understanding of the return to safe play guidelines (35). Despite the great effort of increasing awareness through various campaigns, knowledge levels concerning return to safe play remains low.

Concussion knowledge

Health systems and services have become overly biomedical oriented, technology driven, doctor dominated with less of understanding of patient perspectives especially on concussion.

Patient autonomy is the idea that individuals ought to have a choice with regards to their health matters (41). Focus and process of care should inform and empower people in promoting and ensuring their own health before they become patients. Importantly, knowledge on concussion prevention, signs and safe return to play are pivotal in making safe decisions (42).

Owing to the higher levels of education and increasing access to information, there has been a change from the traditional paternalistic approach where the doctor knows it all. A more autonomous patient centered approach in which the patient is an active consumer of health information rather than a passive recipient is becoming increasingly popular (41;43). This has consequently made the subject of concussion reach the public's consciousness.

The internet has grown rapidly as a communication tool for health-related matters (44;45). It has fundamentally changed people's lives, enabled social progress and pushed the society forward. Despite the great advances in access to information on the internet, it has failed to be a common source of concussion information (36).

Globally internet has been noted to have differential access and use, with South Africa leading the rest of Southern Africa with a penetration rate of 53 % whilst North America is pegged at 95 % (46;47). Zimbabwe has a notable low internet penetration rate of 40, 2% with exorbitant data prices. Disparities in internet access may be postulated to variances in access to concussion information.

The importance of education program has been the center of discussion with regards to concussion. In a study done on Oakland college players, mean knowledge score was around 80%. Those in health science fields had better scores though they demonstrated worse attitudes (48). Didactic lectures probably have minimal benefits with respect to knowledge. This follows a comparison of concussion knowledge scores between a pre-season lecture-based concussion education session at one high school versus a control which had received none (49). There was a significant increase in knowledge in the taught group. In another study the question on the effectiveness of the teaching methods was raised as there were no improvements in knowledge levels following education on concussion in a certain university level ice –hockey study (40).

The Center for Disease Control in America makes use of booklets, information sheets and Compact Discs in their Heads Up for concussion campaign (50). An online survey done by Parker et al showed that this strategy has been a success in improving concussion knowledge in players and coaches (51). The findings of Hunt et al cannot be used to show if a test after watching a concussion educative video had impact on long term efficient knowledge transfer. (52). In the short term, there was an improvement in the pre- video test score as compared to the one done 15 minutes later.

A prior history of concussions is associated with negative disclosure behavior and attitude to the condition (53). In this study, for every 3 additional self-recalled concussions, there was a 48 % decrease in self-reported proportion of concussion disclosure.

Individual factors such as sex and age play a role in concussion knowledge levels. In the study by Kurowski et al, there was better knowledge associated with female gender and older age (54).

Although a robust campaign of safe return to play following concussions has been done premature return still exists (55). This can be explained by the Cognitive Dissonance Theory (56). To elucidate: soccer players are involved in sport because they feel it's good for their health and wellbeing. When they are injured, contrastingly they have two cognitions which are that stop playing is good and continued play is also good. Since these two are at variance, they have to be reconciled. Studies have shown that once formed they are resistant to change. They continue to play despite their injury much to the detriment of their wellbeing yet having a positive impact on the team. This therefore highlights the importance of attitude with respect to safe play (57). Ultimately this leads to serious under-reporting of concussions by players and one study showed a prevalence of about 33 % (58).

In 2018, Zimbabwe had a cholera outbreak with 8 535 reported cases complicated by an excess of 50 deaths (59). Most cases were reported in Harare. To abort further exacerbations massive awareness campaigns were launched with mobilization of resources to curb this epidemic. This goes to show that Zimbabwe is a unique nation with its own high pressure public health problems. This might help explain the absence of a concussion awareness campaigns.

The focus of many studies has been the players themselves. These overlooked the general public who form part of the informants to these school going children, a group encompassing the parents. In a study done by Gardner et al showed that the public knowledge about concussion was modest (60, 61). In this online survey, 26 % of respondents had media as their source of knowledge. This identified patterns of concern. In a study done on rugby players in South Africa assessing their level of knowledge on concussion using an identical tool by Carel Thomas Viljoen showed a mean score of 62% as being inadequate level of knowledge (50). A study done by Kraak etal using the

same questionnaire categorically stated a score above 70 % as adequate knowledge (69). For this study, a score of 70% and above was classified as adequate knowledge.

Neurological decline can occur within the first 24 to 48 hours post injury. This necessitates that the patient be closely monitored. Sleep disturbance can occur about 34 % of patients (62). It can be used to prognosticate the speed of recovery therefore should be assessed by clinicians. Those with sleep disturbances may take more than 2 weeks to recover from a concussion. In a study by Bramley et al melatonin improved sleep disturbance in about two thirds of patients (62). Heavy sedation or anti-cholinergic better known as sleeping tablets must be avoided for they potentiate neurocognitive decline (63). Cognitive behavioral therapy is the first line treatment for insomnia (64). Benzodiazepine has been associated with increased risk for dementia (65). Following a randomized control on 117 patients using Armodafinil at a dose of 250 mg to treat hypersomnia, significant reduction in daytime somnolence was demonstrable on the Epworth Sleepiness scale (66). This therefore highlights the effect of psycho- stimulants although methylphenidate.

Consequences of Brain Concussion

In a study of 334 varsity and high school football players, persistent headache was the most widely recognized symptom of improperly managed concussions as 93% of respondents correctly identified it (67). 50 % of players in this study had a misconception of noting increased blindness as a long term complication. In one study of the symptoms, nausea and vomiting were missed by 47% of the participants whilst 81 % identified loss of consciousness correctly. Only 20% identified jaw pain as a distracter (33). With regards to coma and death; about 65% correctly picked up these complications. Apart from lack of knowledge, the player might confuse the stigmata of concussion with that of dehydration and other related factors (34).

There is paucity of data with regards to concussion knowledge across African soccer players. The focus on most studies has been Europe and America. In South Africa, an assessment on concussion player's knowledge has been done but focused on rugby players (50). In their conclusion, the players lacked a third of essential concussion knowledge raising a query on the effectiveness of the Boksmart Program that had educated coaches and referees. Such interventional programs are directed towards increasing concussion awareness.

2.2 RESEARCH QUESTION

What is the level of knowledge of high school first team soccer players on the signs, symptoms and safe return to play following sports related concussion in Harare, Zimbabwe?

2.3 HYPOTHESES

2.3.1 H0: -There is no difference in concussion knowledge level amongst S1, S2 and S3 first team soccer players in Harare, Zimbabwe.

2.3.2 H1: There is a difference in concussion knowledge level amongst S1, S2 and S3 first team soccer players in Harare, Zimbabwe

2.4 OBJECTIVES

1. To evaluate high school first team soccer players' concussion knowledge on concussion signs, symptoms and safe return to play among the S1, S2 and S3 players in Harare Zimbabwe.

2. To evaluate the association of some demographic factors on high school soccer players' knowledge on concussion signs, symptoms and safe return to play

CHAPTER THREE – RESEARCH METHODOLOGY

3.1 STUDY SETTING

The study was conducted in 40 schools across seven districts in Harare

3.2. STUDY DESIGN

A descriptive cross-sectional study was carried out.

3.3 STUDY POPULATION

First team high school soccer players registered on the team sheet for the 2017 soccer season who gave consent were given access to the questionnaire to fill in under supervision.

3.4 RESEARCH VARIABLES

Dependent Variable:

Knowledge on Concussions

Independent Variables

- Age
- Gender
- Sources of information

Main Outcome Measure

Participants completed a survey by identifying the symptoms, signs, safe return to play and sequalae of concussion amongst distracters and they indicated their sources of information. Percentages of correctly and incorrectly answered questions were noted.

3.5 SAMPLING PROCEDURES

To determine the total sample size for the household survey, calculations used Cochran's sample size formula[1] for categorical data requiring that:

- the sample size be based on a 95% level of confidence;
- allowable margin of error be set at 0.05;
- p(1-p) as the estimate of variance where p=0.5; (to maximize variance because estimates of variance from previous studies were not available);
- allowance for non-response set at 1%;
- a design effect of 1; and
- Z= 1.96 for alpha level of 0.025 in each tail;

1Cochran, W. G. (1977). Sampling techniques (3rd Ed.). New York: John Wiley & Sons.

Cochrane's formula:

$$n = \frac{Z^2 P(1-P)}{(e)^2}$$

The resultant calculations:

Z	Z^2	P	1-P	e	e^2	N	Design Effect	Response Rate	final n (per domain)	No. of domains (*2)
1.96	3.8416	0.5	0.5	0.07	0.0049	576.24	1	0.99	392	784.08

The sample size calculated above was then be distributed across the two zones using number of schools as weights. In order to compare the results by gender the sample size was adjusted to **784**. Multistage cluster sampling technique was used to identify a total of 784 players that participated in the quantitative survey. In each of the two zones 392 players were selected (196 boys and 196 girls).All districts in Harare were selected for the study and Probability Proportion to Size (PPS) sampling technique was employed to determine the number of schools in each district (see Table 1) .Noteworthy, if a district consist of one school of either S1 or S2 level that school was considered for the study. Furthermore, random numbers generated through the aid of a computer were used to randomly select the school in each district (refer to Table 1). Randomly sampling of players is was then done among the selected schools

Table 2: School Categorization and Selection

	(S1)				(S2)			
District	Number of schools	Total Boys	Total Girls	Total	Number of schools	Total Boys	Total Girls	**Total**
Chitungwiza	0	0	0	0	4	35	36	**71**
Glenview Mufakose	1	12	11	23	4	36	35	**71**
High Glen	1	11	12	23	4	35	36	**71**
Mabvuku Tafara	2	23	23	46	2	18	18	**36**
Mbare-Hatifield	4	46	46	92	2	18	18	**36**
Northen Central	6	69	69	138	2	18	18	**36**
Warren Park, Malbereign	3	35	35	69	4	36	35	**71**
Grand Total	**17**	**196**	**196**	**392**	**22**	**196**	**196**	**392**

Table 3: Selected S1 schools by district

District	Name	Boys targeted	Girls targeted	Target group(s)
Glenview Mufakose	Eaglesvale	12	11	Boys &Girls
High Glen	Apex Board	11	12	Boys &Girls
MabvukuTafara	Oriel Boys High	12	0	Boys
MabvukuTafara	Chisipite Senior	11	11	Boys &Girls
MabvukuTafara	Oriel Girls High	0	12	Girls
Mbare Hatfield	Queen Elizabeth Girls	0	15	Girls
Mbare Hatfield	Morgan High	16	15	Boys &Girls
Mbare Hatfield	Prince Edward	15		Boys
Mbare Hatfield	Dominican Convent	15	16	Boys &Girls
Northen Central	Marlborough	11	12	Boys &Girls
Northern Central	St Giles High	12	11	Boys &Girls
Northern Central	Hellenic Academy	11	12	Boys &Girls
Northern Central	Mt. Pleasant	12	11	Boys &Girls
Northern Central	Vainona	11	12	Boys &Girls

Northern Central		Roosevelt	12	11	Boys &Girls
Warren Malbereign	Park	Mabelreign Girls High	0	11	Girls
Warren Malbereign	Park	Divaris Makaharis	12	12	Boys &Girls
Warren Malbereign	Park	Christ Ministries College	12	12	Boys &Girls
Warren Malbereign	Park	Ellis Robins Boys High	11	0	Boys
Grand Total			196	196	

Table 4: Selected S2 schools by district

District	Name	Boys	Girls	Target group(s)
Chitungwiza	Seke 5 High	8	9	Boys & Girls
Chitungwiza	Seke 2 High	9	9	Boys & Girls
Chitungwiza	St Mary	9	9	Boys & Girls
Chitungwiza	Fraderick Mabamba High	9	9	Boys & Girls
Glenview Mufakose	Kambuzuma I High	9	8	Boys & Girls
Glenview Mufakose	Mufakose 2	9	9	Boys & Girls
Glenview Mufakose	Glen View I High	9	9	Boys & Girls
Glenview Mufakose	Mufakose 4	9	9	Boys & Girls
High Glen	Mukai High	8	9	Boys & Girls
High Glen	Simbaredenga	9	9	Boys & Girls
High Glen	Kwayedza High	9	9	Boys & Girls
High Glen	Glen Norah 2 High	9	9	Boys & Girls
MabvukuTafara	Mabvuku High	9	9	Boys & Girls

MabvukuTafara	Epworth Secondary	9	9	Boys & Girls
MbareHatifield	Mbare High	9	9	Boys &Girls
MbareHatifield	Harare High	9	9	Boys &Girls
Northen Central	Arundel High	9	9	Boys & Girls
Northen Central	Hatcliffe	9	9	Boys & Girls
Warren Park Malbereign	Kuwadzana 2 High	9	8	Boys & Girls
Warren Park Malbereign	Cornelius Hope Academy	9	9	Boys & Girls
Warren Park Malbereign	Kuwadzana 1 High	9	9	Boys & Girls
Warren Park Malbereign	Pinewood High School	9	9	Boys & Girls
Total		196	196	

Table 5: Selected S3 schools

District	Name	Boys	Girls	**Total**
Warren Park Malbereign	Maranatha Christian High	10	10	**20**
MabvukuTafara	Manyame	10	10	**20**
Chitungwiza	Nyatsime College	11	10	**21**
Warren Park Malbereign	Westridge	11	10	**21**
Grand total		**42**	**40**	**82**

Pilot Study

A pilot study to ensure that the instructions on the questionnaire were clear was carried out at Harare Girls High School and the rough estimate of time taken to complete it was noted to be about 15 minutes.

3.5 SAMPLING PROCEDURE

All first team soccer players who consented or gave assent who from schools in the selected regions were included in the study

Exclusion Criteria

- All students who were unwilling to participate.
- All students younger than 18years whose caregivers or school authorities were unwilling to allow them to participate.

3.6 DATA COLLECTION

A self-administered questionnaire under supervision was given to randomly selected high school first team soccer players. The assessment tool was developed from the Modified Rosenbaum Concussion Knowledge questionnaire. The high validity and reliability of the Modified Rosenbaum Concussion Knowledge has been found to have a Cronchbatch alpha of 0.76%. Schools were informed in advance on the researcher's visit to limit systematic error in the form of non-observation. Chosen participants were offered an opportunity to respond to the questionnaire in either English or Shona (see data collection tool).

The Principal Investigator was responsible for data collection and one logistic assistant was recruited to assist with gathering participants, distribution and collection of the signed assent forms.

3.7 DATA PROCESSING AND MANAGEMENT

All participants were asked the same questions in the same order. Conditions during data collection were maintained at the same levels for all the study participants, such that, each study participant was afforded equal amounts of comfort and privacy during the interview.

Data Cleaning

The Principal Investigator ensured completeness of the interviewer administered questions at the end of each data collection session. All completed interviewer administered questionnaires were filed in order of when data was collected, that is, kept in sequential order of numbering.

Data entry

Data was entered into the Statistical Package for Social Scientists version 16.0. Data was entered at the end of each data collection day.

3.8 DATA ANALYSIS

Data was analyzed using Statistical package for Social Scientist (SPSS) version 16. 0. Descriptive statistical analysis was carried out using Z test for proportions, for testing the differences in proportions between the groups. Student‘s t-test for independent groups was used to check relationships on continuous variables while categorical variables were expressed as percentages

and frequencies , and compared using the Chi-square test to compute a p-value. Logistic regressions was used to estimate odds ratios and 95 % confidence intervals for the risk factors .Results were presented as means ± SEM ,and comparisons between multiple groups will be made using ANOVA. All statistical tests were considered statistically significant if $p< 0.05$.

3.9 ETHICS

Ethical approval to conduct the study was solicited from the Parirenyatwa College of Health Science Joint Research Ethics Committee. A greater proportion of participants were expected to be under the legal age of majority which is 18 years old. Permission to do the study under the jurisdiction of the head office Ministry Of Education and Culture as well as Harare Regional Office of Education through local school authorities acting in loco parentis was sought. After obtaining this, a formal invitation to participation and permission in all high schools in Harare was made. Participants were required to provide informed consent prior to survey involvement and their choice was respected.

CHAPTER FOUR – RESULTS

A sum of 881 participants filled in the questionnaire. The majority of the players are from S1 (51.2 %; n=451) followed by S2 (39.5 %; n=343) whilst that of S3 is 9.3 %(n=82)

Figure 1: Proportion of School Categories

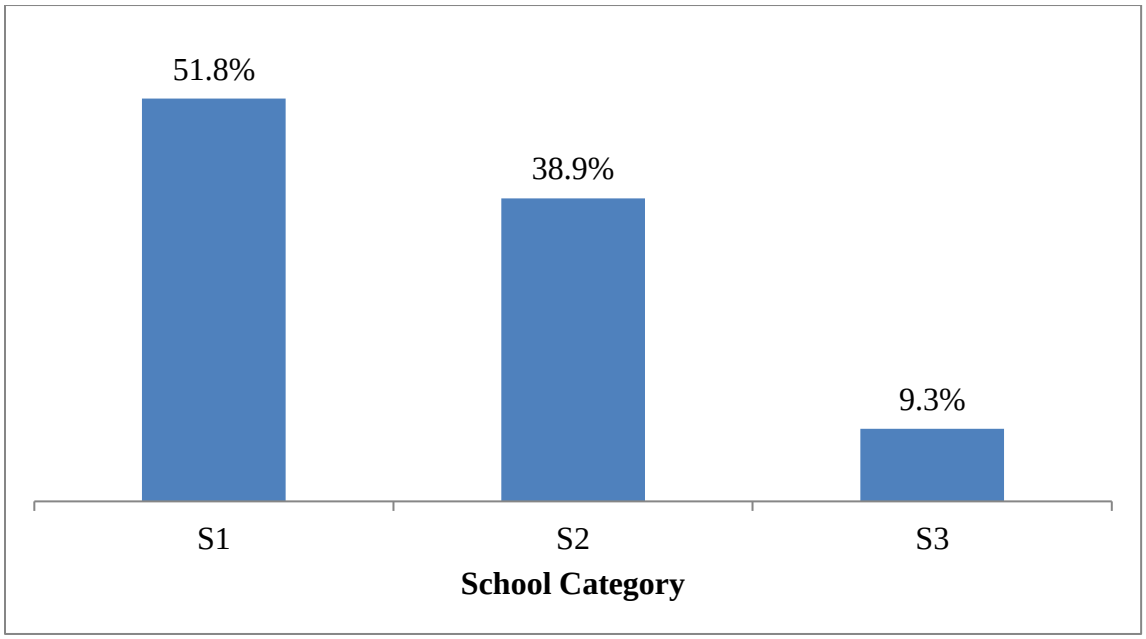
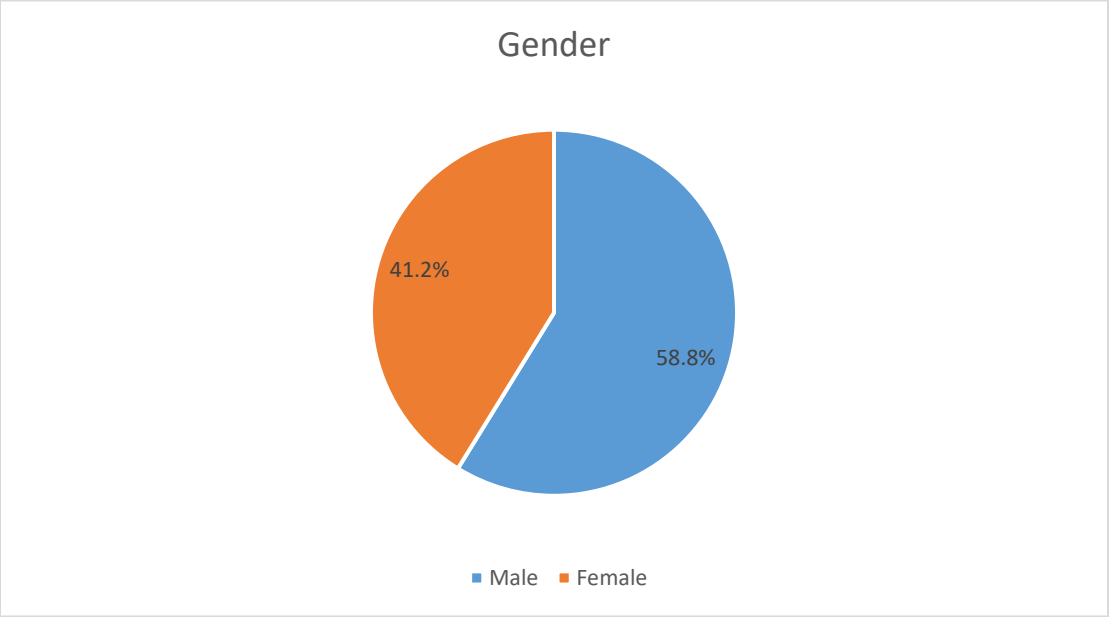


Figure 2: Distribution of respondents with regards to gender



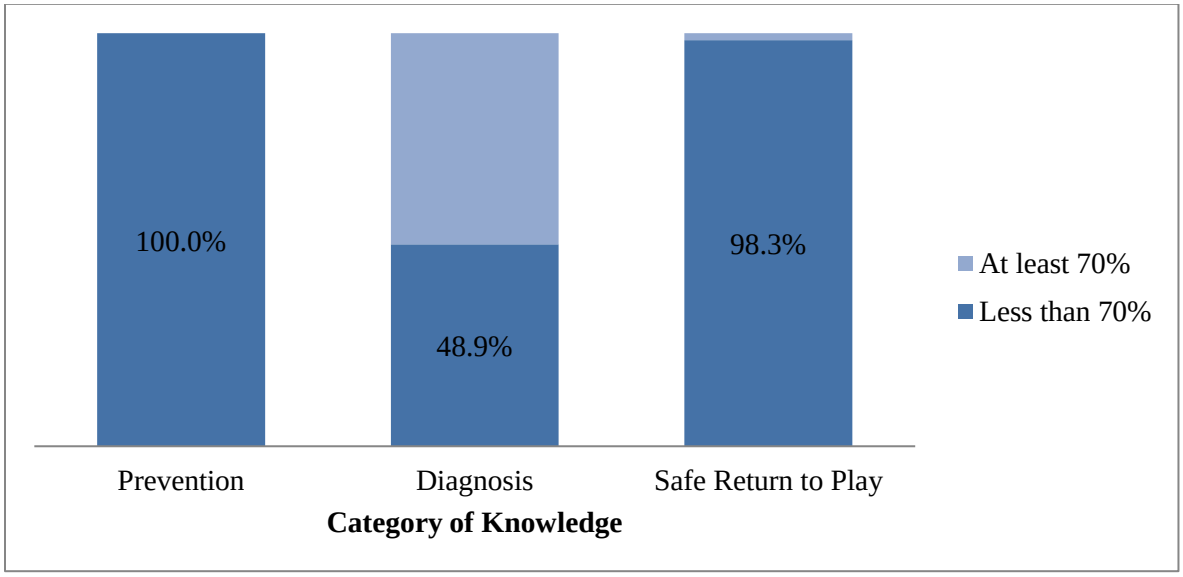
4.1 KNOWLEDGE LEVELS ON PREVENTION, DIAGNOSIS OF CONCUSSIONS AND RETURN TO SAFE PLAY

Only 2.2 % (N= 881) of the players interviewed had adequate knowledge about concussion. Of the 2.2% with adequate knowledge levels i.e. 19 individuals 2.7 % are from S1 schools; 1.4% are from S2 and 2.41% are from S3 schools

The difference in proportion of students with adequate knowledge (at least 70% marks) was not statistically different (P>0.812), although the proportion of the S3 was higher than that of S1 and S2.

Analysis of students with adequate knowledge versus the three categories of knowledge assessed (i.e. prevention, diagnosis and return to safe play) was done (**Fig. 2)** While 51.1% students had adequate knowledge in concussion diagnosis, none of the study participants had adequate knowledge on prevention and only 1.7% had adequate knowledge on return to safe play.

Figure 3: Adequacy of the knowledge assessed

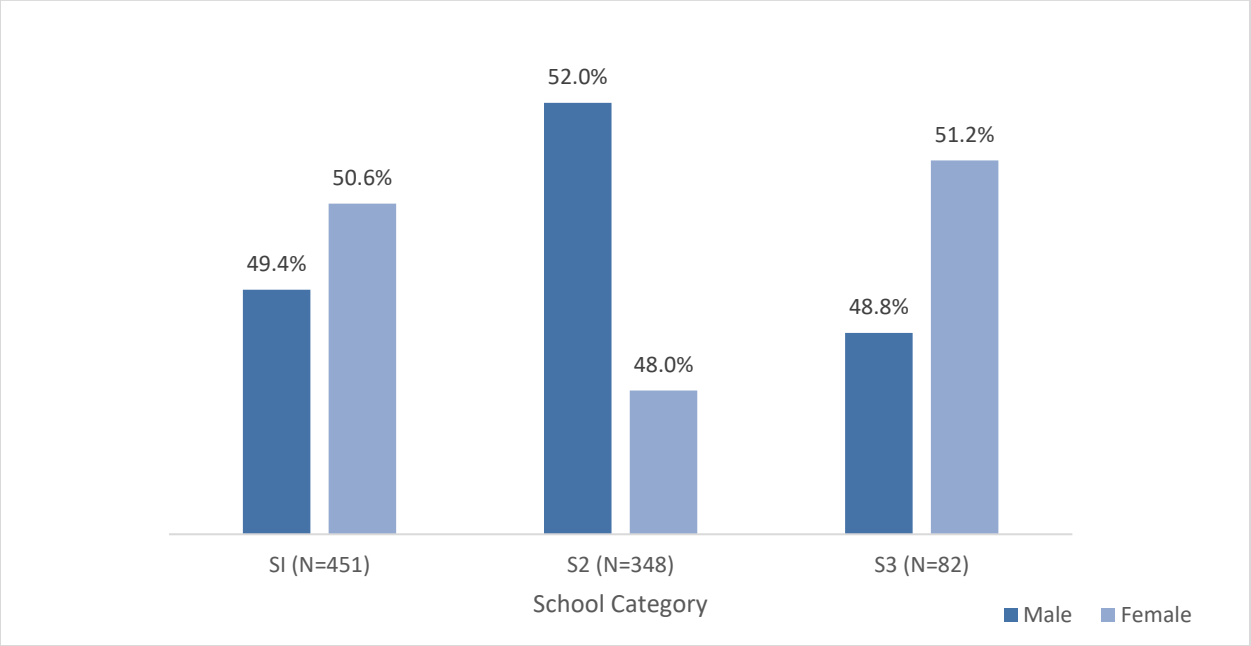


Additional analysis of data on the adequacy of knowledge on sport related concussions reveals that the highest proportions of students with adequate knowledge on diagnosis were in S3 schools followed by those S2 and lastly S1 schools. However one way ANOVA showed that the difference in means was not statistically significant (refer to Table 3, Additional Results in Appendix).

Knowledge on safe return to among the S3 schools seems to be the lowest, while diagnosis knowledge levels are almost similar to S1 schools. Noteworthy knowledge on prevention is almost identical across all schools.

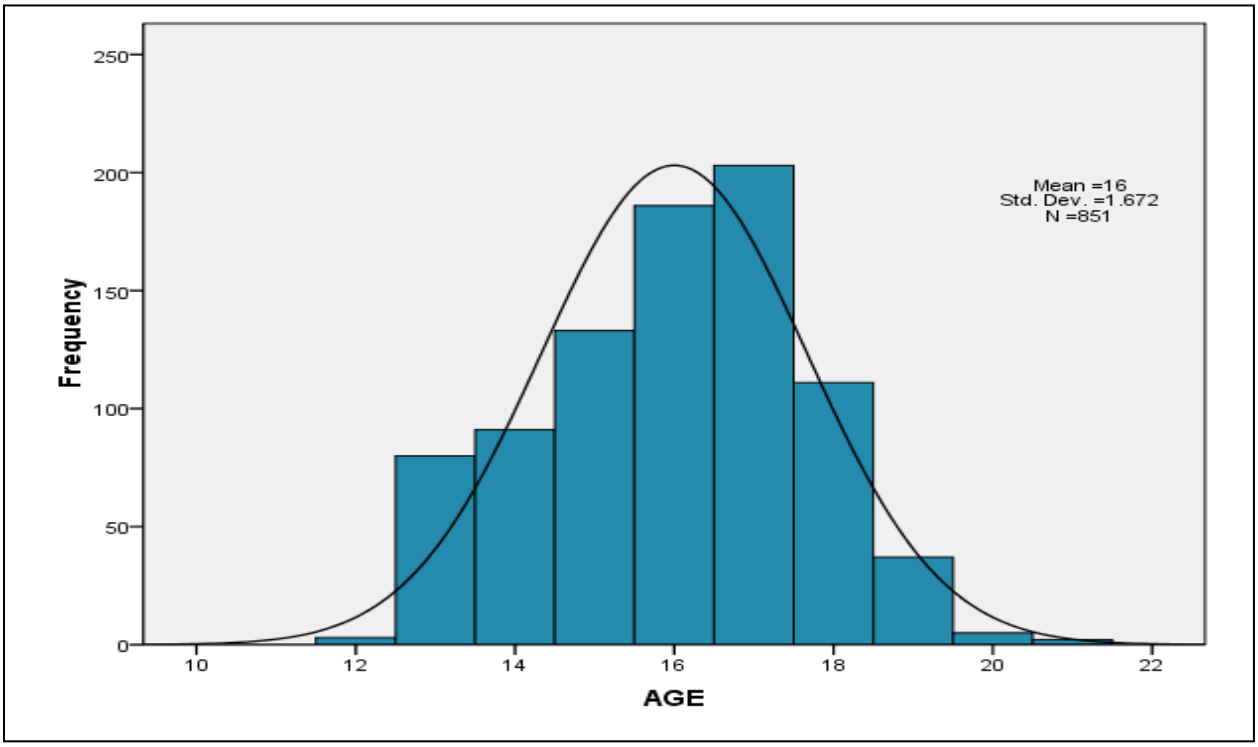
4.2 ASSOCIATED FACTORS INFLUENCING KNOWLEDGE LEVELS

Figure 4: Gender Distribution of Respondents According to School Categorization



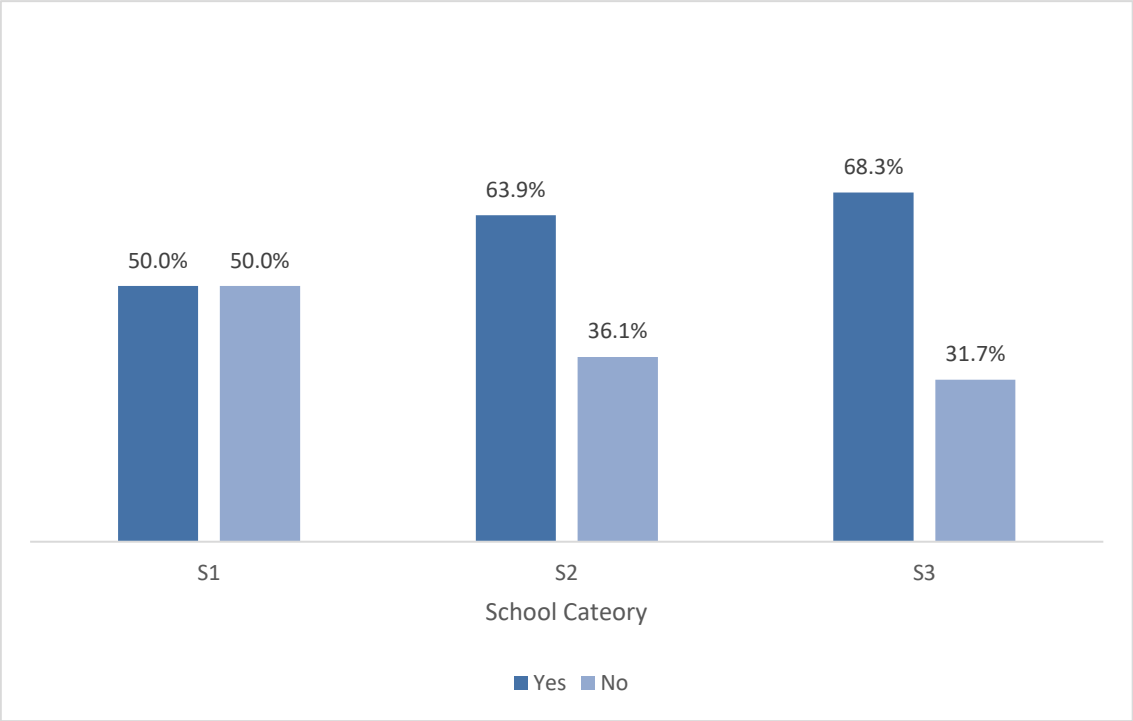
The study results shows a slight predominance of males (50.4 %) compared to females (49.6%). Nevertheless , analysis of data by school levels reveals that only S2 schools had more males than females whilst the S1 and S3 had predominantly female soccer players. The comparison of the overall mean scores shows that the female players (average of 13.6) were significantly ($p=0.01$) more knowledgeable than their male counterparts (average of 13.0). Furthermore, female players were significantly ($p<0.05$) more knowledgeable than their male counterparts in terms diagnosis and prevention of concussions and safe return to play.

Figure 5: Age Distribution of Study Participants



The age range of soccer players was between 12 -21 years while the sample population means age was 16 years with a standard deviation of 1.7. (**See Fig. 5**). The average age of the soccer players was 16 years with boys significantly older (16.3 years on average) than girls (15.6 years on average). It is imperative to note that age was not significantly associated with knowledge levels on concussion.

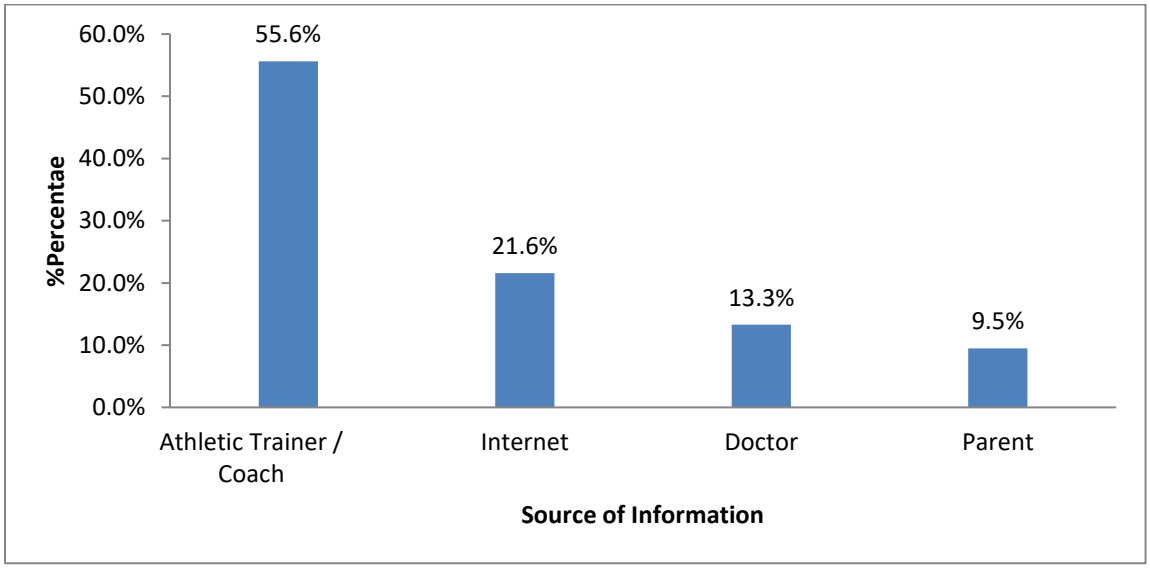
Figure 6: First Time Hearing about Concussions



More than 44% of the study participants stated that they were only learning about concussions on the day of data collection whereas 55.7% ad previously heard about concussions.

Disaggregation of the data by school categories showed that the greater proportions of S2 schools (60.6%) and S3 schools (68.3%) were hearing the concussion information for the first time in comparison to 50% in S1 schools. This variation was determined not to be statistically significant

Figure 7: Concussion Information Sources



Of those who had received prior concussion information, the distribution of their sources were as follows: Teachers (55.6 %); Internet (21.6%); Doctors (13.3%) and parents (9.5%).

Table 6: Concussion Information Sources for Combined School Categories

Concussion Source of Information	Overall n (%)	p-value
Internet	109 (21.6)	0.000*
Coach/ Teachers	281 (55.6)	0.002*
Parent	48 (9.5)	0.428
Doctor	67 (13.3)	0.349

There was a statistically significant association between receiving concussion information source (either the internet, teachers or coaches) and the knowledge levels on concussions among the study respondent Loss of consciousness was the most correctly cited sign of concussion . 81 percent of players were agreeable to being substituted and awarded rest following a brain concussive injury (please refer to Table 3).

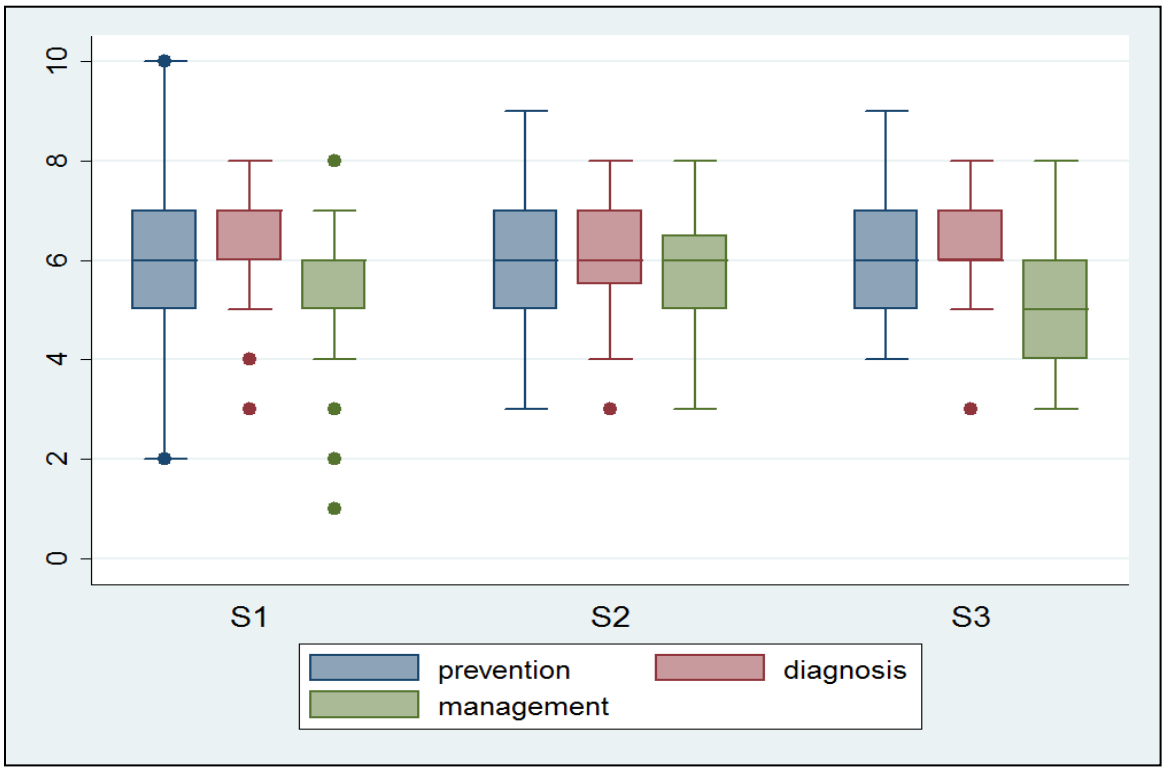
TABLE 3 - Distribution of correct responses on Concussion Signs, prevention and safe return to play

	S1	S2	OVERALL	S3	
	%	%	%	N	%
Concussion can be prevented by putting on a helmet	49.2 %	50.6 %	52.4%	**441**	**50.1%**
Contact must always be made with the head for one to suffer a concussion?	28.4 %	25.3 %	22.0%	**234**	**26.6%**
Confusion about assignment / position	56.5 %	52.3 %	42.7%	**472**	**53.6%**
Loss of consciousness (even briefly)	68.1 %	62.4 %	63.4%	**576**	**65.4%**
Headache	61.0 %	61.8 %	68.3%	**546**	**62.0%**
Locked Jaw	37.9 %	42.2 %	51.2%	**360**	**40.9%**
Personality Changes	32.6 %	35.3 %	30.5%	**295**	**33.5%**
Cannot require events prior to or after the hit / fall	60.3 %	52.0 %	59.8%	**502**	**57.0%**
Diarrhoea	80.9 %	80.2 %	87.8%	**716**	**81.3%**
Fatigue	39.5 %	41.1 %	54.9%	**366**	**41.5%**
After suffering a concussion during a match, it is safe for the player to:					
Be substituted and awarded rest.	85.8 %	86.5 %	84.1%	**757**	**85.9%**
Resume play in the next game the very next day.	66.1 %	65.2 %	52.4%	**568**	**64.5%**
Relax whilst watching television at home.	46.1 %	47.7 %	56.1%	**420**	**47.7%**
Proceed home to do mathematics homework.	73.4 %	72.7 %	76.8%	**647**	**73.4%**
Participate in formal full running during training on the next day.	69.6 %	71.0 %	72.0%	**620**	**70.4%**
Be left home alone, unattended & undisturbed for a peaceful rest in the first 24-48 hours for maximum recovery.	63.0 %	58.3 %	76.8%	**550**	**62.4%**

Drive his/her car immediately to get rest at home.	83.4 %	81.6 %	89.0%	**733**	**83.2%**
To take sleeping tablets when faced with inability to sleep.	46.8 %	39.9 %	48.8%	**390**	**44.3%**
CONSEQUENCES					
Persistent dizziness	70.1 %	67.2 %	47.6%	**589**	**66.9%**
Increased risk of blindness	40.1 %	47.7 %	52.4%	**390**	**44.3%**
Balance problems	59.9 %	58.9 %	70.7%	**533**	**60.5%**
Death	40.6 %	47.1 %	36.6%	**377**	**42.8%**
Sensitivity to light	15.1 %	14.9 %	19.5%	**136**	**15.4%**
Comatose	23.5 %	27.3 %	8.5%	**208**	**23.6%**
Low energy	8.6%	10.1 %	6.1%	**79**	**9.0%**
Brain Haemorrhage (bleeding)	24.4 %	23.9 %	17.1%	**207**	**23.5%**

Figure 8 below shows the analysis of students with adequate knowledge versus the three levels of knowledge assessed (i.e. prevention, diagnosis and safe return to play) disaggregated by school categories.

Figure 8: Analysis of students with adequate knowledge versus the three levels of knowledge assessed

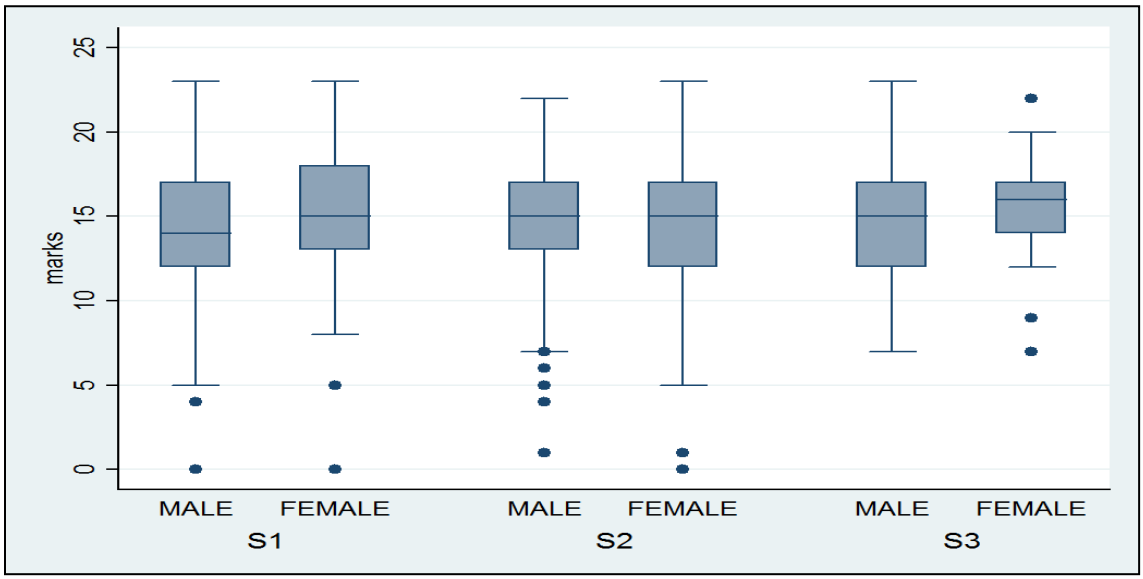


Analysis of Variance					
Source	SS	df	MS	F	Prob > F
Between groups	19.3490784	2	9.6745392	0.66	0.5189
Within groups	12937.9063	878	14.7356564		
Total	12957.2554	880	14.7241539		

Bartlett's test for equal variances: chi2(2) = 4.5116 Prob>chi2 = 0.105

One way ANOVA shows that the difference in means is not statistically significant (P>0.005).

Figure 9: Distribution of results of data analysed by knowledge marks, school group and gender of the students.



	Number of obs =	881	R-squared	=	0.0139
	Root MSE =	3.82125	Adj R-squared	=	0.0083

Source	Partial SS	df	MS	F	Prob > F
Model	180.577487	5	36.1154973	2.47	0.0309
group	12.8239069	2	6.41195347	0.44	0.6447
SEX	65.3796614	1	65.3796614	4.48	0.0346
SEX#group	71.8462011	2	35.9231005	2.46	0.0860
Residual	12776.6779	875	14.6019176		
Total	12957.2554	880	14.7241539		

The difference in means among gender in the three groups are significantly different (see Two way ANOVA results above)

CHAPTER FIVE - DISCUSSION AND CONCLUSION

5.1 KNOWLEDGE LEVELS ON PREVENTION, DIAGNOSIS OF CONCUSSIONS AND SAFE RETURN TO PLAY

This study found that only 2.2% of the study participants had adequate knowledge on concussion prevention, diagnosis and safe return to play. These findings are in similar to the findings by Cournoyer and Tipp who concluded that footballers in their study did not possess appropriate knowledge on the signs and symptoms of concussions (61). Cournoyer and Tipp also found that the most commonly identified concussion symptoms were headache, dizziness and confusion. In this current study, the most commonly cited signs and symptoms were diarrhea followed by loss of consciousness and headache.

Studies by Lumba Brown used differing parameters to measure knowledge on safe return to play (34). The general consensus however is in line with the findings of this study which points to very low levels of knowledge on safe return to play of concussions among soccer players/ athletes.

Low knowledge levels on the consequences of concussions were also observed by the same study which noted that despite robust campaigns of safe return to play following concussions, premature return still existed. In addition to lack of knowledge on concussion consequences, the study also ascribed its observation to the Cognitive Dissonance Theory by Festinger (55;56).

Knowledge deficit on concussions signs and symptoms in the general population also observed as low by Gardner in 2017. The study noted that 59% of the general public had inadequate knowledge (61). However, 67% of respondents in the Gardner study understood the importance of not participating in physical activity when experiencing signs of concussion. This is actually higher

than the findings in the current study. This might be due to Gardner's study design which was an online survey. It had the disadvantage of limited sampling and potential non-observer bias as certain populations are less likely to respond to online questionnaires coupled to limited internet access.

The low knowledge levels on concussion prevention, diagnosis and safe return to play, recorded by the study, were in-line with the observation that that increased concussion publicity and research has been focused on Europe and America which are developed countries. In developing nations like Zimbabwe, unfavorable economic environment and a skewed policy implementation which takes predilection of some other preferred high priority areas like cholera as noted in 2008 by Magonde et. al. continues to influence this trend (24).

5.4 ASSOCIATED FACTORS INFLUENCING KNOWLEDGE LEVELS

Gender

The study's overall mean scores show that female players were significantly more knowledgeable than their male counterparts. The same players also demonstrated more knowledge in terms concussion diagnosis and prevention. This was noted across all school levels. These results corroborate those reported by Kurowski et.al. in that females had better overall knowledge than their male counterparts (54). This result could be attributed to the fact that females usually have better health seeking behavior than their male counterparts.

Age

The age range of soccer players was between 12 - 21 years while the sample population means age was 16 years. Kurowski et. al, recorded an almost identical result to our population with an age range of 13-18 years (54). The age range and mean in this study were comparable to the Cournoyer study which had a mean of 16.3 years (33). This was in contrast to the 18-80 years age range of the study by Gardner et al which focused on concussion knowledge on the general population (61). Literature suggests that older age has a positive association with better concussion knowledge levels and knowledge on safe return to play.

Source of concussion information/ Education

In this study more than 44% of the participants stated that they were only learnt about concussions on the day of data collection. This figure is much higher than that found by Cournoyer and Tipp.

The soccer players (the respondents) reported the following to be the topmost sources of concussion information: Teachers (55.6 %); Internet (21.6%); Doctors (13.3%) and parents (9.5%). The information sources in this study differ from Gardner et al who showed that the public knowledge about concussion was modest and that, 26 % of respondents had media as their source of knowledge (61).

Only 12.3 % had internet as their source of concussion knowledge. The internet has grown rapidly as a communication tool for health-related matters. This is slightly lower than the findings of Cournoyer et al whose results showed that only 75% had received information via the internet (67). This is in contrast to a study done on Oakland college players, were the mean knowledge score was around 80%. In their study, those in the health science fields might have skewed the

results as they had better scores though they demonstrated worse attitudes (48). These were university level players, located in America where there is increased publicity and media. The only limitation of this study though is the small sample size of 200 compared to the 847 in our study (67). Our results were also different from those of Covassin etal, as their participants had better knowledge partly because they were professionals and more exposed to concussion information (10).

It is important to point out that Zimbabwe is a unique nation with its own particular high-pressure public health problems. This point was driven home by the cholera outbreak of 2018 which had 8 535 reported cases with most cases reported in Harare. As a mitigation measure, massive awareness campaigns were launched in addition to the mobilization of resources to curb the epidemic. Due to more attention being directed towards other important public health concerns (e.g. cholera), more often than not conditions like concussions and awareness about them are often neglected even in among populations were 90% of high schools participate in concussion prone game of football.

Most of our participants received concussion education from either a teacher or coach. This therefore highlights the importance of them as citadel of knowledge transfer. However, according to literature search, a trained school health teacher is only available in 27.5 % of secondary schools in Harare, Zimbabwe (16). This differential access to a dedicated health teacher can be a focus of improvement with regards to betterment of concussion knowledge and publicity. Unfortunately, most of the teachers could not respond to the questionnaire due to their commitment in other educational areas as well as assisting in the logistical plan of gathering willing respondents. Parents had the least contribution in our sample as only 5 % passed concussion knowledge to

their children. Although 70.2% of secondary schools have internet access, only 12.3 % had internet as their source of concussion knowledge. This therefore further confirms the differential internet access and use within the population.

Health practitioners were expected to be the leading informants in our study but scored a low 13.3% though they are within 2.2km of every school in Harare (16). A large distance would prohibit access to health information and other medical services. This differed from the 47 % observed in South African rugby players (50). It can be hypothesized that those who received education from health workers might have suffered a concussion. The parents will have taken them to health personnel for attention. This vital statistic in our study is comparable to the 6% of concussed patients who reach emergency rooms (11).

CHAPTER SIX - CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSION

Given the findings of the study, we can therefore conclude that:

- Only 2% of first team soccer players have adequate knowledge on concussion signs, symptoms and safe return to play
- Female gender is associated with better knowledge level scores on concussions among high school soccer players
- Although it failed to reach statistical significance, there is no difference in concussion knowledge on signs, symptoms and safe return to play amongst S1, S2 and S3 schools in Harare Zimbabwe.
- The internet, teachers and coaches were the most effective instruments of concussion knowledge transfer

6.2 LIMITATIONS OF THE STUDY

Our findings must be interpreted in light of several limitations. The questionnaire makes use of "recognition type questions" in assessing knowledge on concussion prevention and symptom recognition. This provides answer options to the respondents and has been shown to give an inflated sense of respondents' knowledge levels (68). Contrastingly, answers that rely on recall are harder to respond but are a better approximation of the respondent's true knowledge since they

provide the answers themselves. A potential source of bias could emanate from the knowledge of responders being different from non-responders.

Sensitization amongst responders might have been possible as data collection at school level was done over 3 weeks. This possible source of contamination should always be considered in all research even in its perceived absence. This could have led to changes in responses possibly explaining how 44 % of those who had never heard about concussion proceeded to give correct answers.

6.3 RECOMMENDATIONS

This research provides motivation for concussion educational programs in Harare, Zimbabwe. These can be aimed at equipping teachers/coaches with the right information to curb concussion misconceptions and encourage safe play. This would be effective as teachers according to this research, are the most popular source of concussion information and are always in contact with the players on most occasions. Players may benefit from instructional videos, pre -participation meetings and awareness campaigns.

Introduction of sports medicine in our local universities, establishment of sports clinics and assembling of specialized paramedic units to monitor all sporting events remains a milestone to be achieved in an effort to curb this silent epidemic.

Evidence based concussion guidelines must be made that suite our local environment. They must be readily available to all. These can be availed to medical practitioners in the Essential Drug List Of Zimbabwe (EDLIZ), a booklet where summarized guidelines of common conditions are

discussed. Web based concussion information can be integrated into already existing digital learning programs designed for students for example Ruzivo, a service provided by a local cellular network provider. With the introduction of Physical Education in the core curriculum, the science of concussion can be introduced to all students during their learning. Enforcement of concussion guidelines and law through the Sports Recreation Commission will encourage safe return to play at highly competitive levels for example the Coca Cola National High School Soccer competitions.

This research provides motivation for future study focusing on other geographical areas in Zimbabwe to comprehensively improve the generalizability of the level of knowledge on concussion signs, symptoms and return to safe play in Zimbabwe.

Ethically, we can no longer sit on the fence with this silent epidemic that may never present to our central hospitals.

In the neurosurgeon's great effort to protect the brain by all means possible, at times it is not the surgical hand that matters. A strive to make a difference in the patient's life with the heart of a humanitarian through adaptation of preventive measures in traumatic brain injury, a very cost-effective strategy.

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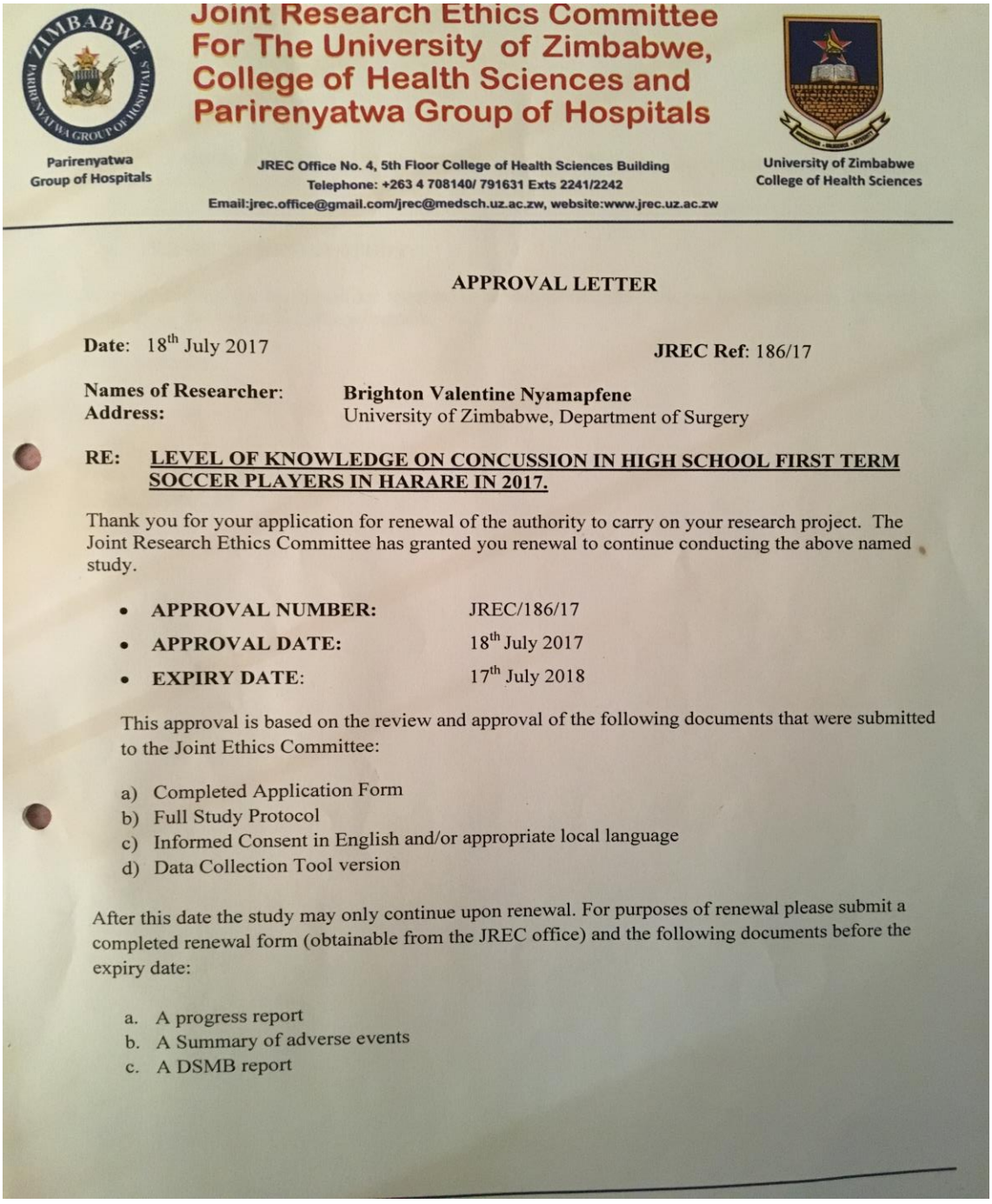
Appendix 1: JREC Approval Letter



Joint Research Ethics Committee
For The University of Zimbabwe,
College of Health Sciences and
Parirenyatwa Group of Hospitals

Parirenyatwa Group of Hospitals

JREC Office No. 4, 5th Floor College of Health Sciences Building
Telephone: +263 4 708140/ 791631 Exts 2241/2242
Email:jrec.office@gmail.com/jrec@medsch.uz.ac.zw, website:www.jrec.uz.ac.zw

University of Zimbabwe
College of Health Sciences

APPROVAL LETTER

Date: 18th July 2017 **JREC Ref**: 186/17

Names of Researcher: **Brighton Valentine Nyamapfene**
Address: University of Zimbabwe, Department of Surgery

RE: **LEVEL OF KNOWLEDGE ON CONCUSSION IN HIGH SCHOOL FIRST TERM SOCCER PLAYERS IN HARARE IN 2017.**

Thank you for your application for renewal of the authority to carry on your research project. The Joint Research Ethics Committee has granted you renewal to continue conducting the above named study.

- **APPROVAL NUMBER:** JREC/186/17
- **APPROVAL DATE:** 18th July 2017
- **EXPIRY DATE**: 17th July 2018

This approval is based on the review and approval of the following documents that were submitted to the Joint Ethics Committee:

a) Completed Application Form
b) Full Study Protocol
c) Informed Consent in English and/or appropriate local language
d) Data Collection Tool version

After this date the study may only continue upon renewal. For purposes of renewal please submit a completed renewal form (obtainable from the JREC office) and the following documents before the expiry date:

a. A progress report
b. A Summary of adverse events
c. A DSMB report

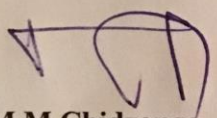
- **MODIFICATIONS:**

  Prior approval is required before implementing any changes in the protocol including changes in the informed consent.

- **TERMINATION OF STUDY**:

On termination of the study you are required to submit a completed request for termination form and a summary of the research findings/ results.

Yours sincerely,



Professor M M Chidzonga
JREC Chairman

Appendix 2: Medical Research Council of Zimbabwe Approval Letter

Telephone: 791792/791193
Telefax: (263) - 4 - 790715
E-mail: mrcz@mrcz.org.zw
Website: http://www.mrcz.org.zw

Medical Research Council of Zimbabwe
Josiah Tongogara / Mazoe Street
P. O. Box CY 573
Causeway
Harare

APPROVAL LETTER

REF: MRCZ/B/1336 **28 July, 2017**

MEDICAL RESEARCH COUNCIL OF ZIMBABWE
2017 -07- 28
APPROVED
P.O. BOX CY 573 CAUSEWAY, HARARE

Dr. Brighton Valentine Nyamapfene
University of Zimbabwe College of Health Sciences
Department of Neurosurgery
Box A178 Mazowe Street
Avondale
Harare

RE: AN ASSESSMENT OF THE LEVEL OF KNOWLEDGE ON BRAIN CONCUSSION IN HIGH SCHOOL FIRST TEAM SOCCER PLAYERS IN HARARE, ZIMBABWE DURING THE 2017 SEASON.

Thank you for the above titled proposal that you submitted to the Medical Research Council of Zimbabwe (MRCZ) for review. Please be advised that the Medical Research Council of Zimbabwe has **reviewed** and **approved** your application to conduct the above titled study. This is based on the following documents that were submitted to the MRCZ for review:

a) Study proposal
b) Informed Consent Forms (English, Shona & Ndebele Version)
c) Data collection tools

APPROVAL NUMBER : MRCZ/B/1336
This number should be used on all correspondence, consent forms and documents as appropriate.

- **APPROVAL DATE : 28 July, 2017**
- **TYPE OF MEETING : Expedited**
- **EXPIRATION DATE : 27 July, 2018**
  After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the MRCZ Offices should be submitted one month before the expiration date for continuing review.
- **SERIOUS ADVERSE EVENT REPORTING**: All serious problems having to do with subject safety must be reported to the Institutional Ethical Review Committee (IERC) as well as the MRCZ within 3 working days using standard forms obtainable from the MRCZ Offices.
- **MODIFICATIONS**: Prior MRCZ and IERC approval using standard forms obtainable from the MRCZ Offices is required before implementing any changes in the Protocol (including changes in the consent documents).
- **TERMINATION OF STUDY**: On termination of a study, a report has to be submitted to the MRCZ using standard forms obtainable from the MRCZ Offices.
- **QUESTIONS**: Please contact the MRCZ on Telephone No. (04) 791792, 791193 or by e-mail on mrcz@mrcz.org.zw.

Other

- Please be reminded to send in copies of your research results for our records as well as for Health Research Database.
- You're also encouraged to submit electronic copies of your publications in peer-reviewed journals that may emanate from this study.

Yours Faithfully

.....

MRCZ SECRETARIAT
FOR CHAIRPERSON
MEDICAL RESEARCH COUNCIL OF ZIMBABWE

PROMOTING THE ETHICAL CONDUCT OF HEALTH RESEARCH

Appendix 3: Ministry of Primary and Secondary Education Permission letter

Reference: C/426/3/Harare
Ministry of Primary and Secondary Education
P.O Box CY 121
Causeway
HARARE

5 April 2017

Brighton .V.Nyamapfene
Parirenyatwa Doctor's Residence
Parirenyatwa
Harare

Re: **PERMISSION TO CARRY OUT RESEARCH IN HARAREPROVINCE: IN THE ATTACHED SCHOOLS IN VARIOUS DISTRICTS**

Reference is made to your application to carry out research at the above mentioned school in Harare Province on the research title:

"CONCUSSION KNOWLEDGE LEVELS IN HIGH SCHOOL FIRST TEAM SOCCER PLAYERS IN THE DISTRICT"

Permission is hereby granted. However, you are required to liaise with the Provincial Education Director, Harare Provinces, who is responsible for the school which you want to involve in your research. You should ensure that your research work does not disrupt the normal operations of the school. Where students are involved, parental consent is required.

You are also required to provide a copy of your final report to the Secretary for Primary and Secondary Education by 31 July 2017.

E. Chinyowa
Acting Director: Planning, Research and Statistics
For: **SECRETARY FOR PRIMARY AND SECONDARY EDUCATION**
cc: PED –Harare Province

Appendix 4: Demographic Questionnaire

DEMOGRAPHICS

(Please tick & give details where applicable)

Study Assigned Number: _____

School: ☐ Date: ☐

(Dd/Mm/Yy)

Age: ☐ Sex: Male ☐ Female ☐

Relationship of Main Caregiver: ☐

Estimated Household Income ☐

For how long have you been playing football? (Months) ☐

Is this your first time to learn or hear about concussions?

Yes ☐ No ☐

How did you get to hear about concussions?

Internet ☐ Athletic Trainer / Coach ☐ Parent ☐ Doctor ☐

Never heard about it ☐

Other (explain) ☐

	QUESTION	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	Concussion can be prevented by putting on a helmet					
2.	Contact must always be made with the head for one to suffer a concussion?					
	A player experiencing any of the following might have suffered a concussion:					
3.	Confusion about assignment / position					
4.	Loss of consciousness (even briefly)					
5.	Headache					
6.	Locked Jaw					
7.	Personality Changes					
8.	Cannot require events prior to or after the hit / fall					
9.	Diarrhea					
10.	Fatigue					

After suffering a concussion during a match, it is safe for the player to:

	Action	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	Be substituted and awarded rest.					
2.	Resume play in the next game the very next day.					
3.	Relax whilst watching television at home.					
4.	Proceed home to do mathematics homework.					
5.	Participate in formal full running during training on the next day.					
6.	Be left home alone, unattended & undisturbed for a peaceful rest in the first 24-48 hours for maximum recovery.					
7.	Drive his/her car immediately to get rest at home.					
8.	To take sleeping tablets when faced with inability to sleep.					

The following are consequences of inappropriate management of a concussion:

	Consequences	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1.	Persistent dizziness					
2.	Increased risk of blindness					
3.	Balance problems					
4.	Death					
5.	Sensitivity to light					
6.	Comatose					
7.	Low energy					
8.	Brain Hemorrhage (bleeding)					

Thank you for participating in our survey.

Appendix 5: The Coach Questionnaire

COACH QUESTIONNAIRE

Study Assigned Number: _____

School: Date:

(Dd/Mm/Yy)

Age: Sex: Male ☐ Female ☐

1. Availability of Athletic Trainer: Yes ☐ No ☐

2. Availability of a concussions register per given session: Yes ☐ No ☐

3. Have you ever received any training on concussion? Yes ☐ No ☐

If your answer for question 1 above is **YES,** where from?

4. Do you have a concussion register? Yes ☐ No ☐

Explain your answer

5. Are you aware of any concussion assessment tool? Yes ☐ No ☐

Explain your answer

THANK YOU FOR PARTICIPATING IN OUR SURVEY.

Appendix 6: English Youth Assent Form

ENGLISH YOUTH ASSENT FORM

My name is **Brighton Valentine Nyamapfene**. I am a Masters in Medicine Neurosurgery student at the University of Zimbabwe. I am carrying out a study to determine knowledge levels on concussion in high school first team soccer players in Harare during 2017 soccer season. I therefore kindly request you to answer the questions that l shall ask as honestly as possible.

I will ask you some questions about your health and concussions. This should take about 15 minutes. You do not have to answer any of the questions we ask if you do not want to or if they make you feel uncomfortable. You will not be penalized if you refuse to participate in the study.

The information collected about you during the study will be kept safely locked up, and nobody will know who you are except the people doing the research. If we write an article about what we learn from the study, we will not use your name

Before you decide to take part in this study, we will answer any questions you have. You can also talk with you parent or guardian. You do not have to be in this study, it is okay to say no. If you decide to be in this study, you can change your mind and stop being part of it at any time. You will be given a copy of this form to keep for yourself.

I have read an understood the information provided regarding the research study. My participation in this research study is voluntary. I have read and understood the above information, asked any questions which I may have and agreed to participate. I will be given a copy of this form to keep.

_____ _____

Name of Participant Signature of Participant Date (DD/MM/YY)

Appendix 7: English Consent Form

CONSENT TO PARTICIPATE IN A CEREBRAL CONCUSSION RESEARCH STUDY

TITLE: AN ASSESSMENT OF THE LEVEL OF KNOWLEDGE ON CONCUSSION SYMPTOMS, PREVENTION AND SAFE RETURN TO SAFE PLAY IN HIGH SCHOOL SOCCER PLAYERS IN HARARE, ZIMBABWE 2017

Introduction

You are being asked to be in a cerebral concussion research study of how your brain may possibly be affected by participating in contact sports, like soccer. You were selected as a possible participant because you are part of the school team for one of the above mentioned sports. We ask that you read this form and ask any questions that you may have before agreeing to be in the study.

Purpose of study

This is a study to assess the level of knowledge on concussion of high school first team soccer players and the associated factors in Harare, Zimbabwe, and to raise awareness.

Risks/discomforts of being in this study

There are no expected risks.

Remuneration

There is **no** remuneration for being part of this research.

Benefits of the study

Results gathered from this study will provide current knowledge levels of high school soccer players in Zimbabwe, and will possibly provide a platform for further research.

Confidentiality

This study is anonymous. We will not be collecting or retaining any information about your identity. The records of this study will be kept strictly confidential. We will not include any

information in any report we may publish that would make it possible to identify you. Your identity will not be disclosed in the material that is published.

Right to refuse or withdraw

The decision to participate in this study is entirely up to you. You may refuse to take part in the study at any time without affecting your relationship with the investigators of this study. Your decision will not result in any loss or benefits to which you are otherwise entitled. You have the right to withdraw completely from the study at any point during the process as it is entirely voluntary.

Right to ask questions and report concerns

You have the right to ask questions about this research study and to have those questions answered by me before, during or after the research. If you have any further questions about the study, feel free to contact me**, Dr B.V. Nyamapfene** at **brightnyama@gmail.com** or by telephone at **+263 774392751**.

Consent

Your signature below indicates that you have decided to volunteer as a research participant for this study, and that you have read and understood the information provided above. You will be given a signed and dated copy of this form to keep, along with any other printed materials deemed necessary by the study investigators.

Participant's Name (print): _____ Signature: _____

Date: _____

Researcher: **Dr. Brighton Valentine Nyamapfene** Signature_____

Email: _____

Supervisor: **Mr. Aaron Musara** Signature: _____

Email: _____

Witness: ________________________________ Signature: __________________

Email: _____________________________