Doping in The Field of Sports – An Overview

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Abstract- In modern era doping is a very serious issue in sports world. The aim of this study was to observed the global status of doping and reviewing the reasons of doping. For the purpose of this study, the researcher reviewed 10 years (2009 – 2018) Laboratory testing report (Included Adverse Analytical Findings [AAF] & Atypical Finding [AF]) of WADA. Moreover, investigator studied several relevant papers from 1980 to 2020, different official sites, i.e. NADA, IOC, IAAF, TOI, The Hindus, different newspapers and other organization and searching terms were Doping, Drugs, etc. For the analysis and interpretation of data mean, percentage and their graphical representation was executed. The last 10 years (2009 - 2018) result shows that the total testing increased from 277928 to 344177 which included Olympic, non-Olympic and non-ADAMS data [Anti-Doping Administration and Management System]. The percentage of total finding still less from 2009 (2.02%) currently it was 1.49% (2018). The average AAF and total finding was 1.27% (3676) and 1.80% (5107). But gradual linear increment shows some light of hope. From this study it was understood that it was not only a task of a single organization to prevent any illegal activities but also made the work fruitful by the surrounded cooperating societies and those who are stand near by this sports person, developed the moral value through education and embedded in one's moral sense that doping can never be an option to achieve accolades.

Keywords – Doping, drugs, moral value, education, behavior

I. INTRODUCTION

Sport plays an important role in society. It is a major social and economic activity, it contributes to public health, entertainment. Achievements in amateur and professional sports are sources of motivation and national pride for many countries. Through participation in sports one can enrich with positive moral values, cooperation, respect for other, for rules, for officials, role playing ability, friendship, compassion and overall social personality and spirit. It is therefore unacceptable that for a handful immoral and crime centric athlete and their entourage abolish all the good thought for the purpose of win and push the society in the way of corruption. Anti-doping regulations based on strong scientific and legal principles can therefore help to prevent abuse and ensure fair contests for athletes in all disciplines (Boye et al., 2017).

Since the mid-20th century sports are significantly influenced by drugs. The 1960s and 70s saw the wide use of amphetamines in sport; the 1980s has been described as the anabolic steroid and cortisone era; the 1990s as the human growth hormone and erythropoietin era; and more recently, the use of peptides has become widespread (Bird et al., 2016). WADA enlisted its doping categories into prohibited at all times in respect of substances and methods in- and out of competition, substances prohibited in-competition and substances prohibited in particular sports. As a broad simplification for this discrepancy the prohibited at all times, in- and out of competition have a potential benefits in terms of enhancing adaptation to training and either directly or as a consequence of these augmented adaptations to improve performance in competition. Whereas prohibited in-competition are likely to heighten the immediate short-term performance of the body by augmenting its ability to meet the demands of the exercise and thereby perform better. Moreover, some substances are prohibited under the WADA code in 'Particular Sports' if they convey benefits or hazards (World Anti-Doping Agency, 2019; Bird et al., 2016).

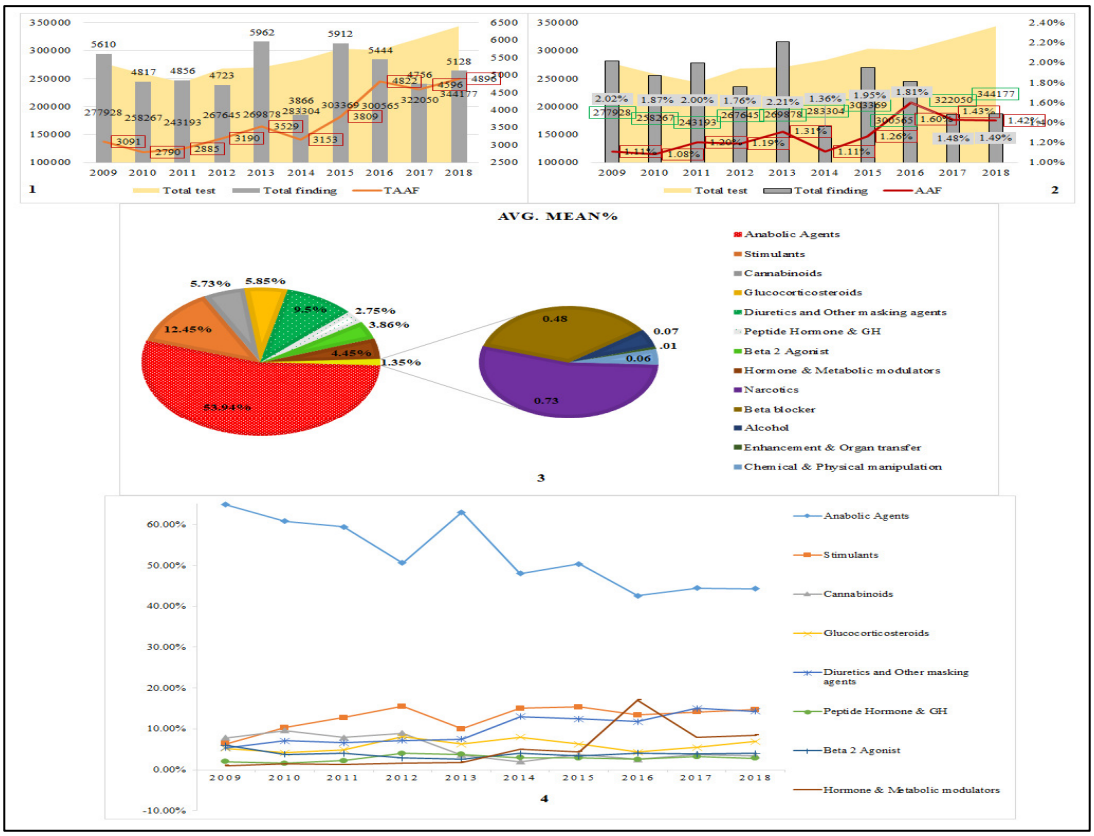
Some sport requires an acquired skill, some are largely or solely based on skill and concentration like ball and board games, shooting, driving, and riding and may benefit from drugs that reduce anxiety, tremor, inattention or fatigue. Sports that are highly dependent on explosive, short-term anaerobic power like sprinting, throwing, boxing, wrestling, typically ones which favor a solid, muscular build, are most susceptible to androgen-induced increases in muscle mass and strength. Other sports with an emphasis on aerobic effort and endurance like long duration events, characteristically preferred by a lean build, may be boosted by blood transfusion, erythropoietin and its analogs or mimetics. Finally, sports that rest on recovery from major injury or recurrent minor injury during intensive training, notably contact sports, may benefit from tissue proliferative and remodeling effects of growth hormone and various growth factors (Bird et al., 2016; Handelsman, 2000).

Adverse Analytical Finding is a report from a WADA-accredited laboratory that identifies the presence of a prohibited substance or its metabolites or markers (including elevated quantities of endogenous substances) or evidence of the use of a prohibited method in a doping control sample (WADA, 2020). An AAF does not necessarily lead to an anti-doping rule violation, since an athlete may have a Therapeutic Use Exemption (TUE) for this particular substance. For every adverse analytical finding, WADA receives a certificate of analysis from the WADA accredited laboratory. These certificates of analysis do not include the name of the athlete involved, since all samples analyzed by laboratories are anonymized and identified only by a code number (WADA 2020; NADA, 2019). The aim of this study was to observed the global status of doping and reviewing the reasons of doping.

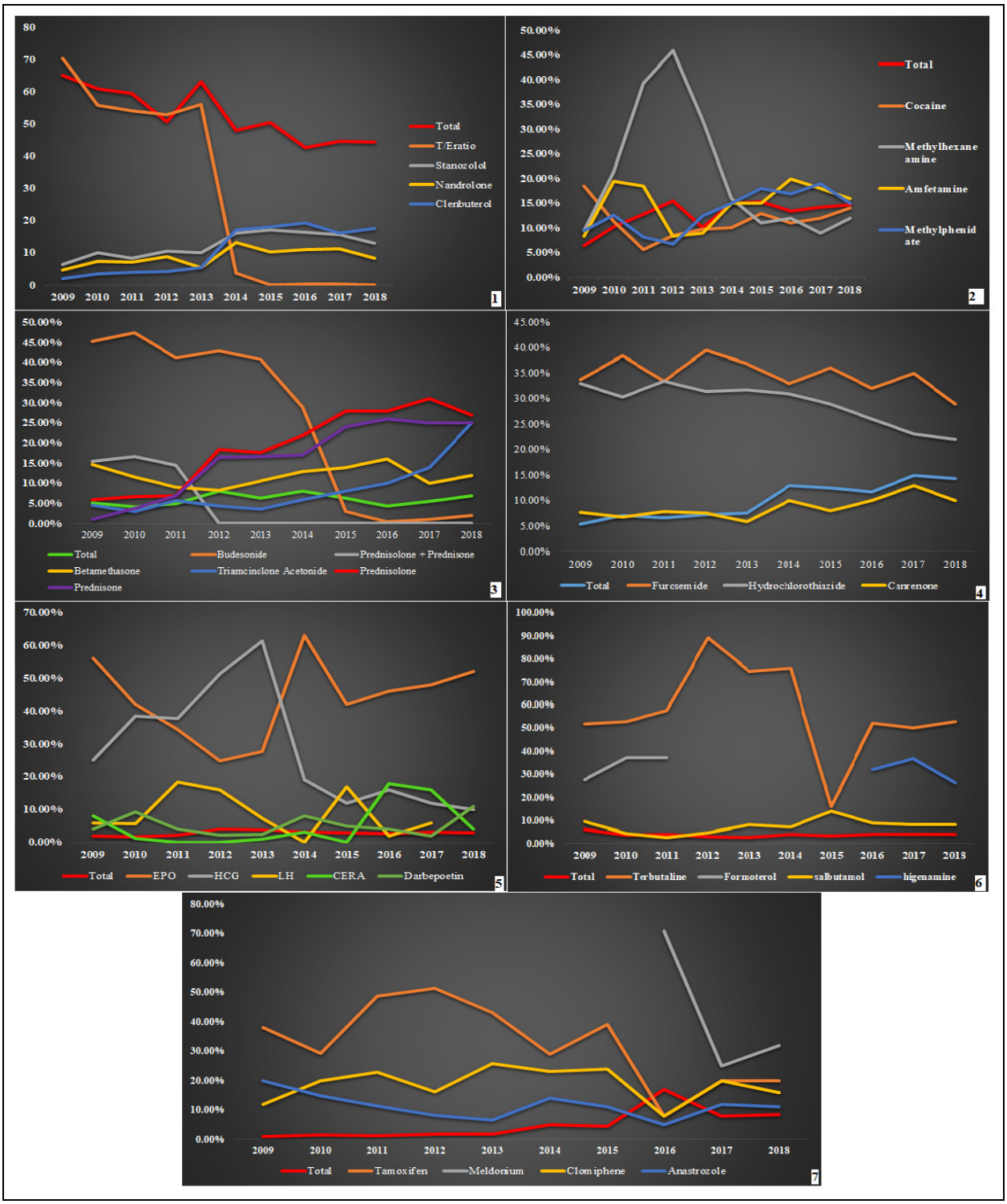
II. METHODOLOGY

For the purpose of this study, the investigator reviewed 10 years (2009 – 2018) Laboratory report on Adverse Analytical Findings (AAF), Atypical Findings (ATF), and overall finding of WADA. According to WADA this report from WADA-accredited laboratory or other WADA-approved laboratory that, consistent with the International Standard, identifies in a Sample the presence of a prohibited substance or its metabolites or markers and use of a Prohibited Method. It's not excluded the TUE cases (World Anti-Doping Agency, 2009; 2010; 2011; 2012; 2013; 2014; 2015; 2016; 2017; 2018a). Moreover, investigator reviewed 120 relevant papers, articles, periodicals, thesis, and went through different official sites, i.e. NADA, IOC, IAAF, TOI, The Hindus, different newspapers and sites of different organization from 1980 to 2020, and according to the necessity and usability for the fulfillment of the purpose investigator select and cite 79 papers and others relevant informative documents, from which 65% were published last 10 years (2011 - 2020) in reputed journals and official site of the different national and international organizations, 29% were published during 2001 – 2010 and 3.8% from 1991 - 2000. For the analysis and interpretation of data mean, percentage and their graphical representation was executed. All the analyses were performed by using Microsoft Excel Worksheet 2016 on windows 10.0.

III. RESULT AND DISCUSSION



Plot 1 Graphical presentation of 1. Total number of test with total finding and Total Adverse Analytical Finding (TAAF), 2. Total number of test with percentage of total finding and AAF, 3. Average percentage of 10 years used WADA listed prohibited substances, 4. Year wise used percentage of WADA listed prohibited substances



Plot 2 Graphical presentation of percentage of year wise most used substances of 1. Anabolic agent 2. Stimulants 3. Glucocorticoids 4. Diuretics and other masking agent 5. Peptide Hormones, Growth Factors, Related substances and Mimetic 6. Beta – Agonists 7. Hormone and Metabolic Modulators

The data of last 10 years (2009 - 2018) shows that the total testing increased from 277928 to 344177 which included Olympic, non-Olympic and non-ADAMS data where the minimum number of test occurred (243193) in the year of 2011 and the maximum number of test occurred (344177) in the year of 2018. From this data it was clear

that number of testing gradually increased that mean doping detection and vigilance was gradually increased (Plot 1.1 & 1.2). The average testing conducted by WADA during this 10 year was 287037. The less number of AAF found in 2010 (2790) and highest in the year of 2018 (4896). From this result it was observed that WADA still not go beyond the 1.60% of Adverse Analytical Finding which happened in the year of 2016 and least (1.08%) in the year of 2010. In respect of total finding which include both Adverse Analytical Finding and Atypical Finding WADA still not go beyond 2.21% (5962) which happened in the year of 2013 and least 1.36% (3866) in the year of 2014. The percentage of total finding still less from 2009 (2.02%) currently it was 1.49% (2018). The average AAF and total finding was 1.27% (3676) and 1.80% (5107) during last 10 years. But gradual linear result shows (Plot 1.1 & 1.2) some light of hope. There are total 31 - 33 such WADA accreditation laboratories work for further advancement. According to Thevis et al., last 13 years doping control was increased due to growing number of AAF. But the percentage of atypical findings and AAFs has remained within the range of 1–2%. Even though increased overall test numbers, decreased costs per sample, decreased administrative expenditures, and improvements the all aspects of the testing system. It was assumed that the multiple aspects can affect the rate of analytical findings, like deterrence of improved test methods, reducing the allure-to-risk ratio of unlawful means and increasingly exploiting loopholes of doping practices that are presently undetectable. Likewise, more emphasis has been put also on the effectiveness of testing via implementation of compliance criteria for testing authorities to target specific groups of compounds based on the general risk assessment of a particular sport. It was observed that doping behaviour and its adaptation was fully dependent on athletes' perception of risk taking (Pitsch & Emrich, 2012; WADA, 2015; Bowers & Bigard, 2017; Mountjoy et al., 2017; Thevis et al., 2018).

During the last 53 years (1967 - 2020), the remarkable advancement in analytical chemistry and technology athletes are easily catch due to the abused of pharmacological products. While great progress has been achieved to catch up with the dopers and their rogue scientific advisors, many challenges remain in the future (Catlin et al., 2008). One of the challenges facing researchers in anti-doping is that in addition to an appreciation for forensic science, they must have expertise in a number of analytical techniques, including gas chromatography (GC) and liquid chromatography (LC), GC equipped with NPD (Nitrogen Phosphorus detector), IRMS (Isotope Ratio Mass Spectrometry), NMR technique, HRMS (High Resolution Mass Spectrometry), ELISA (Enzyme-Linked Immunosorbent Assay), SDS PAGE (Sodium Dodecyl Sulfate and Polyacrylamide Gel- Electrophoresis method), LC-MS/MS (Liquid Chromatography with tandem mass spectrometry – a triple quadrupole mass spectrometry), GC-HRMS (Gas-Chromatograph Coupled with High Resolution Mass Spectrometer), GC/C/IRMS (Gas Chromatography Combustion Isotope Ratio Mass Spectrometry), GCxGC/C/IRMS (Comprehensive two dimensional Gas Chromatography, 40-fold increases in limits of detection for testosterone), UHPLC – HRMS (Ultra High Performance Liquid Chromatography), Isoelectric focusing for Erythropoietin testing (Electrophoretic separation method), flow cytometry for blood transfusion, immunoassay, as well as the disciplines of clinical chemistry, endocrinology, hematology, genetics, physiology (Catlin et al., 2008; Bowers & Bigard, 2017). In 2000, it was recognized that blood doping and some peptide and hormone agents could only be detected in blood. It was an earlier concept that there was a significant drawback to blood is the expense of collection and shipping, but today variety of possible specimen matrices exist that could significantly alter testing strategies, including dried blood spots, dried plasma spots, oral fluid, and breath. These alternative matrices could significantly reduce collection and shipping costs, and allow the collection of a significantly greater number of samples (Thomas et al., 2012; Anizan et al., 2014; Stephanson et al., 2015; Verplaetse et al., 2016; Ponzetto et al., 2016; Bowers & Bigard, 2017; Bowers, 2009).

The testing program for positive result on doping dependent on two factors, timing or detection windows and unpredictability of collections and the analytical capability of the laboratory. Detection windows of the various prohibited substances are highly variable, ranging from hours to months after last use, even some substances have a very short detection window, especially when used in low doses, and thus cannot be traced days or even hours after administration. The dopers are expert to employ such screening techniques. So it was very difficult to catch the athlete who dope and even after the reanalysis (Generally after 8 to 11 years) of the older sample (Catlin et al., 2008; Bowers, 2009; Lentillon-Kaestner & Ohl, 2011; Lentillon-Kaestner, 2013; de Hon, Kuipers, & van Bottenburg, 2014; Hatton, 2007). The constantly decreasing concentration of the analytes or metabolites in positive doping cases most probably due to micro dose or supra-physiological doses or earlier cessation of the drug regimen before doping control which effect on the hypothalamus pituitary gonad axis and significantly reduced the endogenous production, and lead to genetic polymorphism. Doping traps was one of the major problem for unintentional doping cases, like some nutritional products carry some prohibited substance specially the anabolic agents which are available in the market, store and online (Geyer et al., 2014; Havnes et al., 2019). The athletes who have confessed doping and after getting the positive results that athletes change their doping behaviors and frequently involve engaging in new doping practices that the athletes and their scientific advisors perceive as undetectable, based on their perception of

the risk of being detected by testing (Özdemir et al., 2005; Ashenden et al., 2011; Lundby et al., 2012; Bowers & Bigard, 2017). Due to the progressive development of new doping substances and methods, it is very difficult to detect all the agents (Houlihan, 2002; Pitsch, 2009; Ashenden et al., 2011; Lundby et al., 2012; Simkin et al., 1987; Ayotte et al., 2013). Since of this difficulty and the excessive expenditure of the development of new detection methods and the resultant execution of new techniques, the proportion of positive doping tests has not increased (Overbye, 2016; Mottram, 2012). Even most athletes are aware of this issue and support to improve the methods of detection (Striegel et al., 2006; Westmattelmann et al., 2018). The most likely estimate is that, in the period between 2000 and 2010, 14 % of all elite athletes in track and field have engaged in some sort of illegal blood manipulation claim a self-reported doping prevalence, in Olympic sports of between 1 and 30 %, but fail to back up this statement with references. Randomized Response Technique found that between 26 to 48 % of athletes admitted to having used doping at some point in their career. Overall questionnaire-based research indicates that somewhere between 1 to 70 % of all athletes have used doping at some point in their career, depending on their sport and level (Laure, 1997; Pitsch, 2009; Petróczi et al., 2008; Sottas et al., 2011; de Hon et al., 2014; Ulrich et al., 2018). Striegel et al., have reported that about 7% of total 14000 young elite athletes of 2012 London Olympic Games admitted to doping at some time in their career, this would represent almost 1000 people at the Games. Most will stop doping long before the day to avoiding the positive result and falling victim to one of the 6000 samples that will be tested at the new multimillion pound anti-doping facilities. The optimum 21st-century doping agent might be a molecule that isn't of any medical benefit at all (Cooper, 2012).

For many countries, achievements in sport are closely tied to national pride, and the temptation to use prohibited methods can therefore be stronger than respect for the rules or concerns about the health of athletes (Boye et al., 2017). It was proved that the prevalence of doping can be very different between sports, countries, training groups and level of play with players. The International Association of Athletics Federations (IAAF) study shows that, at least in athletics, this number is largely dependent on the country for which one is competing, presumably because doping is not so much an individual decision, but rather a final outcome of a social environment that is rather permissive towards doping and also lower levels, unintentional violation is higher because of less than optimal doping education (de Hon et al., 2014) and studies shows that 61% of French athletes obtained performance enhancement drugs from their doctor (Laure, 1997; Donovan et al., 2002).

However, the widespread concern with doping in sport, along with evidence that children's involvement in sport can be related to less mature moral reasoning and higher aggression (Bredemeier et al., 2016; Donovan et al., 2002). Doping must be checked by increasing threat appraisal, when benefit appraisal was low, personal morality was very strong, resilient personality factors like very high self-esteem and perception of legitimacy of laws and enforcement was very high (Donovan et al., 2002). But the threat appeals being also less effective for low self-esteem and pessimistic individuals because they had lack of will power, lack of skills in general and lack of spirit and their outer directed ness and risk taking propensity driven to use performance enhancing drugs (Riesman et al., 1980; Seligman 1991;Donovan et al., 2002).

Status of WADA listed prohibited substances

S_0: Non Approved Substance

From 2011 WADA first introduced Non approved substance (S_0) for addressing those substances which was not mention any subsequent section and which have no government approval to the health authority for human therapeutic use(World Anti-Doping Agency, 2011b).

S_1: Anabolic Agents

From the observation of 10 years WADA report (2009 - 2018) average 53.94% of total positive result found on anabolic agent. But from the year of 2014 use of this drugs dramatically decrease and reached at 44.28% in 2018. The prohibited anabolic agent divided into two categories Anabolic-Androgenic Steroids (AAS) and other anabolic agents such as selective androgen receptor modulators (SARMs) and AAS further divided into two subcategories exogenous and endogenous anabolic-androgenic steroids. Approximately 70 to 80 substances were enlisted in this category with example, (Other substances with similar chemical structure) but not limited to, during the year of 2018 and 2020 (WADA prohibited list documents 2018, 2020). The maximum detected performance enhancing anabolic agents were stanzolol, Nandrolone and Clenbuterol, testosterone epi-testosterone ratio and metandienone etc. From the observation of plot 2.1 that a sudden declination was seen in the detection of T/E ratio (3.76%) from 2014 but previous of this year's (2009 to 2013) data explain that the most detectable and usable agent was T/E ratio (55 to 70% of total anabolic agents). Afterword's the position taken by stanzolol and clenbuterol (≈ 10% stanzolol were used each year from total use of anabolic agent, and ≈ 90% of clenbuterol from total use of other anabolic agent). AAS are primarily used to increase muscle mass and as a consequence are associated with activities that require strength and high levels of peak power, such as weightlifting, throwing events and sprinting. SARM are drugs that may be taken to enhance the action of the testosterone receptor. People who misuse anabolic steroids usually take

them orally, injection, or apply them to the skin as a gel or cream. These doses may be 10 to 100 times higher than doses prescribed to treat medical conditions through the processes of cycling, stacking, pyramiding and plateauing (Bird et al., 2016; National Institute of Drug Abuse, 2018; World Anti-Doping Agency, 2019; NADA, 2019). The health care system illegally supplies 48.1% of the anabolic substance to the users and 32.1% are even monitored by a physician and the person collected this agent from black market or online (Striegel et al., 2006). According to Handelsman, (2020) in 2017 approximately 1.5% were positive result found with 61% due to hormones from their 99% were androgens. From this result it was clear that detection method of androgen was very effective. In the latest phase in AAS abuse, designer steroids surfaced. For decades, anti-doping scientists had suspected the existence of a clandestine industry, designing doping agents and doping regimens and discovering ways to beat the official tests and make a fortune like Norbolethone, Tetra Hydro Gestrinone (THG) (Tokish et al., 2004; Catlin et al., 2008; Geyer et al., 2014). Basically AAS utilised or supervised to the athletes during the training period for performance enhancement because the effect of AAS gradual onset, after that it discontinue prior to the competition for screening the anti-doping test. This is one reason of many, for outer competition test (Catlin et al., 2008). In 2020 the subdivision of AAS (Exogenous and Endogenous) was removed and all the substances were known by the heading of AAS and Other Anabolic Agents (OAA).

S_2: Peptide Hormones, Growth Factors, Related Substances, and Mimetics

The name of the S_2 class Hormone related substances changed in the year of 2010 to Peptide Hormones, Growth Factors and Related Substances for better define the substances within this category, in 2015 added the 'mimetic' to reflect that synthetic analogue were also prohibited under this section. Due to the growing importance of this drug in this decade there were several modifications occurred in the next years (2010, 2011, 2013, 2015, 2017, 2018, 2019). Peptide hormones, growth factors and released substances and mimetic were categorized into three categories Erythropoietins (EPO) agent affecting erythropoiesis ($S2_1$), Peptide hormone and hormone modulators ($S2_2$) and Growth factors and growth factor modulators ($S2_3$). $S2_1$ was further subcategorized into five classes like EPO-receptor agonist, Hypoxia inducible factor (HIF) activating agents, GATA inhibitors, TGF-β inhibitors and Innate repair receptor agonist. $S2_2$ further categorized into three subclasses like Chronic Gonadotrophin (CG) and Luteinizing Hormone (LH) and their releasing factor, Corticotrophin and their releasing factor and Growth Hormone (GH) and its releasing factor (WADA prohibited list documents 2018,2020). Generally, erythropoiesis increased erythrocytes production which enhance the oxygen uptake capacity. Growth factor and modulators increase testosterone secretion, its influences carbohydrate, fat and protein metabolism and it promotes muscle growth and recovery form sports injuries (Bird et al., 2016; World Anti-Doping Agency, 2020; Rauhala & Simula, 2020). 2.75% of total positive result found on Peptide hormones, growth factors and released substances and mimetic. EPO, CG, LH, CERA were maximum used from total Peptide Hormone & Growth Hormone. ≥ 50% of the total Peptide hormones, growth factors and released substances and mimetic detection case was observed on EPO. The rate of detection of growth hormone and peptide hormone were low due to lack of standardized test and even from Athlete Biological Passport (ABP) (Ashenden et al., 2011). For the detection of that kind of hormone better to use out of competition, blood sample analysis rather conventional urine sample, more sensitive detection technique with longer windows of detection are required (Handelsman, 2020).

S_3: Beta-2 Agonists

Total 12 substances were enlisted in the WADA prohibited list 2018 of β_2 Agonist but from the year of 2019 a new substance Tretoquinol was added and the total enlisted number was 13 (World Anti Doping Agency, 2018 & 19). Before 2017 (11 agent enlisted) there no such substance name was mention in the list. β_2 ($beta_2$) adrenergic receptor agonists, are a class of drugs that act on the β_2 receptor in the sympathetic nervous system cause smooth muscle relaxation. Adrenaline and noradrenaline are catecholamine hormones that are released from the adrenal medulla and also function as neurotransmitters. Their secretion increases at times of stress and facilitates a physiological response to a situation. In a sporting context this relates to increases in cardiac output, vasodilation, ventilation and circulating glucose, with the response being proportional to the intensity of the exercise. β_2 adrenergic agonists' shows Broncho dilating effect, vasodilation in muscle and liver, relaxation of uterine muscle, and release of insulin (Bird et al., 2016; World Anti-Doping Agency, 2020; Rauhala & Simula, 2020; NADA 2020). 3.86% of total positive result found on Beta 2 Agonist, terbutaline (75% - 85%) were maximum used from total Beta 2 Agonist. From the observation of 2009 – 14 WADA report the tendency of the reported case of other Hormone & Metabolic modulators were gradually increase and maximum positive result (5%) was found in 2014.

S_4: Hormone and Metabolic Modulators

Due to the growing importance of this drug in this decade there were several modifications occurred for S_4 and several classes and subclasses added with progressing year of 2012, 2013, 2015, 2016, and 2019. Hormone and metabolic modulators the prohibited list divides into five groups Aromatase inhibitors, Selective oestrogen receptor modulators (SERMs), Other anti-estrogenic substances, Agents modifying myostatin function(s), Myostatin is a

protein produced by the human body. It inhibits muscle growth and thus prevents the muscles from growing in an uncontrolled way. Inactivation of the natural protein function of myostatin leads to excessive muscle growth, metabolic modulators like insulin, activated peroxisome proliferator activated receptor and protein kinase (Bird et al., 2016; WADA prohibited list at all times 2020; Rahula & Simula 2020; NADA 2020; Antidoping Schweiz 2020). 4.45% of total positive result found on Hormone & Metabolic modulators. Tamoxifen (20 – 50%), anastrozole (10 – 20%), meldonium (25 – 71%) and clomiphene (8 – 25%) were the most detected S_4. There was surprisingly higher percentage (17.03% N = 721) of cases reported in 2016 for adding the meldonium, which was 71% of total reported Hormone and metabolic modulators in these year and still reported highest (32% of total used) in 2018.

S_5: Diuretics and Masking Agents

Diuretics were first banned in sport in 1988. Total 14 such substances and some example were enlisted in this category (Other substances with similar chemical structure) but not limited to (WADA prohibited list documents 2018,2020). Diuretics and other masking agents are not considered performance enhancing, but they are taken to conceal the use of other doping agents and abuses. The mechanism of action varies, with the intention being to reduce the concentration of the doping agent or its metabolites in the sample through increasing the volume of urine or reducing the rate of excretion of the doping agent/metabolites into the urine. Its cause rapid weight loss and act as masking agents both in and out of competition. Their abuse is widespread in wrestling, boxing, judo and weight-lifting as well as in general sports where weight categories are involved and among athletes who want to maintain a low body weight, such as female gymnasts and ballet dancers, Skiers and mountain climbers etc. (Cadwallader et al., 2010; WADA, 2018 & 2020; NADA 2020). Average 9.5% of total positive result found on diuretics and other masking agent, furosemide (33% - 39%) and hydrochlrothyizide (22% - 33%) were maximum used from total diuretics and other masking agent. In terms of overall identification of the result of 10 years' data, it was clear that the detection and its method of detection has been steadily increasing a sudden upsurge was observed from the year of 2014. The increment in the cases not only for the abuse of the agents but also for advance detection processes and the observation supported by Cadwallader et al., 2010.

S_6: Stimulants

WADA categorized the Stimulants by specified and non-specified agents. Total 68 such substances (Other substances with similar chemical structure) were included but not limited to, in the year of 2018 which increased to 70 in the year of 2020 but not limited to (WADA prohibited list documents 2018,2020). It's may also be found in over the-counter medicines and/or be taken as 'recreational drugs' were included in the Studies indicate that stimulants account for around 6–18% of the positive samples detected in the sporting context, which makes them the third most prevalent category, behind AAS and cannabinoids. Stimulants influencing the process of neurotransmission at the nerve terminal through the three pathway firstly an elevated release of neurotransmitters (dopamine, noradrenaline, and serotonin) into the synaptic cleft, second the direct stimulation of postsynaptic receptors, and third the inhibition of neurotransmitter reuptake (Thevis et al., 2010). Its reduce the perception of fatigue; increase alertness, promote self-efficacy and confidence; and in some cases stimulate cardiac output and blood flow to the exercising muscles. Some mimic the responses of the sympathetic neuroendocrine system, notably adrenaline and noradrenaline, while others affect the dopamine and serotonin systems. The dosage might be important for the user aggressiveness seems to increase with high dosage, whereas alertness is stimulated by lower doses. (Tokish et al., 2004; Avois et al., 2006; Docherty, 2008; Bird et al., 2016; WADA prohibited list at all times 2020; Rahula & Simula 2020; NADA 2020). Stimulants was the second highest drugs used by the athletes, 12.45% of total positive result on stimulants. From 2010 to 13 maximum detectable stimulants was methylhexanamine (21 – 46%), later from 2014, subsequent equal use was observed for amphetamine, methylphenidate, cocaine and methylhexaneamine. The data of 10 years observed the tendency to use of this drugs gradually decline due to the advance level of detection.

S_7: Narcotics

The category of narcotics includes substances such as Buprenorphine, Dextromoramide, Diamorphine (heroin), morphine and related compounds. Morphine is known for its analgesic pain relieving effects which transferred by central nervous system. Due to their anaesthetizing effect, they can also be castoff as doping in sports that require accuracy. Which may thereby improve performance (Bird et al., 2016; WADA prohibited list at all times 2020; Rahula & Simula 2020; NADA 2020). Total 0.73% cases were reported positive result for narcotics. Maximum cases were reported positive in the year of 2017 (1.73%). The most detected narcotics were morphine, oxycodone, methadone, oxymorphone from there more than 50% reported positive result getting from morphine (33 to 70%).

S_8: Cannabinoids

Cannabinoids included cannabis products, natural and synthetic Cannabinoids which is still banned from competition due to their relaxing properties. In 2020 prohibited list its divided into three subcategories Cannabis and

its products, Natural and Synthetic THC (Tetra Hydro Cannabinols) and Synthetic Cannabinoids that mimic the effect of THC. Total 12 such substances were included in this category (Other substances with similar chemical structure) but not limited to (WADA prohibited list documents 2018,2020). Cannabinoids interfere with the perception of time, place, speed and distance. Combined with the impairment of coordination, reaction time and memory resulting from CNS suppression, this usually results in impaired athletic performance. One of the reasons why cannabinoids are prohibited is that they are considered to be contrary to athletic ideals (Bird et al., 2016; WADA prohibited list at all times 2020; Rahula & Simula 2020; NADA 2020). Average 5.73% positive result detected on cannabinoids from 2009 to 18. 94% to 99% used cannabinoids were carboxy- THC (11 nor 9-carboxy-delta-9-tetrahydrocannabinol). From 2018 synthetic cannabinoids were came under a new heading because it's a one of the main classes of novel psychoactive substances that have constantly emerging new drugs and changing availability.

S_9: Glucocorticoids

Glucocorticosteroids first prohibited in sport in 1985. In 2015 Glucocorticoids modified from Glucocorticosteroids to reflect current nomenclature and use. Total 11 example of such substances were included in this category (Other substances with similar chemical structure) but not limited to (WADA prohibited list documents 2018,2020). In large doses, glucocorticoids may increase the body's ability to endure exertion. However, there is no clear evidence that glucocorticoids improve athletic performance. All **glucocorticoids** are prohibited when administered by oral, intravenous, intramuscular or rectal routes. Glucocorticoids are steroid hormones, closely related to cortisol, that bind to the glucocorticoid receptor which is almost ubiquitous in every vertebrate animal cell. The name of this class of hormones derives from their role in glucose metabolism, their synthesis in the adrenal cortex and their steroidal structure, which have an anti-inflammatory and immunosuppressive role. They are used to treat overuse injuries of muscles and muscle–tendon junctions or insertion tendopathies. In sport they are 'banned in competition due to their effects on pain relief and perhaps fatigue, which may aid performance. They but may also exacerbate injury to the damaged tissues as the person is able to continuing loading the tissue in the absence of pain that would normally cause cessation of the activity. In a recent unpublished international survey of medical doctors working with elite athletes, over 85% reported that they have atleast occasionally administered injectable Glucocorticoids as part of their normal practice(Dvorak et al, 2006; Pigozzi et al., 2012; Vernec et al., 2020; Bird et al., 2016; WADA prohibited list at all times 2020; Rahula & Simula 2020; NADA 2020). Average 5.85% positive result detected on Glucocorticoids from 2009 to 18. It was the 4th highest detectable positive agents after AAS, stimulants and diuretics. The most usable or detectable substances of Glucocorticoids were prednisolone, triamcinolone acetonide, prednisone, betamethasone, budesonide. From 2009 to 2014 most usable and detectable Glucocorticoids was budesonide (40% to 45%) after that its detection rate suddenly falls between 0.5 to 2% from 2016 to 2018. It's may be due to the precise detection method of this agent. Plot 2.3 revealed that there was a tendency of prednisolone, triamcinolone acetonide, prednisone, betamethasone to constantly move towards the top from 2009 to 2018.

P_1: Beta blockers

Beta blockers, also known as beta-adrenergic blocking agents, are drugs that block norepinephrine and epinephrine (adrenaline) from binding to beta receptors on nerves. By blocking the effect of norepinephrine and epinephrine, beta blockers reduce heart rate; reduce blood pressure by dilating blood vessels; and may constrict air passages by stimulating the muscles that surround the air passages to contract. Beta-blockers are used for treating hypertension and to prevent a relapse of myocardial infarction. Their effect, which tranquillizes the CNS and reduces the heart rate and tremors, can improve performance in sports that require concentration, calm nerves and steady hands. Beta-blockers are prohibited only in certain sports like Archery, Automobile, Billiards (all disciplines), Darts, Golf, Shooting, Skiing/Snowboarding, Underwater sports etc. (ISSF 2009; Bird et al., 2016; WADA prohibited list at all times 2020; Rahula & Simula 2020; NADA 2020). 0.48% of total detected agent was beta blocker. The maximum reported beta blocker were propranolol, bisoprolol, metoprolol, atenolol.

In 2018 after a careful consideration Alcohol was excluded from the prohibited list.

M_2: Chemical and Physical Manipulation

Chemical and physical manipulation refers to tampering with a sample taken as part of the antidoping testing procedures, in order to alter its integrity and validity. It also includes the adulteration of samples by the addition of proteases and other chemicals that alters parameters of the steroid profile, a characteristic that appears to be relatively consistent within individuals, but is altered by the use of doping agents. Intravenous infusions, catheterization or injection of total 50-100 ml/6-12-hour period are prohibited except for those legitimately received in the course of hospital treatment, surgical procedures or clinical investigations (IRISHSC, 2008; Mottram, 2012; Bird et al., 2016; WADA prohibited list at all times 2020; Rahula & Simula 2020; NADA 2020). Average 2 to 3

cases (0.06%) reported positive for Chemical and physical manipulation. Maximum 6 cases reported in the year of 2010 and 4 cases reported in the year of 2016.

M_3: Gene and Cell doping

From 2019 Gene doping considered as Gene and Cell doping (M_3). The current human gene map for performance and health-related fitness phenotypes identifies over 200 genes that appear to be associated with athletic performance: some phenotypes favoring endurance, while others favor strength, anaerobic power and sprinting. The means by which this new genetic material gets into the cells is usually via a viral vector with the virus being introduced into the body via injection or nasal spray. Once in the target cells the introduced genetic material will be activated to produce the mRNA and protein that the cell/body currently lacks. To date there are relatively few examples of effective gene therapy, but as a concept it has great potential. In a sporting context, the principles of gene therapy have been foreseen as having the potential for abuse as a doping procedure. Genetic material can be introduced into a cell either *in vivo* or *ex vivo.* The *in vivo* strategy is direct gene delivery into the human body, i.e., into main blood vessels or the target tissue/organ. In indirect DNA transfer strategy, i.e., *ex vivo* gene delivery, cells are collected from the body of the patient, and then, after genetic modification, breeding and selection, are reintroduced into the patient's body. Erythropoietin (EPO), human growth hormone (hGH), insulin-like growth factor-1 (IGF-1), peroxisome proliferator-activated receptor-delta (PPAR δ), and myostatin inhibitor genes have been identified as primary targets for doping and this recombinant proteins threaten to help make good on a promise of the "super athlete" at the cost of sports ethics (Pérusse et al., 2003; Azzazy *et al.*, 2005; Pray, 2003; Brzeziańska 2014; Bird et al., 2016; WADA prohibited list at all times 2020; Rahula & Simula 2020; NADA 2020).

AFP (2019) reported in an article that doping cases in international sport rose 13% in 2017 against the year of 2016. It said the cases in 2017 involved people from 114 nationalities, across 93 sports. Italy had the largest number of infractions, at 171, followed by France at 128 and the United States with 103. Brazil had 84 and Russia 82, China (62), India (57), Belgium (54), Spain (52) and South Africa (43) complete the list of the ten nations most affected by doping in the world. The World Anti-Doping Agency (WADA) on 9th December, 2019 banned Russia from major global events – including the 2021 Tokyo Olympics (After rescheduling due to COVID19 pandemic) and the 2022 World Cup in Qatar – for four years. Bodybuilding had the most violations, 266, followed by athletics which had 242 and cycling with 218. Football (78) and rugby (54) come 6th and 8th respectively. For increasing the positive doping result and detection of the prohibited substance number of sample study further increased. For observing the abnormality in athlete's biological profile WADA kept Athletes Biological Passport (ABP). Follow up testing was very important. For instance, WADA collected around 1100 sample during 2008 and 2012 Olympics and approximate 100 athletes result were proved positive and 75 medal had withdrawn (Mazanov & Huybers, 2010). At the same time out of competition testing, whereabouts testing and testing at night between 11 pm to 6 am any day is very necessary to receiving fruitful result (World Anti Doping Agency, 2015; Westmattelmann et al., 2018).

Indian perspective

Singh 2018 published an article in Hindustan Times that there was a significant improvement from the period between 2013 and 2015 when India was ranked third in the WADA list of dope cheats. However, the improvement in 2016 could be misleading as the total tests conducted were far less than the previous years. Express News Service (2019) published a report of the World Anti-Doping Agency consisting of dope infractions recorded in 2017 across the world has revealed that the country was fifth-highest when it came to total number of positive dope tests in AAF, while it was seventh-highest in the list of Anti-Doping Rule Violations (ADRV). The report stated that the French Anti-Doping Agency had the highest number with 164 AAF followed by USA with 136. Only China (84) and Italy (75) had more cases of doping in 2017 than India with 71. Out of this, 57 were registered as ADRVs. But an even more worrying statistic is that India's 71 dope cases came from a much lesser number of samples collected. While the French anti-doping agency collected 7276 samples, USA collected 9820 and China 11049. The National Anti-Doping Agency's 3174 samples collected samples in comparison to these numbers. In the same list for 2016 shows that India had occupied the same spot with 73 positive tests from 2831 samples collected. In the year of 2018 – 19 total 187 AAF getting from 4348 test results, from their 18 were considered as TUE and total 81 cases were decided to imposed applicable sanction (NADA report, 2018). As revealed from this observation that the number of dope cases registered by NADA has risen sharply. The first eleven months of 2019 alone saw Indian athletes fail 156 dope tests, a cause for concern ahead of an Olympic year.

From this study it was understood that WADA still fight against the tendency of antisocial activities to fulfill the goals of some social people in the society. It was proved that for transparent sports WADA gradually developed and modified the science and technologies (Bowers, 2009). Collapsing the unfavorable scientific and technological development was not possible without changing the human psychosocial behavior. No athletes ever

enter into the world of sports relying on doping. It was not possible to implement this kind of activity without the technical advice, guidance and research of experienced people in the world of sports. Only the closest people influence or pressurized an athlete for taking performance enhancement substances. The main faces among them were the coach, sports physician, sports scientist, personal doctor, instructor, friends, fellow athletes and family members (Wichstrom & Pedersen, 2001; Tokish et al., 2004). According to the present investigator more emphasized on moral development and severe punishment for criminal acts after identify all those athletes and people who help for doping.

After 21 years WADA was now in its adolescence in other wards it constantly trying to find and apply different type of new technology's detection method. They were trying find out advance detection methods of those substances whose detection still not well established or well developed. Still working on how to diagnose the prohibited micro doses of different substances. Apart from that WADA constantly working on to innovate the standard diagnostic method of new application of evil technologies as a challenge. So the expert person and agencies in the sports world were well aware about all the loopholes and abandon the social and moral legitimacy and rules for their own self-interest. As a result, there was a little risk for further detecting. From here it was understood that it was not only a task of a single organization like WADA to prevent any antisocial and illegal activities but also made work fruitful by the surrounded cooperating societies.

An athlete was motivated to achieve the goal in two ways firstly from one previous performance level and secondly from compare to others or better to others. Fist one deal with the intrinsic or task oriented motivation and second one related with ego centric or extrinsic motivation. In first case it was observed that lower doping intention behavior and attitude of a mastery oriented athletes because they were more focused on practice, perfection, health, time table, life style and discipline. But if one gives more priority to second one or ego centric performance then tendency to use any harmful means to fulfill the purpose where the tendency to exalt oneself from society (Mudrak et al., 2018). Then one can go through breaking laws, legal sanction, social disapproval and ignores social difficulties and added extra advantage beyond one natural ability compare to some honest athletes, for fulfill materialistic drive or extrinsic motivation. Above all one's force to behave by sacrificing self-esteem, morality, guilty feeling and harming to health. However, one's behavior entirely depends on individual perception. In a particular situation perception was affected by severity of punishment, weak or strong rules and regulation, previous experience, confidence level, strength and weakness of the athlete like self-esteem (High or low), anxiety level, pressure, self-regulation, self-determination, professional dignity, what is the legal validity of the organization to the individual and type of drug acceptability depending on situation. Behavior and perception of an individual effected by one attitude, moral value, sense of wellbeing and education. There was established relationship proved among education and moral reasoning and attitude change. For this reason, present investigator suggests that as soon as the athlete set the foot on the ground, those who are stand near by this sports person, specially the physical education teacher, coaches, instructor, doctor and family members developed the moral value through educate the sports person by following the pedagogical principle and embedded in one's moral sense that doping is not an option (Wichstrøm & Pedersen, 2001;Donovan et al., 2002; Tokish et al., 2004; Sutton, 1992; Strelan & Boeckmann, 2003; Petróczi et al., 2008; Mazanov & Huybers, 2010; Sánchez & Zabala, 2013; Reardon & Creado, 2014; Mudrak et al., 2018).

IV.CONCLUSION

From this study it was understood that it was not only a task of a single organization to prevent any illegal activities but also made work fruitful by the surrounded cooperating societies and those who are stand near by this sports person, developed the moral value through education and embedded in one's moral sense that doping can never be an option to achieve accolades. In addition to that number of sample study gradually increase, different type of detection method was launched which is showing hope.

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