A CROSS-SECTIONAL STUDY ON KNOWLEDGE AND PERCEPTION ON DOPING AMONG UNDERGRADUATE PHARMACY STUDENTS IN UNIVERSITY OF CYBERJAYA

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DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. This thesis has not been submitted to any other academic institutions or non-academic institutions for any other degree of qualification.

In the event that my thesis be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and agree to be subjected to the disciplinary rules and regulations of University of Cyberjaya (UoC).

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ABSTRACT

Background: Sports can be really beneficial for our healthy body and mind. While in sports competition, due to obsession and passion to win, it has been stained by the involvement of doping. Doping eventually may cause various short and long term adverse effect towards the user. Complication and deterioration of body health may give impact towards our healthcare and sports achievement. As an undergraduate Pharmacy student, the future pharmacist are healthcare provider that may directly or indirectly involve in medical assisted doping Therefore, every Pharmacy students should have been educate comprehensively in this field. This knowledge gap needs to be addressed, in line with the efforts toward developing our national sports. **Objectives**: This study aimed to assess the knowledge and perception on doping among undergraduate Pharmacy students and identify the association between knowledge and perception of doping among them. **Methodology**: A cross-sectional study involving undergraduate Pharmacy students in UoC, Selangor between April and December 2022 was conducted where their knowledge and perception of doping were assessed using self-administered questionnaires that were adopted and adapted by previous study. **Results**: The total of 168 respondents had completed the questionnaire. Majority of the respondents has poor knowledge on doping (n = 132, 78.6%) even most of the respondents has previous history of heard about doping (n = 134, 79.8%). However, perception level showed neutral perception towards doping (n = 123, 73.2%). This study had also found that there was a weak correlation between knowledge and perception towards doping in the studied subjects and the correlation is statistically significant (p = 0.05). **Conclusion**: This study reveals that undergraduate Pharmacy student of UoC, Selangor has poor level of knowledge on doping. In contrast, a majority of the respondents displayed a neutral perception towards doping. Thus, this study has revealed a gap that can be observed as it is ironic that someone who will provide healthcare in future does not understand doping well.

ABSTRAK

Latarbelakang: Sukan boleh menyumbang kepada kesihatan jasmani dan rohani yang baik dalam kehidupan seharian. Malangnya, wujud penglibatan penggunaan doping dalam pertandingan sukan natijah daripada sikap tamak haloba untuk memenangi pertandingan tersebut. Penggunaan doping boleh mengakibatkan perlbagai kesan sampingan jangka masa pendek dan panjang. Komplikasi dan kemerosotan tubuh pengguna akhirnya hanya memberi beban kepada sistem kesihatan serta mengakibatkan kemerosotan prestasi dan pencapaian sukan. Sebagai pelajar Sarjana Muda Farmasi, yakni pelapis Pegawai Farmasi di masa hadapan, perlulah dididik dengan pengetahuan yang mendalam terutamanya tentang doping. Jurang pengetahuan ini perlu dimurnikan selari dengan usaha memajukan sukan negara. **Objektif**: Kajian ini dijalankan bagi menilai tahap pengetahuan dan persepsi terhadap doping dalam kalangan pelajar Sarjana Muda Farmasi disamping mengenalpasti perkaitan antara tahap pengetahuan serta tahap persepsi terhadap doping dalam kalangan pelajar Sarjana Muda Farmasi di UoC, Selangor**. Kaedah:** Kajian rentas keratan yang melibatkan pelajar Sarjana Muda Farmasi di UoC,Selangor dalam tempoh antara April sehingga Disember 2022 telah dijalankan bagi menilai pengetahuan dan persepsi terhadap doping menggunakan boring kaji selidik yang telah diadaptasi oleh kajian-kajian terdahulu. **Keputusan:** Seramai 168 responden telah melengkapkan borang kaji selidik. Majoriti responden menunjukkan tahap pengetahuan yang rendah tentang doping (n = 132, 78.6%) walaupun mempunyai sejarah pernah mendengar tentang doping (n = 134, 79.8%). Namun,tahap persepsi terhadap doping berada pada tahap neutral (n = 123, 73.2%). Kajian ini juga menemukan bahawa terdapat hubungkait yang lemah di antara pengetahuan dan persepsi terhadap doping dalam kalangan subjek dan secara statistiknya, hubungkait tersebut adalah signifikan (p = 0.05). **Kesimpulan:** Kajian ini telah mendedahkan bahawa pelajar Sarjana Muda Farmasi di UoC, Selangor memiliki tahap pengetahuan yang rendah terhadap doping. Sebaliknya, majoriti responden mempamerkan tahap persepsi yang neutral terhadap doping. Oleh itu, kajian ini mengesahkan lagi jurang yang perlu diberi perhatian kerana ironinya responden merupakan pelapis penajaga kesihatan di masa hadapan akan tetapi kurang memahami doping dengan lebih baik.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

CRERC	Cyberjaya Research Ethics Review Committee
WADA	World Anti Doping Agency
ADAMAS	Anti Doping Agency Malaysia
UoC	University of Cyberjaya
WHO	World Health Organization
TUE	Therapeutic Use Exemptions
ADRV	Anti-doping Rule Violation
JADA	Japan Anti Doping Agency
AAS	Androgenic-anabolic steroid

LIST OF SYMBOLS

e	Level of precision
n	Sample size
P	Expected % population proportion
SD	Standard deviation
Z	Statistics for the level of confidence
=	Equal to
>	More than
<	Less than
%	Percentage

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background of Study

The term ‘doping’ is notoriously used in the world of sports across the world. An English dictionary elaborated that the term ‘doping’ was first introduced in the year 1889. Originally, it was a potion containing opium used to dope horses. Dope or *‘doop’* in Afrikaans or Dutch was a spirit made from leftover grapes that Zulu warriors used as a stimulant during battles and religious rituals. Subsequently, the term ‘dope’ came to mean more generally as a stimulant beverage. In the 1900s, the phrase began in the English Turf Sport, referring to the illicit use of drug in racehorses (Rudhard, 2010). In modern times today, the term ‘doping’ can be defined as the use of illegal drugs to improve the performance of a person or an animal in a sports competition.

Doping in sports is generally acknowledged as the use of performance – enhancing substances, especially those prohibited by the authorities and/or event organizers. Doping in a biological view, is a complex issue that affects multiple body systems including the cerebral, metabolic, cardiovascular, respiratory, and haematological systems, not even including future concerns that relate to its effects on the user’s genetics (Giuseppe, 2008). According to an article by Mehmet Unal. (2004), gene or cell doping is the scientific use of genes, genetic elements or cells that might be able to maximize athletic performances.

In doping, the use of performance-enhancing drugs (PEDs) is to gain an advantage in competitive sports. According to an article by Pope *et al.*, 2014, PEDs are pharmacological agents used to enhance performance. According to the World Anti-

Doping Code International Standard Prohibited List 2023, prohibited substances are divided into substances & methods prohibited at all times and substances & methods prohibited in-competition. At all times, prohibited substances include anabolic agents (Ex: Testosterone), peptide hormones, growth factors, related substances and mimetics (Ex: Chorionic gonadotropin – hCG & luteinizing hormone – LH), β-2 agonists (Ex: Salbutamol), hormone & metabolic modulators (Ex: Hepatocyte growth factor – HGF) as well as diuretics & masking agents (Ex: Frusemide). Prohibited methods include manipulation of blood & blood components, chemical & physical manipulation, gene & cell doping. In-competition, prohibited substances include stimulants (Ex: Amphetamine), narcotics (Ex: Morphine), cannabinoids (Ex: Cannabis), glucocorticoids (Ex: Dexamethasone). Prohibited substances for particular sports include β-blockers (Ex: Metoprolol).

The most frequently used PED would be androgenic-anabolic steroids (AAS), which help increase muscle mass and reduce fat mass that enhances a weightlifter's athletic performance. Clenbuterol, a β2 agonist, and the hormone insulin are proven to have some anabolic effects, while stimulants have some fat-burning properties in addition to improving cognitive abilities. Besides enhancing performance, the use of PEDs also help in preventing detection of such prohibited substances during drug control test. For example, a diuretic such as Frusemide aids in enhancing elimination of prohibited substance from body during urine test, increasing a risk for drug to be undetectable.

In accordance with the definition from the World Anti-Doping Agency (WADA), there are three actions that can lead to an 'anti-doping rule violation'. The actions include if an athlete's bodily specimen contains a prohibited substance, if an athlete has used or attempted to use a prohibited substance, or if an athlete has refused to submit sample for collection after being notified as permitted by applicable anti-doping rules, or evading sample collection (Giuseppe, 2008).

Despite their beneficial effects on athletic performance, prohibited substances and PEDs have the potential to cause mild to severe adverse effects that may or may not jeopardize an athlete's career. An article by Momoya *et al.*, 2015, different substances could harm the normal physiology of a body in different ways. For example, side effects of AAS range from mild issues such as acne, testicular atrophy and gynecomastia to life-threatening conditions such as cardiovascular diseases, arrhythmias, stroke, blood clots, liver dysfunction, and cancer. Reported effects of human growth hormone (hGH)

include cardiovascular disease, hyperlipidaemia, and insulin resistance. Serious adverse effects of stimulants such as amphetamine include heat exhaustion, arrhythmias, seizures, hallucinations, and dependence.

Despite the many definitions for the general term 'doping' from multiple sources, most published articles state that young athletes have a medium level of knowledge on doping, and many would still consume prohibited substances if they knew they would not get caught (Chiang *et al.*, 2018). These statistics create cause for concern, which is why it is important that medical professionals involved in sports like physicians, physical therapists, and sports pharmacists are qualified to assist athletes and sports agencies with formal training and exposure.

Pharmacists play an important role in preventing a rise in doping incidents amongst athletes and people who exercise, whether during an event's season or off-season when an athlete is in training. According to the International Pharmaceutical Federation Guidelines, their various roles include keeping up-to-date with the contents of the WADA code, promoting the benefits to health of exercise, including the participation in sporting activities, remaining vigilant to differentiate between the justified use of medication and illegitimate practices, refuse to supply a medicine when it is clearly intended to be used to improve performance illegally, ensure athlete's medication record is up-to-date including what kind of sports activities they participate in, providing information to athletes and help them recognise which medicines contain a substance included in the prohibited list in the WADA Code as well as providing information to athletes on the benefits of nutritional supplements and the risks associated with using them.

A prime example of a pharmacist's importance in anti-doping practices is stated in an article by Vinod *et al.,* 2019, pharmacists dispensing, consulting, or prescribing to athletes who are subject to drug testing must take responsibility for knowing what substances are banned, permitted, or restricted by the athlete's specific sports-governing agency (or agencies), and prevent them from inadvertently taking medications that are not permitted during or out of competition.

Other roles of sports pharmacists include assisting athletes for a Therapeutic Use Exemption (TUE) application. According to an article by Gerrard & Pipe, 2017, the

purpose of a TUE application provides a specific mechanism by which permission is granted to use a prohibited substance or method where that use could be demonstrated to be necessary for the appropriate treatment of a documented clinical condition. For example, a diabetic athlete may need to apply for a TUE to get approved use of insulin, which is normally a prohibited substance under the jurisdiction of WADA. In conclusion, the role of sports pharmacist involves a wide field of medication management and the navigation of how to avoid prohibited substances with safer alternatives to prevent an anti-doping rule violation (ADRV).

That is why in the workplace, a future pharmacist in the field might encounter various scenarios when providing care to the public, and some might be related with one's doping practices. With the practice of pharmacy rapidly changing, the hope is that future pharmacists look for opportunities to find niche roles in their practice (Scott M. *et al*., 2014). Thus, the aim of this research is to highlight the knowledge and perception on doping among Bachelor of Pharmacy student in University of Cyberjaya (UoC) since such studies are still scarce in Malaysia.

1.2 Literature Review

1.2.1 Introduction

There is no doubt that sports have become increasingly significant nowadays, with athletes being influence with the need to exponentially grow in speed, skill, and talent. No matter what kind of sports, athletes struggle to strive for the best and do so in ways that could be appropriate or illegal, all to enhance their own performance. The usage of drugs in sports worldwide is not a new phenomenon.

There is no shortage to incidences of doping from all around the world, from thousands of years ago. The aim of the drugs used are to improve an athlete's performance, since the 3rd BC (Muller, 2010). Currently, doping has become a real concern due to the rise of doping abuse incidences among athletes. A lot of doping cases related to the misuse of drugs have been reported in the past few years. For instance, Russian athletes were banned from competing in major international competitions from 2020 – 2023, including the 2020 and 2022 Olympics, FIFA World Cup, the Youth Olympic Games,

and the Paralympics. This was because the country was operating a state-sponsored doping scheme at the 2014 Sochi Games. In Malaysia, there have been some doping cases reported among young athletes. Incidents of sports doping in Malaysia include two archers consuming Sibutramine, another two weightlifters consuming anabolic steroids and a boxer who was traced for the presence of diuretics.

Young athletes are at high risk of being exposed to this kind of drug abuse. A study reported that the prevalence of doping especially with anabolic steroids by athletes or non-athletes, is higher among adolescents for a better sports performance and appearance purposes (Calfee & Fadale, 2006). Hence, the act of doping should be stopped immediately because it may affect the career of such young and promising athletes in the future. With that knowledge in mind, pharmacists are clearly responsible for educating the public and athletes on the use of drugs in sports. Even though there are many studies done overseas to assess the knowledge and perception among pharmacy students to tackle the problem, there is a lack of studies on this topic among local pharmacy students in Malaysia, especially in institutions offering Sports Pharmacy in their academic syllabus.

1.2.2 Knowledge of Doping Among Students

It is believed that the level of knowledge for doping is low among students in the world. Most only knew the word doping but were never exposed to any classes related with doping. A study by Shibata *et al.*, 2017 expressed that over half of its study's respondents did not know that unintentional doping is the most common doping violation in Japan. In Spain, Aguilar et. al., 2022 stated that the basic knowledge level of AD among Bachelor of Sports Science students was suboptimal. On the other hand, Malaysian students have shown a moderate level of knowledge on doping (Chiang *et al*., 2018). These findings show the need to improve everyone's level of knowledge for doping by establishing more educational courses on drugs in sports.

Most athletes think that anti-doping (AD) education is not applicable for them since it is only done by international level athletes and that only elite athletes participating in international level are required to undergo doping control tests. Therefore, many local athletes assume AD education does not apply to them. However, the truth is that AD education procedures should be taught to athletes of all levels since understanding about doping is part of the rules of sport. Understanding and complying to AD rules

are important for every athlete regardless of their competitive level (Morente, 2013). Currently, the actual knowledge level of AD education among athletes is not well known, which could be because there are no standardized investigative methods of AD knowledge level. Meanwhile, in an article by Henning, 2014, he proposed an AD approach based on health promotion in amateur-level competitions. This approach mainly emphasized the importance in providing general AD educations to local athletes. For the implementation of AD education at the international level, it was suggested to begin from as young age as possible as a prophylaxis step to create an environment without doping (Murofushi *et al.,* 2018). This is a milestone step taken by WADA in increasing educational awareness focused on self-integrity against the illegal act of doping.

A study of final-year students in seven Malaysian universities aimed to measure the knowledge, attitude, and perception of pharmacy students in Malaysia towards doping in sports. Most respondents were female, had a Cumulative Grade Points Average of 3.00–4.00, watched sports programs, played sports regularly and attended courses related to drugs in sport. Respondents had a moderate level of knowledge (median score of 5 ± 2). There was a significant difference in the level of knowledge between respondents who did and did not attend courses on drugs in sport ($p < 0.01$). Generally, respondents had negative attitudes towards statements on doping in sports. Respondents also had a good perception of the need to implement doping prevention initiatives. Studies like these in Malaysia have proven pharmacy students do have some knowledge on anti-doping practices, but they can always be improved to ensure they have proper knowledge and qualification as sports pharmacists.

WADA plays a vital role in ensuring all athletes are free from any prohibited substances or do not participate in any prohibited methods in sports. For example, the WADA Code 2015 announced the launch of an e-learning education system, 'Athlete Learning Program about Health and AD (ALPHA)'. ALPHA mainly consists of a few categories including the doping control process, whereabouts of athletes, therapeutic use exemptions (TUE), results management, medical reasons not to dope, practical help to stay clean and how to deal with pressure. All the main components listed was deemed necessary, aiming for athletes to acquire appropriate AD knowledge and evaluate the degree of their AD knowledge based on the Code.

Despite WADA's efforts to spread awareness on the importance of AD practices, previous studies show most students have insufficient knowledge on doping and AD

practices. Therefore, further studies are needed to improve the mechanisms in elevating level of knowledge of doping among athletes in Malaysia.

1.2.3 Impact of Doping

The intentional use of doping is mainly to boost and enhance performance in sports. There are various type of doping methods used nowadays. Uncontrolled doping and consuming prohibited substances without proper monitoring might lead to serious adverse effects on one's health. Even though doping is perceived to empower sport performance, it also could slowly cause short and long-term effects on the athletes. Short-term effects are usually manifestation of the prohibited substance's side effects. Insomnia, flatulence, anorexia, and gastrointestinal disturbances are the most common side effects that can be immediately experienced by the user. Other perceptions in doping, or the illegal consumption of prohibited substances like anabolic androgenic steroids and peptides, are used to enhance growth and strength of skeletal muscles. However, their negative consequences on cardiac muscles are highly important notice. Androgens promote hypertrophic changes through the androgenic receptors within cardiac myocytes ending by left ventricular hypertrophy and decreasing ejection fraction (Badr el Dine & Attia, 2022). Besides that, undesirable mental health outcomes like suicidal intentions, uncontrolled aggressive behaviour, or even criminal offenses have been linked to the continuous non-therapeutic use of anabolic androgenic steroids (Klötz *et. al.*, 2006).

History has shown the severity of doping and how its adverse effects can harm. For example, British cyclist Tom Simpson passed away during the Tour de France on July 13, 1967, as he pedalled up Mont Ventoux on an extremely hot day. Simpson's cause of death was listed as a heart attack due to dehydration. However, there were tubes of amphetamines in his jersey and an autopsy found traces of amphetamines. An official report related that the drugs Simpson took made it possible for him to push himself into an overworked and dehydrated state. Besides that, East German athletes forced to take steroids as part of a state-sponsored doping program suffered a host of physical maladies, and 30 years later, still suffer from the effects and seek compensation for the damages to their bodies. Hepatitis, heart disease, liver tumours, and liver cancer were among the consequences. Women who received injections or ingested synthetic testosterone also had physical side effects such as acne, deepened voices, excess growth of leg hair and pubic hair, and enlarged clitorises. Some female athletes gave birth to children with club feet or other defects.

Every athlete dreams to be on top of the podium. The 'promising effects' of performance enhancers eventually cause some of them to take a shortcut by consuming prohibited substance without considering the bad impacts the substance brings, short or long-term. Worst case scenario, athletes are so eager to get faster and sooner, the continuous usage of performance enhancers without consultation while neglecting their instructions of might lead to fatality due to overdosage. As pharmacists are responsible for most medication management, the play a vital role in this topic and must equip themselves with good knowledge on doping practises to tackle and prevent the misuse of prohibited substances and educate the public via campaigns to increase awareness on the dangerous uses of prohibited substances. Therefore, further study can be done on Bachelor of Pharmacy in University of Cyberjaya (UoC) to determine the gap in this field.

1.2.4 Exposure to Doping Among Students

Exposure to a Sport Pharmacy course is a good initiative to prepare future pharmacists to become qualified healthcare providers. It is even more important since most doping substances were obtained from a pharmacy. Knowing the basics of doping practices and substances might help prevent doping incidents in sports. Professionalism and working in accordance with the Code of Ethics are important in ensuring and preventing any illegal dispensing of prohibited substances. Besides that, a course in Sports Pharmacy could also be a good medium in spreading awareness to future pharmacist on how to be an ethical with the highest integrity by not supplying any prohibited substances to be abused by athletes.

A cross- sectional survey conducted amongst undergraduate pharmacy students in Qatar aimed to assess pharmacy students' knowledge and perceptions of doping and anti-doping in sports and to explore the curricular needs for undergraduate pharmacy in the field of sports pharmacy. 80 respondents completed the online survey (80% response rate). 60% were unaware of WADA while 85% were unaware of the International Pharmaceutical Federation's statement on the pharmacist's role in anti-doping. Students' knowledge score regarding the prohibited status of drugs that may be used by athletes was around 50%. Fourth-year pharmacy students had significantly higher knowledge scores than the other groups of students. Respondents acknowledged the important roles of health care professionals, including pharmacists, as advisors on the safe and effective use of drugs in sports. 90% of the students supported the inclusion of sports pharmacy in the curriculum. The likely conclusion drawn here is that the

contents of exposure play a role in upcoming pharmacists knowledge regarding doping and AD practices, hence why sports pharmacy curricula needs to be enhanced to ensure proper education is received.

In a study conducted among Syrian pharmacy students, more than 90% did not appear to know that narcotics, β-blockers, and diuretics were used in sports as doping agents (El-Hammadi and Hunien, 2013). This is a cause for concern, as pharmacists are also responsible for providing medication counselling with patient-specific care to everyone. Some athletes may already be consuming medication for their acute or chronic conditions as prescribed by their doctor. However, they might not be aware that the medication they are taking is categorised under the list of prohibit substance in AD rules. This scenario will lead the athletes to failure in adhering to the AD rules and will consequently be disqualified from the sports event. In another study by Awaisu *et al*. (2015), a cross-sectional survey in Qatar University College of Pharmacy was used to assess pharmacy students' knowledge and perceptions of doping and anti-doping in sports to determine the necessity for an undergraduate sports pharmacy course. 60% of respondents were unaware of WADA, while 85% were unaware of a statement from International Pharmacy Federation's (FIP) that highlighted pharmacists' role on anti-doping. 90% of respondents indicated a strong desire to play their role in doping prevention and ensuring the safe and rational use of drugs among athletes, suggesting requiring an education and training strategy for sports pharmacy in undergraduate pharmacy curricula. A study in Jordan by Jaber *et al.* (2015) researched a different but relevant phenomenon, which was the knowledge and attitude and opinion of final year undergraduate and postgraduate pharmacy students on inappropriate drug use in a university campus. The questionnaire inquired about the respondents' demographic details, education level and any experience they might have had with drug misuse or

abuse. It also inquired about the students' knowledge, attitude and practice regarding the identification, prevention and management of drug misuse and abuse. The results showed most students agreeing that all pharmacy staff must be trained on recognizing drug abusers, the types of drugs abused locally and methods of dealing with drug abusers.

Thus, the implementation of AD education, specifically in Sports Pharmacy courses in Bachelor of Pharmacy students in university might be key to producing qualified healthcare professionals with lifelong AD behaviors that focus on prevention via education events. It is believed to be more effective for the youth when perceptions and morals are being built and connected to social skills and personal development (M. Aguilar *et. al.*, 2022). As the Bachelor of Pharmacy in UoC offers the Sports Pharmacy course only for final year students, we can determine the impact of the course towards students' perception on doping.

1.2.5 Exposure to Doping Among Medical Professionals

Medical professionals such as prescribing physicians and pharmacists fall under the category of Athlete Support Personnel (ASP), under the World Anti-Doping Code (WADC). According to the Code, ASP can be defined as "any coach, trainer, manager, agent, team staff, official, medical, paramedical personnel, parent, or any other person working with, treating, or assisting an athlete participating in or preparing for sports competition". The role of ASPs is taken very seriously as any attempt of "administration, attempted administration, assistance, encouragement, aiding, abetting, covering up, or any other type of complicity involving an attempted or actual ADRV, would results in harsh consequences for not only the athlete, but the ASP as well. There have been cases of strict sanctions placed on ASPs. In an article by Riadh & Salleh (2021), it highlighted an incident from the United States Anti-Doping Agency (USADA) where three ASPs, two physicians and one trainer were suspended in relation to an ADRV in 2012. There are other instances of similar banning which include banning of coaches, agents of players, physicians, and ASPs around the world.

Therefore, the role of pharmacists as ASPs but also advocates against AD practices make it important for them to be fully trained and qualified in this topic. A cross-sectional survey conducted in Taiwan was distributed to registered pharmacists in Taiwan. The survey aimed to assess the anti-doping knowledge and educational needs among pharmacists in Taiwan and examines influencing factors. The results showed respondents reported a moderate anti-doping knowledge score ranging from 21 to 48 (out of 51). 15% had the experience of being counselled about drug use in sports. Higher knowledge scores were observed in younger respondents, showing an age-dependent effect ($p < 0.001$). Individuals practicing in southern Taiwan (compared to northern Taiwan) and those working at clinics (compared to hospitals) exhibited lower knowledge. Most of the respondents (90%) knew that stimulant ephedrine is prohibited in sports, but few had recognised diuretic furosemide (38%) and Chinese herbal medicine (7%) containing β2-agonist higenamine. Approximately 90% of respondents agreed with the need for anti-doping education. In conclusion, it is especially important for pharmacists in Asian countries to continuously develop their knowledge and exposure to athlete's use of complementary medication and herbs to prevent an ADRV.

In a study conducted in Iraq, this study aims to explore the knowledge, attitude, and behavior in relation to doping in sports and to understand the individual and social

factors involved in it. The results showed that out of 159 participants, the majority had knowledge of past cases of doping and knew the word “doping” (p=0.026). 56.10% of the male participants and 28.8% of the female participants responded that they have knowledge of past cases of doping (p = 0.002). Most respondents (57.2%) knew that over the counter (OTC) medicines and dietary supplements might contain prohibited substances and 49.1% participants were aware that the name of prohibited substances might not appear on ingredients label (p=0.038). Despite the small number of participants, this study has underlined the need for conducting awareness program at regular intervals regarding doping among pharmacists to ensure they are fully capable to provide the most optimum and legal pharmaceutical care to athletes of all kinds.

In a cross-sectional comparative survey between general practitioners and pharmacists, a study by Auersperger *et al.*, 2011 evaluated the attitudes, level of knowledge and experience among general practitioners (GPs) and pharmacists about doping. Overall, fewer than half (39% GPs vs. 48% pharmacists, P = 0.702) of respondents were familiar with the formal definition of doping. The abbreviation WADA was correctly interpreted by 42% (33% GPs vs. 59% pharmacists, P = 0.003). Overall, 12% of respondents (8.7% GPs, 19.3% pharmacists) reported being directly confronted with a request for prescription of doping agents in the previous 12 months (mainly stimulants, anabolic agents, hormones, corticosteroids). As a conclusion, pharmacists should strive to gain as much knowledge and training to combat ADRVs as general practitioners because pharmacists are also involved in the welfare of athletes.

1.3 Problem Statement

The extensive amounts literature review related to this topic published is evidence more than sufficient to demonstrate the disadvantages of doping. The use of banned substances in sports, commonly known as doping, has been extensively studied, and it has been established that it has both short-term and long-term pharmacological side effects on the individuals who engage in it. This includes the misuse of lifestyle drugs to enhance muscle growth and aid in weight loss. These practices not only pose serious health risks but also have the potential to jeopardize the careers of those involved (Alexander et al., 2019). However, there is a lack of research conducted in Malaysia, specifically focusing on the knowledge and perception of doping among Bachelor of Pharmacy students. This is a crucial area to explore as pharmacists play a vital role in the healthcare system, providing expert advice on pharmaceuticals and medical treatment to prevent the illicit use of substances. Therefore, it is imperative to conduct a study on the knowledge and perception of doping among Bachelor of Pharmacy

students at the University of Cyberjaya, as it can provide valuable insights on this subject matter.

1.4 Objectives

1.4.1 General Objectives

To determine the knowledge and perception level of doping among pharmacy students in UoC.

1.4.2 Specific Objectives

1. To assess the knowledge of doping among pharmacy students in UoC.
2. To determine the perception of doping among pharmacy students in UoC.
3. To identify the association of the knowledge and perception towards doping among pharmacy students in UoC.

1.5 Significance of Study

The objective of this research is to assess the comprehension and viewpoints regarding doping among students pursuing a Bachelor of Pharmacy degree at the University of Cyberjaya (UoC). The outcomes of this study could potentially provide valuable insights that may support the initiation of discussions regarding the inclusion of a Sports Pharmacy course in the Bachelor of Pharmacy curriculum at UoC. Additionally, the aim for the future would be to enhance the understanding and perception of doping among Bachelor of Pharmacy students, who will eventually serve as healthcare professionals, in order to prevent instances of doping in sports among both local and international athletes.

CHAPTER 2

METHODOLOGY

2.1 Research design and subject sources

2.1.1 Study design

A cross-sectional study were adopted for this study and were conducted between April 2023 and December 2023. A self-administered questionnaire were utilized for data collection. The study subject were screened for inclusion and exclusion criteria. Information regarding the survey and respondent consensus were obtained before they start to answer the questions.

2.1.2 Study population and setting

The study population were Bachelor of Pharmacy students from Year 1 to Year 4 studying in University of Cyberjaya.

This study was be conducted by using physical questionnaire as the study tool and performed in University of Cyberjaya.

2.1.3 Subject criteria

The subject criteria for the study as below

Inclusion Criteria

- Currently undergoing a Bachelor of Pharmacy study in UoC.

Exclusion Criteria

- Alumni of Bachelor of Pharmacy UoC.
- Respondents who are unable to complete a self-administered questionnaire

2.1.4 Sample size

Sample size calculation were calculated using Cochrane's Formula:

$$n' = \frac{n}{1 + \frac{z^2 * \hat{p}(1-\hat{p})}{\varepsilon^2 * N}}$$

n: sample size (320)

z: 1.96 (for 95% confidence)

p: 0.295 (29.5%) Prevalence of doping (Roger P.J, 2018)

e: 0.05

N: population size (232)

n'= 320/1 + [1.96^2 x 0.295(1-0.295) /0.05^2 x 232]

= 134

Response rate estimated to be 80%

Response rate: Number of responses needed / Expected % response x 100

134 x 1/0.8 = 168

A total of 168 subjects were recruited to consider 20% dropout.

2.1.5 Study procedure

Questionnaires in a form of hard copy and online Google Form were used as a study tool. Non-probability convenience sampling were used as the sampling method in this study. Participants volunteering were screened for eligibility based on inclusion and exclusion criteria. Study subjects that meet the inclusion criteria listed will be selected for this study. Consent (APPENDIX A) was obtained by the researchers upon participant recruitment. A one-time submission is applicable for Google Form.

2.2 Study tools and scoring

2.2.1 Study tools

The questionnaires (APPENDIX B) contained 30 questions which were consisted of 3 validated sections of (1) socio-demographic, (2) information on knowledge about doping and (3) information on perception about doping.

1) Socio-demographic

This section consisted of items of basic information regarding the participant's background including ages, gender, race and year of study.

2) Information on knowledge about doping

This section consisted of 13 items. After conducting a pilot study, it was reduced to 9 items as discussed in Section 2.3. It was divided into 2 domains. Those 2 domains involved were (1) Knowledge on prohibited substances in sports which consisted of 4 items and (2) Knowledge on definition of doping which consisted of 5 items. This section of questionnaire evaluated the level of knowledge about doping which was also adopted and adapted from (Chiang *et al.*, 2018). The questionnaire also does not need any permission as it has been made freely accessible.

3) Information on perception about doping

This section consisted of 15 items. After conducting a pilot study, it was reduced to 14 items as discussed in Section 2.3. This section determined the perception of doping among the students. Both domain was evaluated according to a 5-point Likert using a rating scale from strongly disagree (1) to strongly agree (5). This section of questionnaires was adopted and adapted from (Badr el Dine & Attia, 2022). The questionnaire also does not need any permission as it has been made freely accessible.

2.2.2 Scoring of Knowledge and Perception questionnaire

Respondents answered 4 questions in first domain and 5 questions in second domain of knowledge questionnaire. Assessment of the knowledge is done by respondents cumulative marks obtained. Each correct answer will be granted one mark, while a wrong answer or 'not sure' will be given zero mark. The respondent's score is graded as good for cumulative above 85, moderate if score between 61 and 84, and poor if below 61 as shown in Table 2.1.

Table 2.1: Knowledge Scoring System (Chiang *et. al.,* 2018)

Score (%)	Knowledge
0-60	Poor knowledge
61-85	Moderate knowledge
86-100	Good knowledge

Respondents answered 14 questions to determine respondent's perception on doping. The overall level of perception was categorized according to Bloom's cut-off point shown in Table 2.2 and will be interpreted as negative, neutral and positive perception. For scores of 49% and below, negative perception was assigned. For scores between 61 and 85, a neutral perception was assigned. For scores between 86 and 100, assigned as positive perception towards doping.

Table 2.2: Perception Scoring System (Badr el Dine & Attia, 2022)

Score (%)	Perception
0-60	Negative perception
61-85	Neutral perception
86-100	Positive perception

2.3 Pilot study

The questionnaire were pilot tested among 15 subjects for validation using Cronbach's alpha reliability testing. The purpose is to ensure the questions are clear and can be understand by the study population.

Cronbach's alpha values more than 0.6 are deemed to be acceptable (Griethuiseijan *et al*., 2014). The results of the initial Cronbach's alpha reliability test from the pilot study are shown in the Table 2.3 which revealed total scores for each section. Both of the domain on knowledge of doping construct showed result below the required value. On the other hand, perception on doping construct also resulted a below required value to pass. All of the questionnaire was revised. Reversing the Likert scale code, rephrasing

the items statement and omission of items was done to improve questions reliability as shown in Table 2,4. Omission involved 4 items form information on knowledge of doping and 1 item from information on perception on doping.

Table 2.3: Results of initial Cronbach's alpha reliability test

Construct	Cronbach's alpha
Knowledge of doping	Domain A : -0.124 Domain B : 0.549
Perception on doping	0.647

Table 2.4: Results of revised Cronbach's alpha reliability test

Construct	Cronbach's alpha
Knowledge of doping	Domain A : 0.778 Domain B : 0.685
Perception on doping	0.701

2.4 Data analysis

All collected data was analyzed using IBM Statistical Package for Social Sciences (SPSS) version 27. Descriptive statistics such as frequency and mean were used to summarize the sociodemographic of the respondents.

Pearson correlation was used to identify the association of 2 continuous data between the knowledge and perception among undergraduates Pharmacy students of UoC. The significant level was set at $p < 0.05$.

2.5 Ethical Approval of the Study

This study has obtained ethical approval from Cyberjaya Research Ethics Review Committee (CRERC) University of Cyberjaya (UOC/CRERC/AL-ER (56/2023)).

Participants in the study were provided with the opportunity to voluntarily engage in the research. Their choice to partake or abstain from participation had no influence on their lifestyle. They possessed the liberty to decline answering any inquiries that causes discomfort. The privacy and confidentiality of all participants' information were rigorously upheld and safeguarded. To maintain anonymity, the data was inputted into the SPSS software using assigned index numbers. The researcher placed significant emphasis on securely storing the gathered data.

CHAPTER 3

RESULTS

A total of 168 respondents were interviewed during the study period.

3.1 Socio-demographic data

The demographic data were shown in Table 3.1. The mean age of subjects were 21 years (1.756). Gender distribution revealed (n = 52, 31%) male respondents and (n = 116, 69%) female respondents. Meanwhile, distribution of ethnicity involved was (n = 96, 57.1%) Malay, (n = 49, 29.2%) Chinese, (n = 22, 13.1%) Indian and (n = 1, 0.6%) other ethnicity. On the other hand, in term of academic background comprised of (n = 57, 33.9%) Year 1 students, (n = 48, 28.6%) Year 2 students, (n = 14, 8.3%) Year 3 students and (n = 49, 29.2%) Year 4 students. Among 168 respondents, 134 (79.8%) have heard about doping which the source consisted of (n = 75, 44.6%) from university, (n = 17, 10.1%) from school, (n = 39, 23.2%) from internet and (n = 3, 1.8%) from self-reading.

Table 3.1: Socio-demographic data of study subjects (n = 168)

Demographic items	Frequency (%) (N = 168)	Mean (SD)
Age (years) (n = 168)		20.87 (1.756)
Gender		
Male	52 (31)	
Female	116 (69)	

Table 3.1 Socio-demographic data of study subjects (continued)

Ethnicity (n = 168)		
	Malay	96 (57.1)
	Chinese	49 (29.2)
	Indian	22 (13.1)
	Other	1 (0.6)
Year of study (n = 168)		
	Year 1	57 (33.9)
	Year 2	48 (28.6)
	Year 3	14 (8.3)
	Year 4	49 (29.2)
Heard about doping (n = 168)		
	Yes	134 (79.8)
	No	34 (20.2)
Source of information (n = 134)		
	University	75 (44.6)
	School	17 (10.1)
	Internet	39 (23.2)
	Self-reading	3 (1.8)

3.2 Knowledge of doping

The knowledge of doping items were shown in Table 3.2. Majority of respondents acknowledged that doping involves inadvertent use of prohibited substances by athletes with (n = 127, 75.6%) answered true. Most of the respondents answered true (n = 130, 77.4%) in statement of which doping involves presence of prohibited substances under prohibited list in athlete's urine sample. On the other hand, most respondents (n = 81, 48.2%) were not sure on doping involves tampering with doping sample collection statement. Meanwhile, a big portion of respondents (n = 84, 50%) answered true on statement of ADAMAS abbreviation stands for Anti-Doping Agency Malaysia. Meanwhile, next domain involved in determining the list of prohibited substance listed in WADA. Majority of the respondents answered false for items caffeine (n = 75, 44.6%), protein (n = 80, 47.6%) and paracetamol (n = 91, 54.2%). In contrast, most of respondents (n = 69, 41.1%) were not sure on whether cigarette was listed in WADA prohibited substance list. Eventually, almost half of respondents (n = 89, 53%) answered true considering alcohol as one of the prohibited substance list.

Table 3.2: Knowledge of doping among respondents (n = 168)

KNOWLEDGE STATEMENT		FALSE	NOT SURE	TRUE
Doping involves inadvertent use of prohibited substances by athletes		8 (4.8%)	33 (19.6%)	127 (75.6%)
Doping involves presence of prohibited substances under prohibited list in athlete's urine sample		10 (6%)	28 (16.7%)	130 (77.4%)
Doping involves tampering with doping sample collection		8 (4.8%)	81 (48.2%)	79 (47%)
ADAMAS abbreviation stands for Anti-Doping Agency Malaysia		8 (4.8%)	76 (45.2%)	84 (50%)
Which of the following substance(s) is/are listed on the World Anti-Doping Agency (WADA) prohibited list	Caffeine (Coffee)	75 (44.6%)	62 (36.9%)	31 (18.5%)
	Protein	80 (47.6%)	56 (33.3%)	32 (19%)
	Paracetamol (Uphamol, Paracil, Panadol)	91 (54.2%)	59 (35.1%)	18 (10.7%)
	Cigarette	50 (29.8%)	69 (41.1%)	49 (29.2%)
	Alcohol	32 (19%)	47 (28%)	89 (53%)

The assessment for knowledge of doping score is shown in Table 3.3. Majority of the respondents (n = 132, 78.6%) had scores within 0 to 60, indicating poor knowledge, followed by moderate knowledge (n = 24, 14.3%) and good knowledge (n = 12, 7.1%).

Table 3.3: Knowledge score on knowledge of doping among respondents (n = 168)

Cut off Score (%)	Knowledge	Frequency (n = 168)	Percentage (%)
0-60	Poor knowledge	132	78.6
61-85	Moderate knowledge	24	14.3
86-100	Good knowledge	12	7.1

3.3 Perception on doping

The perception towards doping among respondents are shown in Table 3.4 below. Majority of the respondents agree and strongly agree that doping substances may posing health hazards (n = 132, 80.5%), doping substances are a serious problem in Malaysia (n = 108, 64.3%) and thought that doping is a form of an addiction (n = 112, 66.7%). However, respondents (n = 80, 47.6%) were neutral regarding safety of nutritional supplements as vitamins, minerals and herbs as a doping. Apart from it, most of respondents also neutral to the statement of the risks related to doping are extremely exaggerated, performance-enhancing drug can reduced boredom during training session (n = 75, 44.6%) and the media blows the doping issue out of proportion (n =75, 44.6%). On the other hand, most respondents agree and strongly agree with the statement that safety of amino acids as a supplement within recommended dosages (n = 86, 51.2%), punishment is deserved for doctors who engaged in medically assisted doping (n = 114, 67.9%), doping agents were used to get more muscular body (n = 98, 58.3%), and performance enhancing drugs give the motivation to train and compete at the highest level (n = 78, 46.4%). Furthermore, most of the respondents in some extends disagree and strongly disagree on statement of there is no difference between drugs and other sports accessory that are all used to enhance performance (n = 78, 46.4%), media should talk less about doping (n = 122, 72.6%) and legalizing performance enhancer would be beneficial for sports (n = 66, 39.3%).

Table 3.4: Perception on doping among respondents (n = 168)

Perception statement	Strongly disagree, n = 168 (%)	Disagree, n = 168 (%)	Neutral, n = 168 (%)	Agree, n = 168 (%)	Strongly agree, n = 168 (%)
Do you think doping substances are posing health hazards?	3 (1.8)	6 (3.6)	27 (16.1)	61 (36.3)	71 (42.3)
Do you think doping substances are a serious problem in Malaysia?	0 (0.0)	10 (6.0)	50 (29.8)	74 (44.0)	34 (20.2)
Do you think doping is a form of an addiction?	3 (1.8)	12 (7.1)	41 (24.4)	70 (41.7)	42 (25.0)
Do you think that nutritional supplements as vitamins, minerals and herbs are safe as a doping?	11 (6.5)	23 (13.7)	80 (47.6)	37 (22.0)	17 (10.1)
Do you think that amino acids as a supplements are safe in recommended dosages?	2 (1.2)	10 (6.0)	70 (41.7)	65 (38.7)	21 (12.5)
Do you think that doctors engaged in medically assisted doping should be punished?	3 (1.8)	6 (3.6)	45 (26.8)	70 (41.7)	44 (26.2)
The risks related to doping are extremely exaggerated?	20 (11.9)	32 (19.0)	59 (35.1)	43 (25.6)	14 (8.3)
Performance-enhancing drugs give the motivation to train and compete at the highest level	14 (8.3)	25 (14.9)	51 (30.4)	47 (28.0)	31 (18.5)
Doping agents are used to get more muscular body?	6 (3.6)	10 (6.0)	54 (32.1)	65 (38.7)	33 (19.6)
Performance-enhancing drugs can reduced boredom during training session	19 (11.3)	26 (15.5)	75 (44.6)	36 (21.4)	12 (7.1)
There is no difference between drugs, fiberglass poles and speedy swimsuits that are all used to enhance performance	28 (16.7)	50 (29.8)	64 (38.1)	21 (12.5)	5 (3.0)
Media should talk less about doping	72 (42.9)	50 (29.8)	30 (17.9)	14 (8.3)	2 (1.2)

The media blows the doping issue out of proportion	15 (8.9)	37 (22.0)	75 (44.6)	28 (16.7)	13 (7.7)
Legalising performance enhancer would be beneficial for sports	32 (19.0)	34 (20.2)	54 (32.1)	24 (14.3)	24 (14.3)

The assessment for perception towards doping score are shown in Table 3.5. Majority of the respondents (n = 123, 73.2%) had score within 61 to 85 which indicates neutral perception towards doping, followed by negative perception (n = 42, 25%) and positive perception (n = 3, 1.8%).

Table 3.5: Perception score on doping among respondents (n= 168)

Cut off Score (%)	Perception	Frequency	Percentage (%)
0-60	Negative perception	42	25.0
61-85	Neutral perception	123	73.2
86-100	Positive perception	3	1.8

3.4 Association between knowledge on doping and perception towards doping

The association between level of knowledge on doping and perception level towards doping among respondents are shown in the Table 3.6. It was revealed that there is moderate correlation between knowledge and perception towards doping in the studied subjects and the correlation is statistically significant (p = 0.05).

Table 3.6: Association between knowledge on doping and perception towards doping among respondents (n = 168)

Variables	Perception towards doping (n = 168)
Knowledge on doping	0.216[a]
	0.05

[a] Pearson correlation coefficient

*P value = 0.05 shows statistical significance

** Correlation is significant at the 0.01 level (2-tailed)

CHAPTER 4

DISCUSSION

4.1 Socio-demographic data

There were 168 respondents completed the questionnaires. The mean (SD) age of respondents were 21 (1.756) with majority of the students were female (n = 116, 69%). This can be compared to other study done in higher education institutes in Malaysia where it had showed that majority of respondents were male (n = 109, 59.9%) with the median age 17 which involves young athletes that participated in international sports competition (Chiang *et al.,* 2018). The present study which involved Faculty of Medicine, Alexandria University students showed almost more than half respondents were females (n = 113, 54.5%) with a mean (SD) age of 22 (1.08) (Badr el Dine & Attia, 2022). Among 168 respondents, 134 respondents has heard about doping previously from vary of source such as university (n = 75, 44.6%), school (n = 17, 10.1%), internet (n = 39, 23.2%) and self-reading (n = 3, 1.8%). Respondents were comprised of undergraduate of Pharmacy students which involved Year 1 (n = 57, 33.9%), Year 2 (n = 48, 28.6%), Year 3 (n = 14, 8.3%) and Year 4 (n = 49, 29.2%).

4.2 Knowledge of doping

It is believed that the level of knowledge for doping is low among students in the world. Most only knew the word doping but were never exposed to any classes related with doping. A study by Shibata *et al.,* (2017) expressed that over half of its study's respondents did not know that unintentional doping is the most common doping violation in Japan. Thus, it was not surprising that in present study, most of undergraduates Pharmacy students in UoC unable to recognise less often used agents. A sizeable proportion of respondents believed protein was not listed (n = 80, 47.6%) while alcohol was listed in the prohibited list by WADA (n = 89, 53%). Since majority of respondents answered not sure and false for item doping involves tampering with doping sample collection (n = 89, 53%), it indicated similarity but better contrast with study by Chiang *et al*., (2018) on Malaysian student athletes (n = 130, 71.4%). Half of present respondents know the abbreviation of ADAMAS compared to the past study, only (n = 12, 6.6%) acknowledged it (Chiang *et al*., 2018). Previous study on 2016 in Qatar among pharmacist, average knowledge score was 53.2% (Mottram *et al.,* 2016) while a study on 2022 in Alexandria among Faculty of Medicine students, average knowledge score was 54.4% which is a nearby figure. While present study showed (n =

132, 78.6%) of respondents acquired below 60% marks which is poor knowledge level on doping. Eventually, this is very ironic since 134 respondents has heard about doping previously from vary of source such as university (n = 75, 44.6%), school (n = 17, 10.1%), internet (n = 39, 23.2%) and self-reading (n = 3, 1.8%). This means, early exposure must be follow with a big understanding. Unable to understand may lead to misconception of facts. In this study, female respondents (n = 116, 59%) involved double up the number of male respondents. However, there is no significant differences regarding their knowledge between males and females.

4.3 Perception towards doping

The intentional use of doping is mainly to boost and enhance performance in sports. There are various type of doping methods used nowadays. Uncontrolled doping and consuming prohibited substances without proper monitoring might lead to serious adverse effects on one's health. Even though doping is perceived to empower sport performance, it also could slowly cause short and long-term effects on the athletes. Majority of respondents answered agree and strongly agree in both items, regarding doping substances possessed health hazard (n = 132, 78.6%) and doping substance are a serious problem in Malaysia (n = 108, 64.2%). It is correlates with previous study, Androgens promote hypertrophic changes through the androgenic receptors within cardiac myocytes ending by left ventricular hypertrophy and decreasing ejection fraction (Badr el Dine & Attia, 2022). Besides that, sporting activities were not an ultimate cause of sudden cardiac mortality. However, it was suspected that the use of illicit and illegal drugs were the primary causes of cardiac arrest (Ghorayeb *et al.*, 2019). Besides, most of respondents neutral on safety on doping using supplements, minerals and herbs (n = 80, 47.6%). Majority of respondents agree and strongly agree that intake of amino acids as a supplement is safe with recommended dosage (n = 86, 51.2%). A previous study has emphasized that it is important to know the appropriate place to get consultations for supplement to prevent inadvertent intake of prohibited substances (Chiang *et al*., 2018). Majority of respondents agree and strongly agree on ensuring the doctors who involved in medically assist doping to be punished accordingly. It is by continuously embed the culture of anti-doping with strict penalty and firm stance against any individual who involved directly or indirectly in doping (Chiang *et al*., 2018).

4.4 Association between knowledge and perception towards doping

The findings of the study revealed that there is weak correlation between knowledge and perception towards doping in the studied subjects and the correlation is statistically significant (p = 0.05), regardless of whether they were having good, moderate or poor level of knowledge. However, it was in contrast with the claims made by a few studies conducted by Badr el Dine & Attia (2022) and Chiang *et al*. (2018) which emphasized that there is no statistically significant between knowledge and perception towards doping. Furthermore, in their study also explained that negative perception only is not sufficient to reduce the burden of this problem. It must compliment with an education.

The reason behind this inconsistency could be affected by different in educational background, accessibility towards information via various sources and level of study. Therefore, their level of knowledge may vary regardless of their respective year of studies.

4.5 Limitation and recommendations

This research is an attempt to measure the knowledge and attitude levels of the pharmacy students at UoC Malaysia on performance-enhancing drugs, although it has certain limitations. Comparing levels of knowledge and attitudes before initiating a lecture series on doping (Sports Pharmacy) would have been more appropriate. In the current research, the psychological and personality risk factors were not included to provide a comprehensive overview. Thus, it can be recommended for further study. Therefore, this work is representative of a single population of one pharmacy faculty that was solely for undergraduate Pharmacy students, so findings may not be generalized to other faculties of pharmacy in the country. It is suggested that future research should be conducted on a larger scale population.

CHAPTER 5

CONCLUSIONS

Based on the findings, it can be concluded that the level of knowledge about doping among undergraduate students at the University of Pharmacy in Malaysia is weak. In contrast, a majority of the respondents displayed a neutral perception regarding doping. Sometimes, history has heard of doping does not have an effect towards increasing findings level knowledge. On the other hand, most of the respondents also agreed with no difference among drugs, fiberglass poles, and speedy swimsuits which are all used to increase performance. Though it could be accepted for a poor level of knowledge to result in a neutral or positive perception towards doping.

It is possible that having an in-depth understanding of doping might be linked to an adverse perception. Overall, this study has revealed a gap that can be observed among pharmacy students at UoC in terms of their knowledge and perception towards doping. It is ironic that someone who will provide healthcare in the future does not understand doping well. Given the evidence that has been established, it is therefore correct to say that anti-doping education can be introduced at an early age. Furthermore, the transformation of Sports Pharmacy into a mandatory discipline for undergraduate Pharmacy students in national higher educational institutions is highly essential in order to make future healthcare providers more efficient against doping.

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APPENDIX A

UNIVERSITY OF CYBERJAYA RESEARCH ETHICS REVIEW COMMITTEE (CRERC)
CYBERJAYA (UOC), PERSIARAN BESTARI, CYBER 11, 63000 CYBERJAYA, SELANGOR, MALAYSIA

FORM B2

RESPONDENT'S INFORMATION SHEET AND INFORMED CONSENT
(for adult subjects)

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.

1. **Title of study:** Knowledge and Perception on Doping among Pharmacy Student in University of Cyberjaya

2. **Name of investigator and institution:** Asbi Iswandi Bin Yusrizal, Bachelor of Pharmacy (Hons), University of Cyberjaya

3. **Name of sponsor:** No external funding

4. **Introduction:**

It is important that you understand why the research is being done and what it will involve. Please take your time to read through and consider this information carefully before you decide if you are willing to participate. Ask the study staff if anything is unclear or if you would like more information. After you are properly satisfied that you understand this study, and that you wish to participate, you must sign this informed consent form.

Your participation in this study is voluntary. You do not have to be in this study if you do not want to. You may also refuse to answer any questions you do not want to answer. If you volunteer to be in this study, you may withdraw from it at any time. If you withdraw, any data collected from you up to your withdrawal will still be used for the study. Your refusal to participate or withdrawal will not affect any medical or health benefits to which you are otherwise entitled.

This study has been approved by University of Cyberjaya Research Ethics Review Committee (CRERC).

5. **What is the purpose of the study?**

You have been invited to the study because you are now currently a pharmacy student enrolled in UoC. This study includes all of pharmacy students in UoC.

The purpose of this study is to measure the level of knowledge and perception on doping among pharmacy students. This mainly to equip students with early exposure towards doping and awareness on the dangerous use of doping.

The expected number of participants is 154 individuals.

6. What are my responsibilities when taking part in this study?

It is important that you answer all of the questions asked by the study staff honestly and completely which will take about 10 minutes of your time. Study team will also access your information for the following information:

You will be given a survey form to be answered. This form contains 3 sections which consist information regarding the survey, consent form for the study, respondent socio-demographic, and a few set of questions to assess the knowledge and perception on doping.

7. What are the potential risks and side effects of being in this study?

Participation to this study will not affect your treatment, and the risk is minimal. You are free to decline to answer any of the questions that you feel uncomfortable with.

8. What are the benefits of being in this study?

There may or may not be any benefits to you. Information obtained from this study will help us to assess the level of knowledge and perception on doping holistically among pharmacy students in UoC.

9. Who is funding the research?

This study does not receive any external funding. You will not be paid for participating in this study.

10. Will my medical/personal information be kept private?

All your information obtained in this study will be kept and handled in a confidential manner, in accordance with applicable laws and/or regulations. When publishing or presenting the study results, your identity will not be revealed without your expressed consent. Individuals involved in this study, qualified monitors and auditors, and governmental or regulatory authorities may inspect the study data, where appropriate and necessary.

11. Who should I call if I have questions?

If you have any questions about the study or if you think you have a study related injury and you want information about this study, please contact the Investigator, Asbi Iswandi Bin Yusrizal via telephone number +60182503441 or email 2010-2274@st.cyberjaya.edu.my.

INFORMED CONSENT FORM

Title of Study: *Knowledge and Perception on Doping among Pharmacy Students in University of Cyberjaya*

By signing below, I confirm the following:

- I have been given oral and written information for the above study and have read and understood the information given.
- I have had sufficient time to consider participation in the study and have had the opportunity to ask questions and all my questions have been answered satisfactorily.
- I understand that my participation is voluntary and I can at anytime freely withdraw from the study without giving a reason and this will in no way affect my future treatment. I understand the risks and benefits, and I freely give my informed consent to participate under the conditions stated. I understand that I must follow the investigator's instructions related to my participation in the study.
- I understand that study staff, qualified monitors and auditors, the sponsor or its affiliates, and governmental or regulatory authorities, have direct access to my record in order to make sure that the study is conducted correctly and the data are recorded correctly. All personal details will be treated as STRICTLY CONFIDENTIAL.
- I will receive a copy of this subject information/informed consent form signed and dated to bring home.

Subject:

Signature: I/C number:

Name: Date:

Investigator conducting informed consent:

Signature: I/C number:

Name: Date:

Impartial witness:

Signature: I/C number:

Name: Date:

UNIVERSITY OF CYBERJAYA RESEARCH ETHICS REVIEW COMMITTEE (CRERC)
CYBERJAYA (UOC), PERSIARAN BESTARI, CYBER 11, 63000 CYBERJAYA, SELANGOR, MALAYSIA

FORM B1

RISALAH MAKLUMAT PESERTA DAN BORANG PERSETUJUAN PESERTA
(untuk subjek dewasa)

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1. **Tajuk penyelidikan**: Pengetahuan & Persepsi Terhadap Doping Dalam Kalangan Pelajar Farmasi di Universiti Cyberjaya

2. **Nama Institusi and nama penyelidik:** Asbi Iswandi Bin Yusrizal, Universiti Cyberjaya

3. **Nama penaja**: Tidak menerima penajaan dari pihak luar

4. Pengenalan:

Risalah ini menjelaskan hal-hal berkenaan penyelidikan tersebut dengan lebih mendalam dan terperinci. Amat penting anda memahami mengapa penyelidikan ini dilakukan dan apa yang dilakukan dalam penyelidikan ini. Sila ambil masa yang secukupnya untuk membaca dan mempertimbangkan dengan teliti penerangan yang diberi sebelum anda bersetuju untuk menyertai penyelidikan ini. Jika ada sebarang kemusykilan ataupun maklumat lanjut yang anda ingin tahu, anda boleh bertanya dengan mana-mana kakitangan yang terlibat dalam penyelidikan ini. Setelah anda berpuas hati bahawa anda memahami penyelidikan ini, dan anda berminat untuk turut serta, anda dikehendaki untuk menandatangani Borang Persetujuan Peserta, pada muka surat akhir risalah ini.

Penyertaan anda dalam penyelidikan ini adalah secara sukarela. Anda tidak perlu menyertai penyelidikan ini jika anda tidak mahu. Anda juga mempunyai hak untuk tidak menjawab mana-mana soalan yang anda tidak mahu jawab. Anda juga boleh menarik diri daripada penyelidikan ini pada bila-bila masa sahaja. Jika anda menarik diri, segala maklumat yang telah diperolehi sebelum anda menarik diri tetap akan digunakan dalam penyelidikan ini. Jika anda tidak mahu menyertai ataupun menarik diri dari penyelidikan ini, tindakan anda tidak akan menjejaskan segala hak dan keistimewaan perubatan kesihatan yang selayaknya anda terima.

Penyelidikan ini telah mendapat kelulusan University of Cyberjaya Research Ethics Review Committee (CRERC).

5. Apakah tujuan penyelidikan ini dilakukan?

Anda dijemput menyertai kajian kerana anda merupakan salah seorang pelajar Farmasi di Universiti Cyberjaya. Kajian ini melibatkan semua pelajar Farmasi di UoC.

Tujuan penyelidikan ini dilakukan adalah untuk mengukur tahap pengetahuan dan persepsi terhadap doping. Penyelidikan ini diperlukan kerana dapat memberi pendedahan awal tentang doping dan kesedaran tentang bahaya penggunaan doping.

Dijangka bahawa 154 individu akan mengambil bahagian dalam kajian ini.

6. Apakah tanggungjawab saya sewaktu menyertai penyelidikan ini?

Amat penting anda menjawab kesemua soalan yang dikemukakan oleh kakitangan penyelidikan dengan jujur dan lengkap yang akan mengambil masa selama 10 minit. Penyelidik juga memerlukan maklumat yang berikut daripada anda:

Anda akan diberi borang soal selidik untuk dijawab. Borang ini mempunyai 3 bahagian yang meliputi pengenalan terhadap topik kajian, borang persetujuan, sosiodemografik profil dan set soalan berkenaan tahap pengetahuan dan persepsi terhadap doping.

7. Apakah risiko dan kesan-kesan sampingan menyertai penyelidikan ini?

Risiko untuk penyertaan penyelidikan ini yang adalah minima dan tidak akan menjejaskan rawatan anda. Anda berhak untuk tidak menjawab jika rasa tidak selesa dengan mana-mana soalan kajian.

8. Apakah manfaatnya saya menyertai kajian ini?

Penyelidikan ini mungkin akan mendatangkan manfaat ataupun langsung tiada memberi apa-apa manfaat kepada anda. Segala maklumat yang diperolehi daripada penyelidikan ini akan dapat membantu dalam mengenalpasti tahap pengetahuan dan persepsi terhadap doping dengan lebih holistik dalam kalangan pelajar.

9. Siapakah yang membiayai penyelidikan ini?

Kajian ini tidak menerima penajaan dari pihak luar. Anda tidak akan dibayar untuk menyertai kajian ini.

10. Adakah maklumat saya akan dirahsiakan?

Segala maklumat anda yang diperolehi dalam penyelidikan ini akan disimpan dan dikendalikan secara sulit, bersesuaian dengan peraturan-peraturan dan/ atau undang-undang yang berkenaan. Sekiranya hasil penyelidikan ini diterbitkan atau dibentangkan kepada orang ramai, identiti anda tidak akan didedahkan tanpa kebenaran anda terlebih dahulu. Pihak-pihak tertentu seperti individu yang terlibat dalam penyelidikan ini, juruaudit dan jurupantau yang terlatih, pihak berkuasa kerajaan atau undang-undang, boleh memeriksa maklumat atau data kajian jika diperlukan.

11. Siapakah yang perlu saya hubungi sekiranya saya mempunyai sebarang pertanyaan?

Anda boleh menghubungi ketua penyelidik, Asbi Iswandi Bin Yusrizal menerusi nombor telefon +60182503441 atau emel kepada 2010-2274@st.cyberjaya.edu.my sekiranya anda mempunyai sebarang pertanyaan mengenai penyelidikan ini atau jika anda mengesyaki anda mengalami kecederaan yang terhasil daripada penyelidikan ini dan anda mahukan maklumat tentang rawatannya.

BORANG PERSETUJUAN PESERTA

Tajuk Penyelidikan : Pengetahuan dan Persepsi Terhadap Doping Dalam Kalangan Pelajar Farmasi di Universiti Cyberjaya.

Dengan menandatangani di bawah, saya mengesahkan bahawa:

- Saya telah diberi maklumat tentang penyelidikan di atas secara lisan dan bertulis dan saya telah membaca dan memahami segala maklumat yang diberikan dalam risalah ini.
- Saya telah diberikan masa yang secukupnya untuk mempertimbangkan penyertaan saya dalam penyelidikan ini dan telah diberi peluang untuk bertanyakan soalan dan semua persoalan saya telah dijawab dengan sempurna dan memuaskan.
- Saya faham bahawa penyertaan saya adalah secara sukarela dan pada bila-bila masa saya bebas menarik diri daripada penyelidikan ini tanpa harus memberi sebarang alasan dan ianya sama sekali tidak akan menjejaskan rawatan perubatan saya pada masa akan datang. Saya memahami risiko dan manfaat penyelidikan ini dan saya secara sukarela memberi persetujuan untuk menyertai penyelidikan ini di bawah syarat-syarat yang telah dinyatakan di atas. Saya faham saya harus mematuhi nasihat dan arahan penyelidik yang berkaitan dengan penyertaan saya dalam penyelidikan ini.
- Saya faham bahawa kakitangan penyelidikan, pemantau dan juruaudit terlatih, pihak penaja atau gabungannya, dan pihak berkuasa kerajaan atau undang-undang, mempunyai akses langsung dan boleh menyemak data saya bagi memastikan penyelidikan ini dijalankan dengan betul dan data direkodkan dengan betul. Segala maklumat dan data peribadi akan dianggap sebagai SULIT.
- Saya akan menerima satu salinan 'Risalah Maklumat Pesakit dan Borang Persetujuan Peserta' yang telah lengkap dengan tarikh dan tandatangan untuk dibawa pulang ke rumah.

Subjek :

Tandatangan: Nombor K/P:

Nama: Tarikh :

Penyelidik yang mengendalikan proses menandatangani borang persetujuan:

Tandatangan: Nombor K/P:

Nama: Tarikh :

Saksi tidak-berpihak/adil:

Tandatangan: Nombor K/P:

Nama: Tarikh :

APPENDIX B

QUESTIONNAIRE

PART 1: INFORMATION REGARDING SURVEY

Assalamualaikum and Greetings,

My name is Asbi Iswandi Bin Yusrizal and I am currently enrolled in the fourth year Bachelor of Pharmacy at the University of Cyberjaya (UoC). I would like to invite all pharmacy students in UoC to take part in my research study titled **"Knowledge and Perception on Doping Among Pharmacy Students in UoC."**

This questionnaire will take around 10-15 minutes to be completed.

This research is conducted under the supervision of Dr. Ahmad Rashidi bin Mohamed Tahir, a lecturer at the University of Cyberjaya as well as has obtained ethical approval from the University of Cyberjaya Research Ethics Review Committee (CRERC).

Please read the introduction carefully, as it will help you answer the questions.

This survey consists of 4 sections

Section A: Demographic information

Section B: Information on knowledge about doping.

Section C: Information on perception about doping.

The objectives of this research are as follows:

- To assess the knowledge of doping among pharmacy students in UoC.
- To determine the perception of doping among pharmacy students in UoC.
- To evaluate correlation between knowledge and perception on doping among pharmacy students in UoC.

Risks and Benefits

To complete the study, participants will only be required to fill in the survey form, hence the risk is minimal. There will not be any rewards or direct benefits for you from participating in this study. However, information obtained from this study could be useful in assessing the knowledge of doping among pharmacy students in UoC. The findings of the study might give a big understanding and literally contributing towards the earlier exposure towards doping. Besides, reducing populations affected by long term side effects of the doping. Your participation in this research is entirely voluntary. Please understand that you may refuse to participate in this research or withdraw at any time before the completion of the online questionnaire without giving any reason. Rest assured that all information given will be treated with strict confidentiality and used solely for the purposes of the research. By completing and submitting this survey, you are acknowledging that you have read and understood the information as mentioned above and give your consent to take part in this research. If you have any inquiries or require further clarification concerning this research study, feel free to contact me or send me an email.

Mobile number :

+6018-2503441 (Asbi)

Or

Email:

2010-2274@st.cyberjaya.edu.my

PART 2: INFORMED CONSENT TO PARTICIPATE IN THE RESEARCH STUDY.

By agreeing to take part in this research study, I confirm that I have received, read, and understood all the information on the previous page. Furthermore, I understand that my participation is entirely voluntary and I can withdraw from the survey at any time without having a reason. In addition, I am assured that all information that I provided in the questionnaire will be treated with the utmost confidentiality.

I confirm that I am:

1. An undergraduate pharmacy student session of 2023/2024 at the University of Cyberjaya (UoC)

Respondent signature

…….

PART 3: QUESTIONNAIRE

SECTION A (SOCIO-DEMOGRAPHIC OF RESPONDENTS)

1. What is your age _____(years)?

2. Race
   - Malay
   - Chinese
   - Indian
   - Other

3. Gender
   - Male
   - Female

4. Year of study?
   - Year 1
   - Year 2
   - Year 3
   - Year 4

5. Have you heard term related with doping before?
   - Yes
   - No

   If yes, where do participate / enrol to the programme / course?
   - University
   - School
   - Self reading
   - Internet

SECTION B: KNOWLEDGE OF DOPING

Listed below are several statements regarding doping. For each statement, kindly tick with (/) the number that corresponds to yourself. You are required to answer all the statements.

1: False

2: Not sure

3: True

1. Knowledge on doping

Statement	1	2	3
1. Doping involves inadvertent use of prohibited substances by athletes			
2. Doping involves presence of prohibited substances under prohibited list in athlete's urine sample			
3. Doping involves tampering with doping sample collection			
4. ADAMAS abbreviation stands for Anti Doping Agency Malaysia			

2. Knowledge on prohibited substances used in sports.

Which of the following substance(s) is/are listed on the World Anti-Doping Agency (WADA) prohibited list?

Statement	1	2	3
Caffeine (Coffee)			
Protein			
Paracetamol (Panadol, Paracil, Uphamol)			
Cigarette			
Alcohol			

SECTION C: PERCEPTION TOWARDS DOPING.

Listed below are statement regarding the perception towards doping. For each statement, kindly tick the number that corresponds to yourself. You are required to answer all the statements.

1 : Strongly Disagree
2 : Disagree
3 : Neutral
4 : Agree
5 : Strongly Agree

Table 4.1.4: Perception towards doping

Statement	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
1. Do you think doping substances are posing health hazards?					
2. Do you think doping substances are a serious problem in Malaysia?					
3. Do you think doping is a form of addiction?					
4. Do you think that nutritional supplements as vitamins, minerals and herbs are safe as a doping?					

5. Do you think that Amino acids supplements are safe in recommended dosages?					
6. Do you think that doctors engaged in medically assisted doping should be punished?					
7. The risks related to doping are extremely exaggerated					
8. Performance-enhancing drugs give the motivation to train and compete at the highest level					
9. Doping agents are used to get more muscular body?					
10. Performance-enhancing drug can reduce boredom during training					
11. There is no difference between drugs, fiberglass poles and speedy swimsuits that are allused to enhance performance					

12. Media should talk less about doping					
13. The media blows the doping issue out of proportion					
14. Legalizing performance enhancer would be beneficial for sports					

- End of Questionnaire -

Thank You

APPENDIX C

CRERC APPROVAL

Ref No : UOC/CRERC/AL-ER (56/2023)

Date : 17th August 2023

AHMAD RASHIDI BIN MOHAMED TAHIR
Assistant Professor
Faculty of Pharmacy
University of Cyberjaya

Dear Sir,

UNIVERSITY OF CYBERJAYA RESEARCH ETHICS REVIEW COMMITTEE (CRERC) APPROVAL

CRERC Reference number : UOC/CRERC/ER/567

Project Title : Knowledge and Perception on Doping among Pharmacy Students in UoC

Principal Investigator : 1. Ahmad Rashidi bin Mohamed Tahir (Supervisor)

2. Asbi Iswandi Bin Yusrizal (Undergraduate Student)

Thank you for submitting the above research project for ethical review. I am pleased to advise you that the University of Cyberjaya Research Ethics Review Committee (CRERC) has granted ethic approval for this research project.

The participating site in this project is located in University of Cyberjaya, Cyberjaya, Selangor.

*(Note: If additional sites are engaged prior to the commencement of, or during the research project, the Coordinating Principal Investigator is required to notify **Secretary of the CRERC**, CRGS. Notification of withdrawn sites should also be provided to the CRERC in a timely fashion.)*

The approved documents include:

Document	Version	Date
Form B1: Respondent's Information Sheet and Informed Consent (Malay)	-	17 August 2023
Form B2: Respondent's Information Sheet and Informed Consent (English)	-	17 August 2023
Research Proposal	-	17 August 2023
Questionnaires	-	17 August 2023

Approval of this project from CRERC is valid from **17th August 2023 to 17th August 2024.** In addition to the above specific conditions the following general conditions must also be adhered to:

- The Principal Investigator will immediately report anything that might warrant a review of ethical approval of the project.
- The Principal Investigator will immediately report any changes in the research protocol, Respondent Information Sheet, or Consent Form.
- The investigators will not execute any changes from the approved protocol without prior approval from CRERC.
- The Principal Investigator will notify the CRERC of any event that requires a modification to the protocol or other project documents and submit any required amendments in accordance with the instructions provided by the CRERC.
- The Principal Investigator will report to the CRERC every SIX MONTHS in the specified format and NOTIFY the CRERC when the project is COMPLETED at all sites.
- The Principal Investigator will notify the CRERC if the project is discontinued at a participating site before the expected completion date, with reasons provided.
- The Principal Investigator will notify the CRERC of any plan to extend the duration of the project past the approval period listed above and will submit any associated required documentation.
- The Principal Investigator will notify the CRERC of his or her inability to continue as Principal Investigator including the name of and contact information for a replacement.
- The research data must be stored confidentially for at least five (5) years.

Any violation of non-adherence to the terms approved by CRERC for this research may lead to **IMMEDIATE REVOCATION** of this Ethic Approval.

This letter constitutes ethic approval only. A copy of this ethic approval letter must be submitted by the Principal Investigator to the Research Governance Office or equivalent body or individual at each participating institution (if applicable) in a timely manner to enable the institution to authorise the commencement of the project at its site.

Should you have any queries about the CRERC's consideration of your project please contact the secretariat.

The CRERC wishes you every success in your research.

Thank you.

"NURTURING THE PASSION TO CARE"

Yours faithfully,

PROF. DR. KRISHNA GOPAL RAMPAL

Chairman
University of Cyberjaya Research Ethics Review Committee (CRERC)
University of Cyberjaya (UoC)