



Pharmacy professionals' knowledge, attitude and practice towards doping in sports: A Cross-sectional study in Ethiopia

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ABSTRACT

Background: Doping is appearing as a major problem in Ethiopia, a country decorated with medium and long-distance runners. To protect athletes from doping, pharmacists can be the first port of call for advising athletes on drug treatment. Hence, to fuel the anti-doping movement, it is crucial to explore the knowledge, attitude, and practice of community pharmacy professionals. Therefore, this study aimed to assess the community pharmacy professionals' knowledge, attitude, and practices towards doping in sports in Addis Ababa, Ethiopia.

Materials and methods: A cross-sectional survey, involving 336 study participants, was conducted in selected community pharmacies of Addis Ababa, Ethiopia from April to May 2018.

Results: Of 336 study participants, most of them knew the word "doping" and out of these, 51.9 % of them wrote the definition of doping correctly. Most respondents classified narcotics, hormone modulators, growth factors, and β -2 agonists correctly. Almost one-third of the professionals agreed that they have adequate information about doping and that doping is a public health problem. Among the participants, only 33.4 % were confronted with "suspicious of doping substance" without a prescription over the last 12 months.

Conclusions: Although most pharmacy professionals lack doping-specific knowledge and adequate training required to be operative in doping prevention, most of them perceive doping as a public health problem although the curriculum does not have good coverage about doping.

1. Background

The sports industry is moving forward from an amateur era into a highly competitive professional business that attracts billions of dollars in investment [1]. This made modern sport plagued by suspicions that elite athletes resort to doping to enhance performance [2, 3]. Moreover, the use of doping agents is prevalent among young sportspeople in schools, non-competing amateurs, and gymnasium clients mainly to improve body appearance [4]. Likewise, it was found that up to 5 % of United States (US) high-school students had

Abbreviations: AA, amino acid; IAAF, International Association of Athletics Federations; SPSS, Statistical Package for the Social Sciences; WADA, World Anti-Doping Agency.

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used growth hormone as anabolic aid [5]. Moreover, in 2001 it was estimated that 2.8 million US recreational athletes had tried ephedrine as a stimulating agent [6].

Today, there are as many different performance-enhancing drugs, which are proven to enhance performance or seriously affect athletes' health and diminish the image of sport, which are prohibited to use in or out of competition. Doping in sports compromises fair play and endangers health. To deter doping among elite athletes, a list of prohibited substances and methods of doping is issued and updated annually by the World Anti-Doping Agency (WADA) [7]. Over 192 banned drugs and 'performance enhancing methods' (such as blood doping) are registered by WADA, a list that is constantly updated as new drugs appear.

Many illicit performance-enhancing substances, such as anabolic-androgenic steroids and stimulants, are notorious for causing life-threatening health problems including cardiac events [8]. Furthermore, several death incidents have been connected to the misuse of doping agents [9]. Physicians and pharmacists would play major roles in the fight against doping in sports, and they would be perfectly appointed to; instruct and counsel both elite and recreational athletes on matters related to doping [10]. Doping is emerging as a major problem in Ethiopia, a country decorated with medium and long-distance runners.

In addition, the emerging field of "sports pharmacy" has emphasized new duties for pharmacists in sports medicine and doping control [11,12]. Therefore, both pharmacists and physicians must be sufficiently trained on doping agents to have a role to play in the prevention of doping in sports. There is little information on doping and restricted public access to such knowledge [13].

Besides well-known illicit performance-enhancing substances, such as anabolic steroids, growth hormones, and stimulants, the list contains less popular doping agents, e.g., narcotics, diuretics, and β -blockers [14]. Although Amino acids (AAs) are the structural units that make up proteins, the major constituents of muscles, there is no evidence that these supplements have performance-enhancing effects in sports [15].

The goals of prohibiting doping in sports are not just to prevent athletes from gaining an unfair competitive advantage, but also to protect athletes' health against the potential hazards of doping [16]. A French survey concluded that pharmacists did not have the general knowledge and skills important to participate effectively in doping prevention [17]. In a study conducted on South African pharmacists and general practitioners, both of them have insufficient doping-related knowledge and lack doping-specific training [18]. A study conducted in Japan indicated that the students' basic knowledge regarding doping was limited [19]. This highlights the need to review medical practitioners' and pharmacists' education and professional development of doping in sports [10]. Even though the most suitable method of delivering training is complex and requires strategic planning, there was great support for further training among general practitioners [20]. The sports pharmacist has a pivotal role in promoting the prevention of doping at its roots.

The role and responsibilities of pharmacists in the fight against doping may be of particular interest in countries where doping control experts and sports physicians are not commonly met, such as in developing countries like Ethiopia. The major concern, however, remains whether pharmacy curricula supply adequate training to enable graduates to take on these roles. The results of the current study would allow us to understand the extent of the knowledge gap and take proper action to improve knowledge, attitudes, and practice. Reliable information is therefore needed to develop a national guide on doping and to take policy action. Since no study has been conducted in this area, this study can serve as a basis for further future research. Therefore, the main goal of this study was to investigate the knowledge, attitude, and practices of pharmacists in Addis Ababa, Ethiopia, about doping in sports.

2. Materials and methods

2.1. Study setting, period, and design

A facility-based cross-sectional study design was employed between April and May 2018 using a semi-structured questionnaire. This study was conducted in selected community pharmacies found in Addis Ababa, the capital of Ethiopia. It is found at the geographic center of the nation and covers an area of 540 Km² [21]. In 2018, the city had a projected total population of 4,000,000 (about twice the population of New Mexico) [22]. The city is administratively structured into ten sub-cities. Of these, the survey was conducted in five sub-cities (Bole, Lideta, Nifas Silk, Arada, and Kolfe) which were selected by random sampling using the lottery method [21].

2.2. Sample size determination and sampling procedure

The number of pharmacy professionals, practicing in the selected community pharmacies of Addis Ababa, to be involved in the study was decided by using a single population proportion [23]. Due to the absence of earlier studies, the expected proportion of knowledge, attitude, and practice was considered as 50 %. The absolute sampling error to be tolerated was taken as 5 % with a 95 % confidence interval. However, the total number of pharmacy professionals working in community pharmacies in Addis Ababa was less than 10000. Therefore, the sample size was adjusted using the adjustment formula as follows:

$$\text{Corrected sample size} = \frac{n \times N}{n + N} = 305$$

Allowing for 10 % inappropriate responses and non-responses, a total of 336 pharmacy professionals were included in the survey. Then, the sample size of 336 was proportionally divided among the five sub-cities, which were randomly selected by lottery. Then, pharmacies and pharmacy professionals were randomly selected until the sub-city quota was met.

2.3. Data collection and management

Quantitative information was collected from each selected pharmacy professional with a pre-tested semi-structured questionnaire by trained data collectors. Data collectors were trained for two days on how to introduce study tools to the study participants and check the completeness of the collected questionnaire. The questionnaire was developed after an extensive literature review on knowledge (K), attitude (A), and practice (P) of the pharmacy profession towards doping [17,18,24–27].

To check the validity and reliability, a pretest was also conducted on similar study participants who were not included in the study. A description of the term "doping" and a list of specific medications thought to be doping agents were not included in the questionnaire given to participants before the pretest. Moreover, a separate question asked the participant to describe the general mechanism of doping. After the pretest, the questionnaire was changed to ask, "If your answer to Q#8 is yes, please define what doping is for you" (Q9), "List of specific drugs" (Q14), and "How doping helps athletes' ability to win championships" (Q11).

2.4. Statistical analysis

Collected data were checked for completeness, coded, and entered Epi Info™ version 3.35, and analyzed using Statistical Package for the Social Sciences (SPSS) version 21.0 software. For the open-ended questions, the standard mechanisms for performance enhancement by doping were adopted from WADA. Descriptive statistics, including mean, standard deviation, and percentages, were used for description. All variables in the study were first tested for an association with doping knowledge, attitude, and practice using the binary logistic regression model. Variables that showed an association with the dependent variable were included in the multi-variable analysis model to test whether the association still existed after controlling for all other variables. At a 95 % confidence interval, variables with p-values less than or equal to 0.05 were considered to have statistically significant associations with knowledge of doping.

2.5. Ethical considerations

Ethical approval was obtained from the Ethical Review Board of the School of Pharmacy, College of Health Sciences, Addis Ababa University, with the reference number (ERB/SOP/March 52, 2018). The purpose of the study was clearly explained to all study participants and written informed consent was obtained after they understood the information. Participants were informed before the start of the study that they could withdraw from participation at any time during the survey and that this would invalidate their entire participation. They were also informed about the anonymity of the data collection.

3. Results

3.1. Socio demographics characteristics

The response rate for this study was 100 %. Of the total 336 sampled pharmacy professionals, 336 of them responded. More than half [188; (56.0 %)] of the participants were males with a mean age of 31.07 years (SD; ± 5.996). Out of 336 professionals, more than two-thirds (65.5 %) of them had a first degree in pharmacy (Table 1).

Table 1
Sociodemographic characteristics of community pharmacy professionals in addis ababa, 2018.

Sociodemographic variables	Category	N (%)
Sex	Male	188 (56)
	Female	148 (44)
Age	<25	20 (6)
	25–35	252 (75)
	36–45	55 (16.3)
	>45	9 (2.7)
Educational status	Diploma	82 (24.4)
	Degree	220 (65.5)
	MSc or above	34 (10.1)
Marital status	Married	170 (51.2)
	Single	140 (42.2)
	Divorced	19 (5.7)
	Widowed	3 (0.9)
Work experience in community pharmacy (in years)	<5	27 (8)
	5–10	157 (46.7)
	11–15	66 (19.7)
	16–20	39 (11.6)
	>20	47 (14)

3.2. Pharmacy professionals' knowledge of substances prohibition status in sports

The level of knowledge was classified as good and poor. Good if a respondent answered at least nine out of eighteen knowledge-related questions, while they were classified as poor if they answered fewer than nine questions. Of all respondents, 53.6 % had good knowledge and 46.4 % had poor knowledge. All pharmacological classes were correctly classified according to their prohibition status in the sport, except anabolic steroids, antihistamines, and diuretics. Narcotics, hormone modulators, growth factors, and β -2-agonists were correctly classified by 63.4 %, 57.9 %, 56.0 %, and 54.9 % of respondents, respectively. However, less than half of the respondents correctly classified antihistamines, anabolic steroids, and diuretics (Table 2).

The extent to which pharmacists were aware of the prohibited status of pharmacological classes as well as certain drugs on the WADA list was examined (Table 2). Narcotics (63.4 %) and hormone modulators (57.9 %) were the first two drug classes whose status on the WADA list was correctly recognized by pharmacy professionals. However, only a minority (<50 %) of study participants were able to correctly find the exact prohibition status of anabolic steroids (38.2 %), antihistamines (37.5 %), and diuretics (36.1 %).

Among specific medications, erythropoietin [194; (61.8 %)] was the most frequently correctly identified medication, followed by nortestosterone, [187; (59.4 %)], omeprazole, insulin, salbutamol tablets, and furosemide were correctly assigned to their sport ban status by more than half of the respondents, whereas tramadol and loratadine were correctly assigned by only 35.4 % and 32.8 % of the participants, respectively (Table 2).

Among the participants, more than two-thirds knew the word "doping" while the rest did not know. Of these, slightly more than half (51.9 %) of them wrote the definition of doping correctly. The source of information for most respondents was either mass media or school. Though more than two-thirds (69.3 %) of the study participants recognized the word doping, only slightly more than half (51.9 %) of them wrote the right definition of doping. The highest percentage (31.6 %) of participants claimed the major mechanism of performance-enhancing drugs is increasing the production of red blood cells (RBCs). Those who knew the word doping sources of information revealed that the main means of getting information related to doping in sports was mass media (41.1 %) (Table 3).

Regarding how doping drugs help athletes to be a champion, the most common mechanisms mentioned were by increasing the production of RBC to improve the blood's ability to carry oxygen and by increasing muscle size and strength. More than half of the respondents thought that dispensing doping has a criminal punishment in Ethiopia (Table 3).

3.3. Pharmacy professional's attitude towards doping

Almost one-third of pharmacy professionals agreed that they have adequate information about doping. Moreover, more than half of the participants agreed (58.2 %) that doping is a public health problem. More than a third of respondents thought that doping is ethical (35.4 %). However, more than half of them would not respect individuals who took doping agents while 22.2 % of them remained neutral. In this study, 23.6 % (strongly agreed) of pharmacy professionals believed that their undergraduate program did not supply good coverage about doping in its content (Table 4). To explore pharmacists' attitudes towards doping, 13 questions were designed. The descriptive results are presented in Table 4.

3.4. Pharmacy professional's practice toward doping

Pharmacists' practice in community pharmacies was evaluated among the participants; more than two-thirds thought that the most effective prevention for doping is dependent on the action of pharmacy professionals. Most of them, however (68.4 %), claimed

Table 2

Knowledge of community pharmacy professionals on medicines prohibition status in sports in addis ababa, 2018.

Substances	N (%)			Correct answer (WADA, 2018)
	Prohibited	Not Prohibited	Do not know	
Medicines class				
Anabolic Steroids	128 (38.2)	104 (31.4)	104 (31.4)	P
Diuretics	119 (36.1)	143 (43.3)	68 (20.6)	P
Growth factor	177 (56)	89 (28.2)	50 (15.8)	P
Antihistamines	118 (37.5)	145 (46)	52 (16.5)	NP
Narcotics	201 (63.4)	65 (20.5)	51 (16.1)	P
β -2 agonist	173 (54.9)	94 (29.8)	48 (15.2)	P
Hormone modulator	183 (57.9)	99 (31.3)	34 (10.8)	P
List of specific medicines				
Nortestosterone	187 (59.4)	78 (24.8)	50 (15.9)	P
Furosemide	138 (43.8)	127 (40.3)	50 (15.9)	P
Erythropoietin	194 (61.8)	77 (24.5)	43 (13.7)	P
Loratadine	104 (31.9)	107 (32.8)	115 (35.3)	NP
Omeprazole	80 (25.3)	187 (59.2)	49 (15.5)	NP
Tramadol	136 (43)	112 (35.4)	68 (21.5)	NP
Salbutamol tablet	165 (52.4)	100 (31.7)	50 (15.9)	P
Insulin	173 (54.7)	91 (28.8)	50 (15.8)	P

WADA: World Anti-Doping Agency; N: Number; %: Percentage; P: Prohibited; NP: Non-Prohibited.

Table 3
Knowledge of community pharmacy professionals on drug use in sports, addis ababa, 2018.

Variables	Category	N (%)
Do you know the word "doping"?	Yes	233 (69.3)
	No	110 (30.7)
Definition of doping	Correct	121 (51.9)
	Incorrect	112 (48.1)
Source of information	School	107 (29.3)
	IAAF	13 (3.6)
	WADA	38 (10.4)
	Mass media	150 (41.1)
	Others (Friends, Relatives, Not specified)	57 (15.6)
How do doping drugs help athletes to be a champion?	Increase the production of RBC to improve the blood's ability to carry oxygen	87 (31.6)
	To increase muscle size and strength	84 (30.4)
	To reduce the amount of time needed to recover after exercise	13 (4.7)
	To train harder and for an extended period	13 (4.7)
	To stimulate the production of naturally occurring hormones	19 (6.9)
	To reduce body fat	8 (2.9)
	To reduce the pain from a nagging injury	10 (3.6)
	To reduce anxiety and its manifestation or reduce hand tremor	1 (0.4)
	To increase metabolism	12 (4.3)
	Others (Giving false energy or answer not provided)	29 (10.5)
Do you think that dispensing doping has a criminal punishment in Ethiopia?	Yes	115 (54.4)
	No	130 (45.6)
What is the punishment?	Prison	31 (27)
	License revoked	23 (20)
	Closure of pharmacy	12 (10.4)
	I do not know	38 (33)
	Others (Depends on the medication, salary suspension, or not specified)	11 (9.6)

WADA: World Anti-Doping Agency; N: Number; %: Percentage; IAAF: International Association of Athletics Federations; RBC: Red Blood Cell.

Table 4
Attitude of community pharmacy professionals towards doping in sports, addis ababa, 2018.

Variables	N (%)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have adequate information about doping	26 (7.9)	85 (25.7)	95 (28.7)	106 (32)	19 (5.7)
Well-informed about the effectiveness of sport supplement	30 (9.1)	72 (21.8)	133 (40.2)	77 (23.3)	19 (5.7)
Well-informed about the side effects of sport supplement	07 (2.1)	80 (24.2)	117 (35.3)	102 (30.8)	25 (7.6)
Doping is a public health problem	19 (5.8)	39 (11.8)	80 (24.2)	103 (31.2)	89 (27)
Doping is a form of drug addiction	18 (5.4)	56 (16.9)	77 (23.3)	95 (28.7)	85 (25.7)
Most records have been broken because of doping	34 (10.4)	69 (21.0)	85 (25.9)	92 (28)	48 (14.6)
Most great champions resort to doping	32 (9.7)	53 (16.1)	126 (38.2)	83 (25.2)	36 (10.9)
Doping prevention is effective as it currently stands	42 (12.8)	63 (19.1)	96 (29.2)	84 (25.5)	44 (13.4)
Taking a doping agent is an ethical action	97 (29.4)	50 (15.2)	66 (20)	75 (22.7)	42 (12.7)
I respect individuals who took doping agents	121 (36.7)	67 (20.3)	73 (22.1)	39 (11.8)	30 (9.1)
Taking a doping agent can harm the user's health	43 (13.0)	38 (11.5)	80 (24.2)	104 (31.5)	65 (19.7)
Taking a doping agent for only a brief period is not harmful	51 (15.5)	89 (27.1)	97 (29.6)	68 (20.7)	23 (7)

N: Number; %: Percentage.

themselves either poorly trained or not trained at all about doping in sports (31.5 % considered themselves well or very well trained) (Table 5).

Close to three-fourths of our pharmacists did not take any training related to doping over the past 12 months. Within the context of doping prevention, however, the majority (88 %) of pharmacy professionals consider that they have a role to play in the anti-doping movement (Table 5). A quarter of the study participants agreed that they always devoted enough time to advising sports supplement consumers. However, the highest percentage (34.7 %) of them agreed that they had studied some scientific references/web pages about sports supplements (Table 6).

Table 5
Practice of community pharmacy professionals towards doping prevention in sports, addis ababa, 2018.

Variables	Category	N (%)
The most effective prevention of doping is action by whom?	Physicians	64 (19.05)
	Sport federations	34 (10.12)
	Pharmacy professionals	81 (24.11)
	Trainers	57 (16.96)
	State	25 (7.44)
	School sport teacher	21 (6.25)
	Athletes	54 (16.07)
Would you say that in terms of doping prevention, you are?	Very well trained	20 (6)
	Well trained	85 (25.5)
	Poorly trained	140 (42)
	Not trained at all	88 (26.5)
	Yes	87 (26.1)
Chance to train about doping in the last 12 months?	No	246 (73.9)
	Yes	124 (37.2)
Consulted for advice on doping?	No	209 (62.8)
	Yes	292 (88)
Pharmacy professionals' role in doping prevention in sport?	No	40 (12)
	Yes	108 (33.4)
Over the last 12 months, have you been directly confronted with "suspicion of doping substance" without a prescription?	No	215 (66.6)
	At least once daily	8 (7.2)
How often did you encounter it?	At least once a week	43 (38.7)
	At least once per month	60 (54)
	Job-status	24 (7.1)
Information you ask before dispensing?	Health status	52 (15.5)
	Medication history	63 (18.8)
	Others	9 (2.7)
	Dosage	58 (17.3)
Advice you usually give	Risks	36 (10.7)
	Ethics in Sport Regulation	16 (4.8)
	Efficacy	28 (8.3)
	Cost	23 (6.8)

Table 6
Practice of community pharmacy professionals towards doping in sports, addis ababa, 2018.

Variables	N (%)				
		Strongly disagree	Disagree	Neutral	Agree
I always devote enough time to advising sports supplements consumers	35 (10.6)	74 (22.4)	107 (32.3)	82 (24.8)	33 (10)
I have studied some scientific references/Web Pages about Sports Supplements	29 (8.8)	60 (18.1)	112 (33.8)	115 (34.7)	15 (4.5)
I always recommend sports supplements to consumers with confidence	32 (9.7)	63 (19.1)	145 (44.1)	75 (22.8)	14 (4.3)
I always inform consumers about the dosage and administration of sports supplements	27 (8.2)	46 (13.9)	102 (30.8)	117 (35.3)	39 (11.8)
I have self-confidence in recommending sport supplement	41 (12.4)	48 (14.5)	96 (29.1)	92 (27.9)	53 (16.1)

Table 7
Factors associated with knowledge of community pharmacy professionals towards doping in addis ababa, 2018.

Variables		Knowledge towards doping		COR (95 % CI)	AOR (95 % CI)	P-value
		N (%)				
		Good	Poor			
Age	≤35	155 (57)	117 (43)	1.00	1.00	0.86
	>35	25 (39.1)	39 (60.9)	0.48 (0.28–0.84) ^a	0.79 (0.42–1.50)	
Marital Status	Married	83 (48.8)	87 (51.2)	1.00	1.00	0.59
	Unmarried	96 (59.3)	66 (40.7)	1.53 (0.99–2.35) ^a	1.10 (0.68–1.76)	
Work Experience in Community pharmacy (in years)	<5	18 (66.7)	9 (33.3)	1.00	1.00	0.032
	≥5	162 (52.4)	147 (47.6)	0.35 (0.23–0.56) ^a	0.40 (0.24–0.68) ^a	

^a Variables that showed a p-value of less than 0.05 on the multiple logistic regression analysis; ** Adjusted odds ratio – adjusted for age, marital status, and total work experience and work experience in the community; COR (Crude odds ratio); AOR (Adjusted Odds Ratio); CI (Confidence Interval).

3.5. Factors associated with knowledge of doping

To find factors associated with knowledge about doping, first binary logistic regression was done, and those independent variables that showed a p-value of less than 0.25 were taken to the multiple logistic regression analysis. During the binary logistic regression analysis age of 35 or less, being currently unmarried, and having a community experience of <5 years were associated with knowledge about doping.

Binary logistic regression analysis of the present study revealed that Pharmacists' age, marital status of the professionals as well as total work experience in general, and community pharmacy work experience, in particular, were significantly associated with knowledge about doping (Table 7).

4. Discussion

Despite efforts to prevent doping in sports, doping violations have not noticeably decreased [28]. In Ethiopia, they are reported to have increased compared with earlier times. Pharmacists need to have adequate knowledge of the drugs used in sports and have a positive attitude and practice toward doping and its prevention [24]. In addition, a better understanding of pharmacists' knowledge about doping, their attitude toward it, and their practice is crucial for the development of effective prevention programs. As a role model, in collaboration with the Japan Pharmaceutical Association, the Japan Anti-doping Agency (JADA) introduced the "Sports Pharmacists System" in 2009. The goal of the Sports Pharmacist System was to accredit pharmacists who have received the necessary training in anti-doping and who can impart correct knowledge on medicine and the effects of drugs on health to the athletes [29]. Considering this, the study assessed, for the first time, Ethiopian pharmacists' knowledge, attitudes, and practices about doping in sports using standard survey instruments.

Based on the feedback from the pretest, amendments were made to some parts such as including a list of various substances (specific drugs from each listed medicines class) used by athletes to assess and confirm pharmacy professionals' knowledge of the doping concept. Thus, besides well-known performance-enhancing substances, i.e., anabolic steroids, growth hormones, and stimulants, the study incorporated less popular banned doping agents, including diuretics, narcotics, and beta-2 agonists, with specific drugs from each group, which helps to evaluate their knowledge in detail. Furthermore, non-prohibited substances i.e., antihistamines, and proton pump inhibitors were also included in this list.

The participants' knowledge of doping, which is important to their role in preventing and minimizing the harm caused by the illicit use of banned substances, can also be evaluated by asking them about the definition of doping. Besides, pharmacists are expected to have an in-depth understanding of the molecular makeup of medications and to offer athletes crucial guidance and information. To do so, a question was asked to tell the general mechanism of action of doping, which was rephrased as "How doping helps athletes' ability to win championships" to make it easier for the participants to respond.

The highest percentage of study participants correctly recognized the legal status of narcotics, β -agonists, growth factors, and hormone modulators in sports. In contrast, in a study conducted in Syria [24], only a lower percentage of respondents knew that narcotics were classified as prohibited. In contrast to a study by Hammadi and Hunien, most participants in the present study could not correctly find the WADA status of anabolic steroids. However, one drug, nortestosterone from the anabolic steroids group, was mentioned as banned by a significant percentage of participants. This could be due to a lack of knowledge about the correct pharmacological class of nortestosterone. A smaller percentage of respondents correctly classified diuretics. In our study, insulin was correctly classified as prohibited by 54.7 % of participants, which is superior to a study from Qatar (15 %) [25]. Insulin has now become a significant threat to the level of play that is essential in sports [30].

Athletes use doping for several reasons, from regular social behavior to illicit performance-enhancing medications. When prescribed for proven medical problems, medications that are on the WADA Prohibited List may be exempted under the Therapeutic Use Exemption rules. Athletes continue to use illegal substances despite knowing that it is against the spirit of the game and that it would result in a penalty. The WADA in its eighth annual Anti-Doping Rule Violations (ADRVs) Report highlights 935 confirmed Anti-Doping Rule Violations in 2020. The ADRV's involve individuals from 91 nations and across 67 sports [31]. A middle-distance runner who took Erythropoietin as a performance-enhancing drug was banned for 8 years in 2009, according to an ADRV's report. Another high jumper was warned publicly for using furosemide in 2013 when it was discovered that he had done so [32].

Most pharmacists surveyed said they knew what doping meant and that the mass media were their main source of information on doping. This result is questionable, however, because a considerable proportion of the participants did not give the correct definition of doping. This suggests that most pharmacy professionals did not supply a credible scientific source of information on doping. In contrast, Japanese third-year pharmacy students responded that they were familiar with doping and eighty-two percent of them knew what doping was in detail [19]. This suggests that the inclusion of doping in the curriculum increases awareness of the issue. To follow WADA recommendations [33], it is critical to increasing education and awareness of doping among Ethiopian health professionals. Respondents were asked to write down the mechanisms of action of doping agents, and almost 80 % of the study participants mentioned at least one of the pharmacological mechanisms of doping agents listed by WADA. This is not surprising, as the Ethiopian pharmacy education curriculum includes extensive information on drug action and use that helps them predict the mechanism of performance enhancement by doping agents. However, doping substances are not covered in a separate chapter titled "Doping." Doping in sports is not covered in undergraduate pharmacy curricula [18].

Most pharmacists reported that they did not receive any training during their studies, which was also noted in the study conducted in South Africa [18]. Interestingly, most pharmacists believe that they have a role to play in doping prevention. This finding is like a survey in France, where 91 % of pharmacists believe they have a role to play in doping prevention [17]. This suggests that there is a

need for doping-specific training and workshops targeting pharmacists to recognize their positive attitude and motivation toward doping in sports. In addition, including doping in the pharmacy curriculum is crucial to overcoming this problem.

More than half of the pharmacists in this study agreed or strongly agreed that doping is a public health problem and a form of drug addiction. Consistent with our study, Ama et al. 34 reported that the majority of working pharmacists considered doping to be a public health problem [17]. However, only a small proportion of Malaysian pharmacy students [114 (41.7 %)] agreed that doping is a public health problem [34]. This difference could be mainly because students may not have experience in dealing with athletes requesting information about doping substances [32].

More than 33 % of the pharmacists studied had already been confronted with suspicious doping in sports or had received a questionable prescription slip in the past 12 months. This figure is slightly lower than that of a study from France (40 %) [35]. However, the figure from our study is underestimated, especially since a certain proportion of pharmacists do not know whether the requested drug is doping or not.

To determine predictors of knowledge about doping, logistic regression analysis was used. The independent variables were subjected to binary logistic regression analysis, and variables with a p-value of less than 0.25 (age of 35 or less, being currently unmarried, and having a community pharmacy experience of <5 years) were taken to the multiple logistic regression analysis. Finally, only community pharmacy work experience was found to be significantly associated with knowledge. The result revealed that study participants who had less than 5 years of community pharmacy experience had better knowledge about doping as compared to participants with experience of 5 years or more (AOR = 0.24, 95 % CI: 0.24–0.68, $p = 0.032$), in contrast to a study conducted in Iran [26], Pharmacists with pharmacy experience of less than 5 years were more likely to have better knowledge of doping compared with more experienced pharmacists. This could be due to recent changes in the pharmacy curriculum at the national level, which allows them to read and know about doping. In addition, newly qualified pharmacists have easy access to information about drugs used as doping agents and other related information.

Better information and vigilance of pharmacy staff would ease the establishment of an epidemiological alert system. This, in turn, would allow early detection of new drug abuse for doping purposes [17]. The study had some limitations. One of the limitations is that, because of the cross-sectional nature of the study, we cannot infer a cause-and-effect relationship. The second is that we used only a quantitative approach, so a deeper investigation and detailed information may not be possible.

5. Conclusions

The results of the study show that pharmacy professionals are confronted with requests and prescriptions for banned substances. Although most of them lack doping-specific knowledge and adequate training to be active in doping prevention, most pharmacy staff believe they can play a role in the fight against doping. However, the curriculum does not allow pharmacists to learn more about doping prevention.

Author contribution statement

Hanan Muzeyin Kedir: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Hassen Seid Kemal: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Zelalem Tilahun Mekonen: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Alfoalem Araba Abiye: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Solomon Assefa Huluka: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

The data sets used and/or analyzed in this study are available from the corresponding author upon reasonable request.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e21207>.

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