Research Paper

Androgenic Anabolic Steroids Use in Pakistan From the Perspective of Bodybuilders

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ABSTRACT

Objectives: To determine the prevalence of androgenic anabolic steroids (AAS) use among bodybuilders in different cities of Pakistan.

Methods: This cross-sectional study recruited 380 bodybuilders utilizing convenience sampling from different cities of Pakistan, including Karachi, Lahore, Multan, Quetta, Peshawar, Faisalabad, Rawalpindi, and Islamabad. The study was conducted over a period of 6 months from January 2019 to June 2019. The sample included male bodybuilders aged 18 to 50 years. The basic demographic sheet and a self-designed form were used to collect data. SPSS software v. 21 was utilized for statistical analysis. The chi-square test was used to observe any relationship with $P<0.05$ as significant.

Results: The current study showed a prevalence of 109 (28.68%) AAS use in bodybuilders with testosterone being most commonly used. A total of 54 people (49.5%) used self-administration, 38 people (34.9%) used it for the short-term while 27 people (24.8%) used it in long-term. Bodybuilders were mostly inspired by peers 73 (67%) and encouraged by coaches 62 (56.9%) to use AAS. Regarding knowledge of AAS, its usage, benefits, and side effects, the majority (89%) had little or no knowledge.

Conclusion: The study concludes that the use of AAS is quite prevalent among bodybuilders in Pakistan with 28.68% of AAS mainly using testosterone preparation, and bodybuilders of age 20 to 40 mainly consuming AAS. Peers were the main inspiration for most (67%) and encouraged by their coaches to use AAS (56.9%).

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Highlights

• A high prevalence (28.68%) of androgenic anabolic steroids (AAS) use in bodybuilders is present in Pakistani cities with 34.9% using it in short-term while 24.8% in long-term.

• Self-administration of AAS is common (49.5%) among bodybuilders.

• Bodybuilders are mostly inspired by peers (67%) to take AAS and encouraged by coaches (56.9%)

• Bodybuilders lack knowledge regarding AAS use, its benefits, and side effects.

Plain Language Summary

The use of androgenic anabolic steroids (AAS) in bodybuilders has reached to new heights and AAS vendors are also involved in the illicit purchase of raw forms, brewing them at home, and selling them not only to athletes and bodybuilders but also to common men. Since AAS use is also associated with adverse effects and due to literature on the subject, a study was conducted to determine the prevalence of AAS usage among bodybuilders in different cities of the country. In the current cross-sectional study, 380 bodybuilders were studied, which revealed a prevalence of 28.68% AAS use in bodybuilders with self-administration being the commonest (49.5%) mode. A total of 34.9% used it for the short-term while 24.8% used in long-term. Most bodybuilders were inspired by peers (67%) and were encouraged by coaches (56.9%) to use AAS. They lacked knowledge regarding its usage, benefits, and side effects.

1. Introduction

Bodybuilding is the phenomenon of increasing the musculature induced by repeated and accelerated resistance exercises with diet alterations. Achieving this caloric intake is limited to induce a weight loss of about 0.5%-1% per week and enhance muscle retention by taking proteins to the tune of 2 to 3 g/kg of lean mass of the body per day along with fat-related caloric intake of 15%-30% and rest of carbohydrates in 3-6 meals/24 hours [1]. These dietary alterations along with isotonic exercises that include concentric and eccentric contraction induce muscular hypertrophy and strength while reducing fat percentage [2].

In bodybuilding, the mainstream goal is to acquire muscle hypertrophy, symmetry, and perspective, so that bodybuilders can participate in competitions where they are lined up on the stage to exhibit their muscles in various poses before assigned judges, who rank the competitors on the basis of their best muscular proportion, definition and aesthetic appearance, etc.

In 1936, an anabolic steroid (testosterone propionate) was developed which came in sports use after the Olympics of 1948 with further development of anabolic steroids in the United states in 1958 and East Germany in 1966 resulted in the virilization of today's sports with different forms and mode of administration of testosterone with short-acting buccal forms and transdermal patches as well, with more than 1000 anabolic steroids being available [3].

Anabolic androgenic steroids (AAS) are by-products of testosterone, a male sex hormone, and have historically been misused for building body mass and strength, though not without adverse effects. AAS can affect all organs and tissues of the body due to processes, such as changes in protein synthesis, oxidative stress, and cell death due to apoptosis [4]. A long list of health effects from acne and hirsutism to cancer, and bone deformities [3] with hepatotoxicity is a major complication [5]

A global lifetime prevalence of AAS use was reported by a meta-analysis study by Sagoe et al. Since 3.3% with a much higher prevalence in men compared to women is a serious public health issue [6], so that 2% to 10% of adolescents use AAS and endanger their health at the level of graduation from high school alone [7]. Though it is more prevalent in Western nations, recent studies showed increased prevalence in Eastern Mediterranean countries [8].

Though AAS has been used by athletes for the last four decades, its use has reached new heights. In 1990, American Congress placed the AAS into the schedule III class of the Controlled Substance Act (CSA). This applies to AAS and all associated substances which result in hypertrophy and strengthening of muscles [7].

However, AAS vendors involved in illicit purchase of raw liquid or powered forms and by home brewing methods increase their profits and sell it not only to athletes and bodybuilders but also to common men who wish to appear muscular. Hence, research is required to look into the pattern of distribution and use, so if necessary, it is possible to ensure the enforcement of the law by recruiting manpower, etc. if necessary [9]. However, a diverse population is now motivated to use AAS, including a group of young men as well as working-class involved in its use, which has now become a worldwide public health issue [10, 11]. With AAS use as well as dependence being prevalent even in advanced countries, such as the United States, hence expanded research in the field has been recommended to intervene at the right time to prevent future disasters [12]. A review by Hearne et al. involving Eastern Mediterranean region revealed the need for qualitative and quantitative research, considering the complexities of culture and religion [8].

AAS use is a serious public health issue with a high prevalence [6], and increasing prevalence in Eastern Mediterranean region and thus requiring research [8]. A local study by Usman et al. revealed the awareness level and practice about the side effects of anabolic steroids only in Rawalpindi and Islamabad; however, data on the prevalence of use of abuse especially in bodybuilders is lacking [13]. Hence this study was conducted to determine the prevalence of AAS use among the bodybuilders in different cities of Pakistan.

This study has significant importance since it will highlight the increasing trend of AAS use and their negative effects on policymakers and athletes alike to plan future strategies and as a research base for future studies.

2. Materials and Methods

This Cross-sectional study recruited 380 bodybuilders using non-probability convenience sampling from different cities of Pakistan, including Karachi, Lahore, Multan, Quetta, Peshawar, Faisalabad, and Rawalpindi-Islamabad during a 6-month period from January 1 2019 to June 31 2019. The sample included male bodybuilders aged 18 to 50 years. Cases with trauma were excluded from the study.

The sample of n=384 was calculated using formula, n= z 2 (p) (1-p) c2, with standard normal deviation (z) set at 95% confidence level (1.96), the percentage of choosing one choice (0.5) with confidence interval (0.05=±5). However four participants were excluded from the study due to incomplete data, hence our sample for the study was n=380.

The study was initiated after obtaining ethical approval of research from the Institutional Research Board of Isra Institute of Rehabilitation Sciences, Isra University with reference No. 1709-M.Phil-HPESS-0012 and permission for data collection from Pakistan natural bodybuilders' guild and its affiliated gyms and after obtaining the consent of the participant bodybuilders. Ethical standards were maintained during data collection and the anonymity of participants was maintained.

A basic demographic sheet and a self-designed data collection sheet/questionnaire include data/questions, such as building characteristics, including height, weight, and body type; training characteristics include training experience, use of a trainer, training frequency, exercise preference, exercise duration; eating habits include meals per day, protein intake, type of food, stimulant usage, water intake, vitamins; AAS usage include administration method, post cycle therapy, period used, advised by, inspired by, knowledge of AAS.

SPSS software v. 21 was used for statistical analysis. Descriptive statistics were utilized with frequency and percentage. Confounding variables, such as age, occupation, qualification, etc. were controlled by stratification, and chi-square was used to observe any association. $P<0.05$ was considered significant.

3. Results

The current study was conducted with a sample of 380 male bodybuilders, of which 202(53.2%) were 20-30 years old, and most of them 154(40.5%) had private jobs. The majority of 211 people (55.5%) were undergraduates and most of them were from Karachi and Lahore 80(21.1%) each (Table 1).

The AAS use was quite prevalent with 109(28.68%) bodybuilders taking AAS (Figure 1) with testosterone being commonly used by them 108(99.1%), with post-cycle therapy being used by 57(52.3%). The administration of AAS was mainly done by bodybuilders themselves 54(49.5%) with 30(27.5%) currently using and 27(24.8%) using AAS for a long time. Mostly AAS was advised by coaches 62(56.9%); however, 73(67%) were inspired by peers, and 69(63%) of bodybuilders had almost no knowledge of AAS (Table 2).

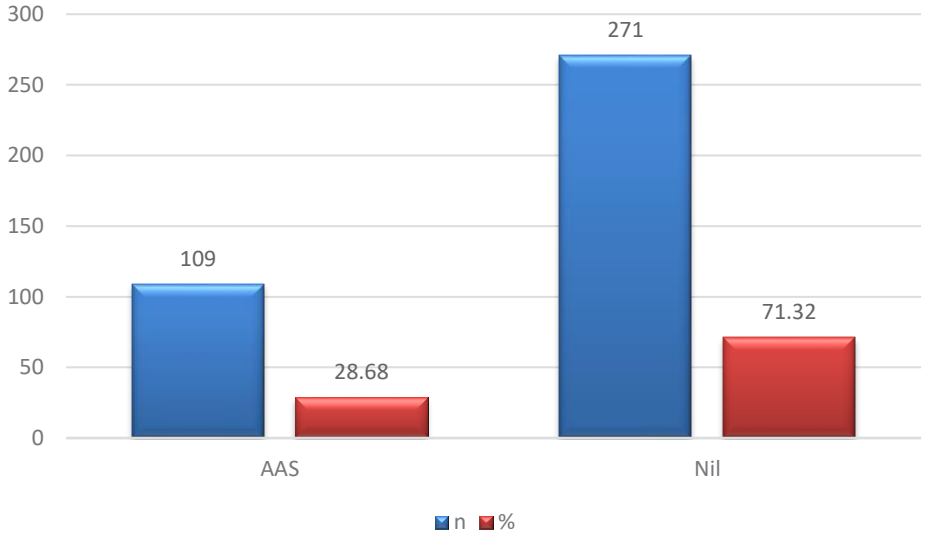

Figure 1. Prevalence of androgenic anabolic Steroid (AAS) use in bodybuilders (n=380)

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Regarding the AAS prevalence in bodybuilders with different socio-demographic characteristics, no significant difference was observed in terms of age (P=0.386), occupation (P=0.594), qualification (P=0.551); however, a higher percentage of cases from Karachi and Lahore used AAS compared to other cities and the difference was significant (P=0.013) (Table 1).

Regarding physical characteristics, no significant relationship was observed between AAS use and height (P=0.383), weight (P=0.394) and body type (P=0.309).

The AAS use was also not significantly associated with training characteristics, such as experience (P=0.661), use of a trainer (P=0.517), and training frequency (P=0.233), while exercise duration was significantly associated (P=0.0001) with AAS use with most participants (109) exercising more than1 h using AAS.

No significant relationship was observed between AAS use and type of food (P=0.631), stimulant usage (P=0.103), and multivitamin usage (P=0.443). While AAS use was significantly associated with meals per day (P=0.0001) and most AAS users (99) taking more than 5 meals per day and protein intake (P=0.0001) with most AAS users taking 2 g/kg. Significantly more (P=0.0001) water intake was also observed in AAS users.

Regarding drug dosage (Table 3), a significant difference (P=0.009) was observed in the dosage of AAS with lower doses administered by self and by the coaches. Long-term users used higher doses compared to others (P=0.002). Also, significant difference (P=0.017) was observed when AAS was advised by coaches compared to self-medication, while no significant difference (P=0.068) was observed depending upon inspiration from different people and knowledge of AAS (P=0.459) and weight of bodybuilder (P=0.242)

4. Discussion

The current study showed a prevalence of AAS use of 28.68% among bodybuilders with the majority (53.21%) being 20-30 years old, doing private jobs (38.53%), and undergraduates (59.63%). This study did not include a female sample; however, the literature reveals a worse effect of AAS on female musculature with masculinization and the resultant impact on sexual physiology, social life as well as self-esteem [14]

Similarly, a study by Nakhaee et al. showed a lifetime prevalence of AAS use of 24.5% which was more common in people with less education and singles [15], and a prevalence of 28.8% was reported in an Iranian study by Razavi et al., and the majority of them were bodybuilders younger than 25 years of age [16]. A slightly higher prevalence of 31% was reported in a Saudi study by Bahari et al. [17] with the highest (37.6%) prevalence in the age group of 30 to 34 years and in the highly educated. In contrast, in another study, a very high prevalence of 64% AAS use was observed among bodybuilders in which the age group was 24±3 years with 84% being educated [13]. Hussain et al. reported that bodybuilders were most (49.8%) vulnerable to AAS use [18]. A Saudi study by Al-Harbi et al. showed a prevalence of 29.3% in gym users [19] in participants with a mean age of 27 years with a majority of 61% be-

Table 1. Participant characteristics versus androgenic anabolic steroid (AAS) usage cross tabulation, Chi-square association (n=380)

Participant Characteristics			Total	Anabolic Androgenic Steroid Usage, No.		X^2, P
	Variables	Groups	No. (%)/No	No (n=271)	Yes (n=109)	
Socio demographic	Age (y)	20-30	202(53.2)	143	58	3.035, 0.386
		31-40	159(41.8)	113	46	
		41-50	19(5.0)	15	5	
	Occupation	Business	82(21.6)	59	23	2.787, 0.594
		Govt job	53(13.9)	37	16	
		Private job	154(40.5)	112	42	
		Students	81(21.3)	54	27	
		Unemployed	10(2.6)	9	1	
	Qualification	Undergraduate	211(55.5)	146	65	1.193, 0.551
		Graduate	115(30.3)	84	31	
		Post-graduate	54(14.2)	41	13	
	City	Faisalabad	30(7.9)	23	7	17.766, 0.013
		Islamabad	60(15.8)	53	7	
		Karachi	80(21.1)	50	30	
		Lahore	80(21.1)	48	32	
		Multan	40(10.5)	30	10	
		Peshawar	30(7.9)	22	8	
		Quetta	30(7.9)	23	7	
		Rawalpindi	30(7.9)	22	8	
Build characteristics	Height (feet)	5-5.6	36(9.5)	29	7	1.922, 0.383
		5.7-6	330(86.8)	233	97	
		6.1-6.6	14(3.7)	9	5	
	Weight (kg)	60-70	74(19.7)	58	16	2.983, 0.394
		71-80	133(35.0)	96	37	
		81-90	152(40.5)	103	49	
		91-100	18(4.7)	12	6	
	Body type	Mesomorph	359(94.5)	256	103	2.344, 0.309
		Ectomorph	9(2.4)	8	1	
		Endomorph	12(3.2)	7	5	

Participant Characteristics			Total	Anabolic Androgenic Steroid Usage, No.		X^2, P
	Variables	Groups	No. (%)/No	No (n=271)	Yes (n=109)	
Training characteristics	Training experience (y)	<5	272(71.6)	193	79	0.829, 0.661
		05-09	106(27.9)	76	30	
		10≥	2(0.5)	2	0	
	Using Trainer	No	344(90.5)	247	97	0.42, 0.517
		Yes	36(9.5)	24	12	
	Training frequency	3 to 4 days	85(22.4)	65	20	1.422, 0.233
		5 to 6 days	295(77.6)	206	89	
	Exercise preference	Strength	380(100)	271	109	-
	Exercise duration	1 h	180(47.4)	180	0	137.55, 0.0001
		>1 h	200(52.6)	91	109	
Eating Habits Characteristics	Meals per day	05	166(43.7)	156	10	73.99, 0.0001
		>5	214(56.3)	115	99	
	Protein intake	1 g	137(36.1)	136	1	337.48, 0.0001
		1.5 g	131(34.5)	128	3	
		2 g	110(28.9)	5	105	
	Type of food	<1 g	2(0.5)	2	0	0.231, 0.631
		Mix	363(95.5)	258	105	
		Veg	17(4.5)	13	4	
	Stimulant usage	Coffee	86(22.6)	55	31	4.545, 0.103
		Energy drinks	57(15.0)	38	19	
		Nil	237(62.4)	178	59	
	Water intake	01-05	7	5	2	23.19, 0.0001
		06-10	317	241	76	
		>10	56	25	31	
	Multivitamins	No	261(68.7)	183	78	0.588, 0.443
		Yes	119(31.3)	88	31	

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ing singles, 67.1% educated, 35.5% government employees, and 31% students [19], while a much higher prevalence of 45.5% was observed in weightlifters those in private sector 35.8% and aged >25 i.e., 53.3% [19]. However in current study, no significant difference was observed between age (P=0.386), occupation (P=0.594), and qualification (P=0.551). Though most samples were obtained from Karachi, Lahore, and Islamabad because these metropolitan cities have more gyms; however, more percentage of cases from Karachi and Lahore used AAS compared to other cities and the difference was significant (P=0.013). This may

Table 2. Androgenic anabolic steroid (AAS) use characteristics (n=109)

Characteristics	Groups	No. (%)
AAS used	Combo	1(0.9)
	Testosterone	108(99.1)
Post Cycle therapy	No	52(47.7)
	Yes	57(52.3)
Method of administration	Coach	43(39.4)
	Medical expert	12(11.0)
	Self	54(49.5)
Period used	Current	30(27.5)
	Long term	27(24.8)
	Past	14(12.8)
	Short term	38(34.9)
Advised by	Coach	62(56.9)
	Nil	3(2.8)
	Self	44(40.4)
Inspired by	Peers	73(67)
	Showbiz	26(23.9)
	Social media	10(9.2)
Knowledge of AAS	Little	28(25.7)
	None	69(63.3)
	Sufficient	12(11.0)

AAS: androgenic anabolic steroids.

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be due to the easy availability of AAS in these highly populated metropolitan cities. However another study showed age association with 22% below 20 years of age using AAS [12]. Thus the prevalence of AAS use in Pakistan is somewhat similar to the literature [15-17, 19].

In the current study, the use of AAS was quite prevalent with 109 (28.68%) bodybuilders using AAS with post-cycle therapy being used by 57 (52.3%). The administration of AAS was mainly done by bodybuilders themselves 54 (49.5%) with 30 (27.5%) currently using and 27 (24.8%) using AAS in long-term. Mostly AAS was advised by coaches 62 (56.9%) after being inspired by peers 73 (67%) with almost no knowledge of AAS among 69 (63%) of bodybuilders. An Iranian study by Razavi et al. reported that mostly AAS use was suggested by peers 43.1%, coaches 36.1%, and had no relationship with knowledge. [16]. A Saudi study Aldarweesh and Alhajjaj reported a frequency of 17.69% AAS use in gyms where coaches are the main providers. Gym AAS users (50%) have inadequate knowledge of AAS [20].

Regarding physical characteristics, no significant relationship was observed between AAS use and height (P=0.383), weight (P=0.394) and body type (P=0.309) in the current study and no relationship was observed in training characteristics, such as experience (P=0.661), the use of a trainer (P=0.517), training frequency (P=0.233). However, exercise duration was significantly associated (P=0.0001) with AAS use

Table 3. Anabolic androgenic steroid (AAS) use characteristics Vs dosage of steroid. Cross tabulation. Chi square association (n=109)

Characteristics	Group (n)	Tota1, No (%)	Dosage (Milligram)				X^2, P
			100-200 (n=31)	201-300 (n=61)	301-400 (n=14)	401-500 (n=3)	
Method of administration	Coach	43(39.4)	7	30	5	1	16.99, 0.009
	Medical expert	12(11.0)	3	5	2	2	
	Self	54(49.5)	21	26	7	0	
Period	Current	30(27.5)	14	16	0	0	25.84, 0.002
	Long-term	27(24.8)	3	14	7	3	
	Past	14(12.8)	6	7	1	0	
	Short-term	38(34.9)	8	24	6	0	
Advised by	Coach	62(56.8)	12	41	6	3	10.22, 0.017
	Self	47(43.2)	16	20	8	0	
Inspired by	Peers	73(67.0)	14	45	12	2	11.74, 0.068
	Showbiz	26(23.9)	13	10	2	1	
	Social media	10(9.2)	4	6	0	0	
Knowledge of AAS	Little	28(25.7)	10	13	4	1	5.60, 0.459
	None	69(63.3)	15	43	9	2	
	Sufficient	12(11.0)	6	5	1	0	
Weight group	60-70	16(14.7)	3	9	4	0	11.52, 0.242
	71-80	37(33.9)	17	15	4	1	
	81-90	49(45.0)	10	32	5	2	
	91-100	6(5.5)	1	4	1	0	

AAS: androgenic anabolic steroids

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with most participants who exercised for more than 1 h using AAS. Also, no significant relationship was observed between AAS use and eating habits of the type of food (P=0.631), stimulant usage (P=0.103), and multivitamin usage (P=0.443). While AAS use was significantly associated with meals per day (P=0.0001) with most AAS users (99) taking more than 5 meals per day, protein intake (P=0.0001) with most AAS users taking 2 g/kg. Significantly more (P=0.0001) water intake was also observed in AAS users. Al-Harbi et al. reported that weight lifting, vitamin and mineral supplement use, special diets, and peers using AAS were the factors significantly associated with AAS use in another study [19]. Since caloric intake is adjusted to reduce body weight by 0.5% to 1% per week to maximize the retention of muscles by taking 2.3 to 3.1 g/kg of protein [1]. Taking 3 to 6 meals per day prior to resistance training exercises maximizes the nutrient benefit [1]. Creatine monohydrate, beta-alanine, and caffeine-like compounds are said to have positive effects on contest preparation, and hence such stimulants are consumed [1].

In the present study, a significant difference (P=0.009) was observed in the dosage of AAS with lower doses administered by self and coaches compared to medical experts. Long-term users used higher doses compared to others (P=0.002). While Hussain et al. indicated that most people (58.4%) used testosterone, and most (53.3%) used it mostly by injections at the suggestion of a friend [18]. Similarly, in the current study, a significant relationship (P=0.017) was observed

with majority AAS users used AAS compared to self-medication advised by coaches, while no significant difference (P=0.068) was observed depending upon inspiration from different people and knowledge of AAS (P=0.459) and weight of bodybuilder (P=0.242). Friends and coaches/trainers of bodybuilders were the main motivators in another study (P=0.008) [13].

A local study concluded that the use of AAS in bodybuilders was on the rise so that they are used without knowledge of the adverse effects and symptoms which are related to withdrawal. Despite unregulated sources of AAS in the region, health care professionals, as well as, media should play their role in disseminating knowledge [13, 21].

Limitations

The current study has limitations in not including female samples, however since the study has ample samples from all the major cities of Pakistan, the results can easily be generalized not only for other cities and areas of Pakistan but also for the neighboring countries.

Recommendations

Future studies with samples, including women, as well as research on the adverse effects of AAS observed in bodybuilders are recommended.

5. Conclusion

The study concludes that AAS use is quite prevalent among bodybuilders in Pakistan with 28.68% of AAS mainly using testosterone preparation, with bodybuilders of age 20 to 40 mainly using AAS. Peers were the main inspiration for most (67%) and encouraged by their coaches to use AAS (56.9%). This is essential and it is suggested that drug regulatory authorities should enhance public awareness about the adverse effects of AAS and initiate concrete steps to control drug abuse.

Ethical Considerations

Compliance with ethical guidelines

The study was approved by Research Committee of Isra Institute of Rehabilitation Sciences, Isra University, Islamabad, Pakistan (Code:1709-M.Phil-HPESS-0012)

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Authors' contributions

Conceptualization and supervision: Aqeel Ahmed Khan, Muhammad Imran Khan; Methodology, resources, and data duration: Syed Muhammad, Muhammad Kamran; Formal analysis and writing-original draft preparation: Ghulam Saqulain, Muhammad Imran Khan, Ejaz Asghar; Writing, reviewing and editing, and supervising: Ghulam Saqulain, Shoukat Hayat, Aqeel Ahmed Khan.

Conflict of interest

The authors declared no conflict of interest.

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