FREQUENCY OF INJURIES IN RECREATIONAL BODYBUILDING IN SAUDI ARABIA

Ahmed Hussain Alqahtani*[1], Ali Abdullah Ali Alshehri[2]

[1]Senior registrar orthopedic, Orthopedic Department, Armed Forced Hospital South Region, Asir Region, Saudi Arabia; [2]Senior Resident Orthopedic, Orthopedic Department, Armed Forced Hospital South Region, Asir Region, Saudi Arabia

Abstract

Background: Bodybuilding is widely recognized as a safe and effective way of engaging in physical workouts, however not without potential risks. The primary hazards to the musculoskeletal system are related to excessive strain on the joints due to repeated movements and errors in technical execution.

Aim: To evaluate the frequency of injuries among recreational bodybuilders in Saudi Arabia.

Methods: An cross-sectional research was conducted among individuals engaged in bodybuilding in Saudi Arabia. Participants were given an online questionnaire using Google Link. The data was processed using the SPSS 23.0 software. The Chi-square test was used to examine the association between the incidence of injuries and socio-demographic and training parameters. The significance level was determined to be 0.05.

Results: 163 individuals participated in the present study. Males dominate the sample, comprising 67.5%, while females represent 32.5%. The largest age group is 20-29 years, comprising 35%. The most common training frequency is 6 days per week, reported by 19.0%. The most reported frequency of rest is 1 rest day per week (19%). 33.7% reported using weight range between 20-39 kilograms, while 27.6 5 reported lifting between 10-19 kilograms. A majority, 61.3%, reported not being injured, while 38.7% reported experiencing an injury. Our results show a significant association between gender and injury rates among bodybuilders in the past 6 months ($\chi2 = 12.962$, $p = 0.001 < 0.05$). In addition, shows a significant association between age groups and injury rates among bodybuilders in the past 6 months ($\chi2 = 50.135$, $p = 0.001$). The data reveals a significant association between bodybuilding experience and injury rates in the past 6 months ($\chi2 = 27.780$, $p = 0.001$). The data shows no significant association between training multiple times a day and injury rates among bodybuilders in the past 6 months ($\chi2 = 0.751$, $p = 0.24$). There is a significant association between bodybuilding supervision and injury rates in the past 6 months ($\chi2 = 40.536$, $p = 0.001$). There is a significant association between training session duration and injury rates in the past 6 months ($\chi2 = 17.441$, $p = 0.002$). However, we observed no significant association between the number of training days per week and injury rates among bodybuilders in the past 6 months ($\chi2 = 6.094$, $p = 0.413$). Sprains were the most common type of injury, accounting for nearly one-third of all reported injuries, followed by strain-muscle tears. Dislocations accounted for 15.9% and general inflammation and pain (12.7%). The most commonly injured body parts are the bicep and hamstring, each accounting for 11.1% of the injuries. This is followed by the groin, ankle, and foot, each with 7.9% of the injuries.

Conclusion: The study found a 38.7% injury prevalence among recreational bodybuilders in Saudi Arabia, with bicep and hamstring injuries being the most common. Factors such as gender, age, bodybuilding experience, supervision, and training duration were associated with injury rates. The research could help health professionals reduce injury occurrence.

Keywords: Frequency, Injuries, Recreational, Bodybuilding and Saudi Arabia.

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*Corresponding Author: Prof. Saad Ali Al-Shahrani, Senior registrar orthopedic, Orthopedic Department, Armed Forced Hospital South Region, Asir Region , Saudi Arabia

Tel: 966535362866

Correo-e: Ahmad.Alqahtani19@gmail.com

Introduction

Resistance training is a widely practiced physical exercise that is effective in enhancing strength, muscular hypertrophy, and endurance [1]. Resistance training involves the use of skeletal muscles to overcome resistance, which may be from the trainee's own body weight or workout equipment such as dumbbells, barbells, and training machines. The goal of resistance training is to target particular muscle groups and joint movements. While some people engage in resistance training only for overall health advantages, some groups want to participate in sports that primarily rely on resistance training as the main type of exercise prior to the competition. The sports mentioned include powerlifting, CrossFit, Olympic weightlifting, and bodybuilding [2]. Compared to other sports that prioritize resistance training, bodybuilding does not evaluate athletic performance during contests. Nevertheless, the athletes are assessed by a panel of evaluators, including two or three persons, who consider their muscle size, definition, and symmetry. Historically, bodybuilding was the only competitive category accessible to both males and females [3]. Over the last two decades, other subcategories have been included, each with different assessment criteria [4]. There are distinct categories for men and females. Women have the opportunity to participate in the bikini fitness, body fitness/ figure, and women's physique divisions. Men's physique, classic bodybuilding, and classic physique are distinct competition divisions created only for male contestants. Both men and women may participate in bodybuilding and physical fitness [5, 6].

Applying uniformly to all categories, top athletes go through several periods of modified training volume, frequency, and intensity along with customized food plans. The "on-season" and "offseason" cycles, as they are often called, serve as the cornerstone of bodybuilding competition preparation [7]. Excessive calorie eating and resistance training, aimed at gaining muscle mass and body weight, are common characteristics of the off-season [8].

The objective is to preserve the gained muscle mass throughout the on-season, which is the period leading up to competition while simultaneously reducing body fat and weight [9]. This is often achieved by raising energy expenditure and lowering energy consumption [10]. Certain bodybuilding divisions' weight loss phases are comparable to those of combat sports and powerlifting. This is due to the fact that competitors in these subcategories must participate in a weigh-in in order to compete in a certain weight division [11]. Powerlifting's three main disciplines-squats, bench presses, and deadlifts—are often included in the training regimen for a bodybuilding competition [12]. Nonetheless, bodybuilders often engage in a broad range of exercises, but at a lesser intensity than powerlifters, whose training regimen is centered on a certain percentage of their one-repetition maximum (1-RM). This distinction is based on the fact that bodybuilding competitions do not include strength testing. Instead, it is advised to exercise often and in a significant quantity to support the growth of muscle [13].

One risk factor for musculoskeletal injuries encountered during lengthy strength training sessions is a sudden and significant increase in training volume, frequency, and intensity [14]. Furthermore, participating in training and competitive activities that include external elements that modify the usual movement pattern might heighten the risk of injury [15]. Two other lifestyle-related risk variables are decreased caloric intake and eating disorders [16]. Studies have shown that rapid weight reduction achieved by ingesting a high number of calories is harmful to performance and the preservation of lean body mass, in contrast to a slower pace of weight loss [17]. Individuals who engage in strength training are at a higher risk of experiencing tendon-related injuries if they use anabolic steroids [18].

Previous study in the same field has identified the shoulder, elbow, lower back, and knee as the most common places for anatomical injuries [19]. Research has shown the presence of sexrelated differences in the frequency, timing, and site of musculoskeletal injuries in sports focused on strength training [11]. Female athletes who engage in resistance training are more prone to have injuries that have a quick onset, while male athletes typically sustain injuries without a specific triggering event. However, because to the limited amount of data available, there is a lack of comprehension of the difference between genders in the field of bodybuilding.

Weightlifting sports have a somewhat lower frequency of injuries in comparison to team sports [20]. Bodybuilding has the lowest injury rate compared to other activities that depend on resistance [1].

While there is existing data on injuries in other weightlifting disciplines, there is a scarcity of study especially dedicated to bodybuilders. To the best of the author's knowledge, there is just one thorough study review that investigates the prevalence of injuries among bodybuilders. Furthermore, there is a lack of previous study on the prevalence and precise sites of injuries among bodybuilders in Saudi Arabia. There is empirical data indicating that there are disparities in the prevalence and subjective experience of pain depending on demographic characteristics [1]. Moreover, it is still uncertain if the previous study covered other competitive categories outside bodybuilding or just categorized all athletes as "bodybuilders". Therefore, our objective was to assess the prevalence of injuries among individuals engaged in recreational bodybuilding in Saudi Arabia.

Aim of Work

To evaluate the frequency of injuries among recreational bodybuilders in Saudi Arabia.

Methods

An observational research was conducted among bodybuilders in Saudi Arabia. Participants were provided with an online questionnaire via a Google Link. The questionnaire had three components. The first section gathered the sociodemographic attributes of individuals, including gender, age, height, weight, and body mass index (BMI). The second section gathered data on training features, including the time of training per session and per week, as well as the amount of weight lifted each session. The third section examined the geographical distribution, severity, and occurrence rate of injuries experienced by participants throughout their training.

Ethical consideration

The approval was obtained from the..... no. (.....). An informed consent was acquired from the participants. Participants were assured respect and confidentiality of their collected information and they were given a brief overview of the study and its objectives.

Statistical analysis

The data was analyzed using the SPSS 23.0 software. Descriptive statistics were used to summarize the data, including measurements such as mean, standard deviation, frequencies, and percentages. The Chi-square test was used to examine the correlation between the incidence of injuries and socio-demographic and training parameters. The significance level was determined to be 0.05.

Results

(Table 1)163 individuals participated in the present study. Table (1) shows the gender distribution in a sample of 163 individuals. Males dominate the sample, comprising 67.5% (n= 110), while females represent 32.5% (n= 53).

(Table 2) presents the age distribution of the same 163-individual sample. The largest age group is 20-29 years, comprising 35% (n= 57), closely followed by the 30-39 age group at 34.4% (n= 56). The 40-49 age group represents 18.4% (n= 30), while the 50-59 group is the smallest at 12.3% (n= 20). This distribution shows a skew towards younger age groups, with nearly 70% of the sample under 40 years old. The data is complete, with percentages summing to 100%, providing a clear picture of the age structure within the sample.

(Table 3) shows the distribution of bodybuilding experience among 163 individuals. The sample is fairly evenly distributed across four categories of experience. Those with "One year to less than 2 years" of experience form the largest group at 25.8% (n= 42). Both "6 months to less than one year" and "5 years and above" categories each represent 25.2% (n= 41) of the sample. The "Two years to less than 5 years" group comprises 23.9% (n= 39).

(Table 4) presents the distribution of individuals who train multiple times a day among a sample of 163 individuals. The sample is almost evenly split, with 50.3% (n= 82) reporting that they do not train multiple times a day, while 49.7% (n= 81) do.

(Table 5) shows the distribution of supervised versus unsupervised bodybuilding among 163 individuals. A slight majority, 52.8% (n= 86), report bodybuilding without supervision, while

47.2% (n= 77) train under supervision.

(Table 6) presents the distribution of average training session durations among 163 individuals. The most common training duration is "90 to 119 minutes," reported by 27.0% (n= 44). This is followed by "Less than 30 minutes" at 21.5% (35 individuals), "30 to 59 minutes" at 20.2% (n= 33), and "60 to 89 minutes" at 17.8% (n= 29). The least common duration is "120 minutes and above," reported by 13.5% (n= 22).

(Table 7) shows the distribution of average training days per week among 163 persons. The most common frequency is 6 days per week, reported by 19.0% (n= 31). This is followed by 1 day per week at 15.3% (n= 25). Interestingly, there's a relatively even distribution across 2, 3, and 5 days per week, each at 13.5% (n= 22). Training 4 days per week is slightly less common at 12.9% (21 individuals), while 7 days per week is the least common at 12.3% (n= 20).

As shown in (Table 8), the distribution of average rest days per week among

Table 1. Gender distribution among the study participants.

Gender		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	110	67.5	67.5	67.5
	Female	53	32.5	32.5	100
	Total	163	100	100	

Table 2. Age distribution of the study participants Age.

Gender		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-29	57	35	35	35
	30-39	56	34.4	34.4	69.3
	40-49	30	18.4	18.4	87.7
	50-59	20	12.3	12.3	100
	Total	163	100	100	

Table 3. Frequency of bodybuilding.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6 months to less than one year	41	25.2	25.2	25.2
	One year to less than 2 years	42	25.8	25.8	50.9
	Two years to less than 5 years	39	23.9	23.9	74.8
	5 years and above	41	25.2	25.2	100
	Total	163	100	100	

How long have you been bodybuilding?

Table 4. Frequency of training of the study participants.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	81	49.7	49.7	49.7
	No	82	50.3	50.3	100
	Total	163	100	100	

Do you train multiple times a day?

Table 5. Distribution of supervised versus unsupervised bodybuilding among the participants.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Supervised	77	47.2	47.2	47.2
	Unsupervised	86	52.8	52.8	100
	Total	163	100	100	

Table 6. Distribution of average training session durations among the participants.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 30 minutes	35	21.5	21.5	21.5
	30 to 59 minutes	33	20.2	20.2	41.7
	60 to 89 minutes	29	17.8	17.8	59.5
	90 to 119 minutes	44	27	27	86.5
	120 minutes and above	22	13.5	13.5	100
	Total	163	100	100	

Table 7. Frequency of training per week

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	25	15.3	15.3	15.3
	2.00	22	13.5	13.5	28.8
	3.00	22	13.5	13.5	42.3
	4.00	21	12.9	12.9	55.2
	5.00	22	13.5	13.5	68.7
	6.00	31	19	19	87.7
	7.00	20	12.3	12.3	100
	Total	163	100	100	

Table 8. Frequency of rest from training per week.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	20	12.3	12.3	12.3
	1	31	19	19	31.3
	2	22	13.5	13.5	44.8
	3	21	12.9	12.9	57.7
	4	22	13.5	13.5	71.2
	5	22	13.5	13.5	84.7
	6	25	15.3	15.3	100
	Total	163	100	100	

On the average, how many rest days do you take per week.

Table 9. Distribution of weight lifted during training

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	19 kilograms	45	27.6	27.6	27.6
	20-39 kilograms	55	33.7	33.7	61.3
	40-59 kilograms	41	25.2	25.2	86.5
	60-79 kilograms	18	11	11	97.5
	80 kilograms	4	2.5	2.5	100
	Total	163	100	100	

What amount of weight do you lift during training?

163 individuals. The most common frequency is 1 rest day per week, reported by 19.0% (n= 31). This is followed by

6 rest days per week at 15.3% (n= 25). Interestingly, there's an even distribution across 2, 4, and 5 rest days per week, each at 13.5% (n= 22). Taking 3 rest days is slightly less common at 12.9% (n= 21), while having no rest days (0) is the least common at 12.3% (n= 20).

(Table 9) presents the distribution of weight lifted during training among 163 individuals. The most common weight range is "20-39 kilograms," reported by 33.7% (n= 55) of the sample. This is followed closely by those lifting "19 kilograms" at 27.6% (n= 45) and "40-59 kilograms" at 25.2% (n= 41). A smaller portion, 11.0% (n= 18), lifts "60-79 kilograms," while only 2.5% (n= 4) lift "80 kilograms" or more.

(Table 10) shows the distribution of individuals who have been injured while bodybuilding in the past 6 months among a sample of 163 individuals. A majority, 61.3% (n= 100), reported not having been injured, while 38.7% (n= 63) reported experiencing an injury. This indicates that while a significant portion of the sample has remained injury-free, a notable minority has encountered injuries.

(Table 11) shows a significant association between gender and injury rates among bodybuilders in the past 6 months ($\chi2 = 12.962$, $p = 0.001 < 0.05$). For male bodybuilders:

- 53 out of 110 (48.2%) reported being injured
- 57 out of 110 (51.8%) reported no injuries For female bodybuilders:
- 10 out of 53 (18.9%) reported being injured
- 43 out of 53 (81.1%) reported no injuries

Table 10. Incidence of injury during bodybuilding among the study participants.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	63	38.7	38.7	38.7
	No	100	61.3	61.3	100
	Total	163	100	100	

Have you been injured while bodybuilding in the past 6 months?

Table 11. Relation between gender and incidence of injury among the study participants.

		Have you been injured while bodybuilding in the past 6 months		Total	Pearson	p-value
		Yes	No		ChiSquare	
Gender	Male	53	57	110	12.962a	0.001
	Female	10	43	53		
Total		63	100	163		

Table 12. Relation between age and incidence of injury among the study participants.

		months?	Have you been injured while bodybuilding in the past 6	Total	Pearson ChiSquare	p-value
		Yes	No			
Age	20-29	41	16	57	50.135a	0.001
	30-39	9	47	56		
	40-49	3	27	30		
	50-59	10	10	20		
Total		63	100	163		

(Table 12) shows a significant association between age groups and injury rates among bodybuilders in the past 6 months ($\chi2 = 50.135$, $p = 0.001$). Breaking down the injury rates by age group:

- 20-29 years: 41 out of 57 (71.9%) reported injuries
- 30-39 years: 9 out of 56 (16.1%) reported injuries
- 40-49 years: 3 out of 30 (10.0%) reported injuries
- 50-59 years: 10 out of 20 (50.0%) reported injuries

(Table 13) reveals a significant association between bodybuilding experience and injury rates in the past 6 months ($\chi2 = 27.780$, $p = 0.001$).

Examining injury rates across different experience levels:

- 6 months to less than one year: 24 out of 41 (58.5%) reported injuries
- One year to less than 2 years: 24 out of 42 (57.1%) reported injuries
- Two years to less than 5 years: 10 out of 39 (25.6%) reported injuries

(Table 14) shows no significant association between training multiple times a day and injury rates among bodybuilders in the past 6 months ($\chi2 = 0.751$, $p = 0.24$). Breaking down the injury rates by training frequency:

- Those who train multiple times a day: 34 out of 81 (42.0%) reported injuries
- Those who do not train multiple times a day: 29 out of 82 (35.4%) reported injuries.

(Table 15) shows that there is a significant association between bodybuilding supervision and injury rates in the past 6 months ($\chi2 = 40.536$, $p = 0.001$).

Examining injury rates across supervised and unsupervised bodybuilding:

- Supervised bodybuilding: 10 out of 77 (13.0%) reported injuries
- Unsupervised bodybuilding: 53 out of 86 (61.6%) reported injuries

(Table 16) shows a significant association between training session duration and injury rates in the past 6 months ($\chi2 = 17.441$, $p = 0.002$).

Examining injury rates across different training durations:

Table 13. Association between bodybuilding experience and injury rates.

Crosstab Count	Have you been injured while bodybuilding in the past 6 months?			Total		
How long 6 months to less than have you been one year		Yes	No		Pearson ChiSquare	P-value
		24	17	41	27.780a	0
bodybuilding?	One year to less than 2 years	24	18	42		1
	Two years to less than 5 years	10	29	39		
	5 years and above	5	36	41		
Total		63	100	163		

Table 14. Association between training times per day and injury rates.

	Have you been injured while bodybuilding in the past 6 months?		Total	Pearson ChiSquare	p-value
	Yes	No			
Do you train multiple times a day? Yes	34	47	81	0.751a	0.24
No	29	53	82		
Total	63	100	163		

Table 15. association between bodybuilding supervision and injury rates.

	Have you been injured while bodybuilding in the past 6 months?			Pearson ChiSquare	p-value
	Yes	No	Total		
Do your body build Supervised	10	67	77	40.536a	0.001
with or without supervision? Unsupervised d	53	33	86		
Total	63	100	163		

Table 16. shows a significant association between training session duration and injury rates in the past 6 months ($\chi2 = 17.441$, $p = 0.002$).

	Have you been injured while bodybuilding in the past 6 months?		Total	Chi-Square	p-value
	Yes	No			
On the Less than 30 60 to 89 minutes average, how minutes average, how minutes	7	28	35	17.441	0.002
30 to 59 minutes	7	26	33		
60 to 89 minutes	16	13	29		
90 to 119 minutes	24	20	44		
120 minutes and above	9	13	22		
Total	63	100	163		

- Less than 30 minutes: 7 out of 35 (20.0%) reported injuries
- 30 to 59 minutes: 7 out of 33 (21.2%) reported injuries
- 60 to 89 minutes: 16 out of 29 (55.2%) reported injuries
- 90 to 119 minutes: 24 out of 44 (54.5%) reported injuries
- 120 minutes and above: 9 out of 22 (40.9%) reported injuries

(Table 17) shows no significant association between the number of training days per week and injury rates among bodybuilders in the past 6 months ($\chi2 = 6.094$, $p = 0.413$).

Examining injury rates across different training frequencies:

- 1 day per week: 8 out of 25 (32.0%) reported injuries
- 2 days per week: 8 out of 22 (36.4%) reported injuries
- 3 days per week: 11 out of 22 (50.0%) reported injuries
- 4 days per week: 5 out of 21 (23.8%) reported injuries
- 5 days per week: 9 out of 22 (40.9%) reported injuries
- 6 days per week: 11 out of 31 (35.5%) reported injuries - 7 days per week: 11 out of 20 (55.0%) reported injuries

(Table 18) shows no significant association between the number of rest days per week and injury rates among bodybuilders in the past 6 months ($\chi2 = 6.094$, $p = 0.413$).

Examining injury rates across different rest day frequencies:

- 0 rest days per week: 11 out of 20 (55.0%) reported injuries
- 1 rest day per week: 11 out of 31 (35.5%) reported injuries
- 2 rest days per week: 9 out of 22 (40.9%) reported injuries
- 3 rest days per week: 5 out of 21 (23.8%) reported injuries
- 4 rest days per week: 11 out of 22 (50.0%) reported injuries
- 5 rest days per week: 8 out of 22 (36.4%) reported injuries - 6 rest days per week: 8 out of 25 (32.0%) reported injuries

(Table 19) reveals a significant association between the amount of weight lifted and injury rates among bodybuilders in the past 6 months ($\chi2 = 9.590$, $p = 0.048$).

Examining injury rates across different weight categories:

- 19 kilograms: 12 out of 45 (26.7%) reported injuries
- 20-39 kilograms: 29 out of 55 (52.7%) reported injuries
- 40-59 kilograms: 16 out of 41 (39.0%) reported injuries
- 60-79 kilograms: 4 out of 18 (22.2%) reported injuries
- 80 kilograms: 2 out of 4 (50.0%) reported injuries

(Table 20) presents data on injury recurrence among 63 bodybuilders who reported injuries in the past 6 months. The distribution is relatively even, with

Table 17. Association between the number of training days per week and injury rates among bodybuilders.

		Have you been injured while bodybuilding in the past 6 months?		Total	Chi-Square	p-value
		Yes	No			
On the average, how many rest days do you take per week?	00	11	9	20	6.094	0.413
	1.00	11	20	31		
	2.00	9	13	22		
	3.00	5	16	21		
	4.00	11	11	22		
	5.00	8	14	22		
	6.00	8	17	25		
Total		63	100	163		

Table 18. shows no significant association between the number of rest days per week and injury rates among bodybuilders in the past 6 months ($\chi 2 = 6.094$, $p = 0.413$).

	Have you been injured while bodybuilding in the past 6 months?				Chi-Square	p-value
		Yes	No	Total		
On the average, how many rest days do you take per week?	00	11	9	20	6.094	0.413
	1.00	11	20	31		
	2.00	9	13	22		
	3.00	5	16	21		
	4.00	11	11	22		
	5.00	8	14	22		
	6.00	8	17	25		
Total		63	100	163		

Table 19. reveals a significant association between the amount of weight lifted and injury rates among bodybuilders in the past 6 months ($\chi 2 = 9.590$, $p = 0.048$).

		Have you been injured while bodybuilding in the past 6 months?		Total	Chi-Square	P-value
		Yes	No			
What amount of 19 weight do you lift kilograms during training?		12	33	45	9.59	0.048
	20-39 kilograms	29	26	55		
	40-59 kilograms	16	25	41		
	60-79 kilograms	4	14	18		
	80 kilograms	2	2	4		
Total		63	100	163		

Table 20. Presents data on injury recurrence among 63 bodybuilders who reported injuries in the past 6 months. The distribution is relatively even, with a slight majority experiencing repeated injuries.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	First time	29	46	46	46
	Repeated	34	54	54	100
	Total	63	100	100	

Table 21. Association between time of training and injury rates.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Early in the training	20	31.7	31.7	31.7
	in the middle of training	21	33.3	33.3	65.1
	at the end of training	22	34.9	34.9	100
	Total	63	100	100	

At what time in the training session did the injury occur?

a slight majority experiencing repeated injuries:

- First-time injuries: 29 individuals (46.0%)
- Repeated injuries: 34 individuals (54.0%)

This distribution suggests that slightly more than half of the injured bodybuilders have experienced the same injury before.

(Table 21) presents data on when injuries occurred during training sessions among 63 bodybuilders who reported injuries in the past 6 months. The distribution is fairly even across different times in the training session: - Early in the training: 20 individuals (31.7%)

- In the middle of training: 21 individuals (33.3%)
- At the end of training: 22 individuals (34.9%)

These findings suggest that injuries can occur at any point during a training session, with a slight increase towards the end of the session.

(Table 22) The most commonly injured body parts are the bicep and hamstring, each accounting for 11.1% of the injuries. This is followed by the groin, ankle, and foot, each with 7.9% of the injuries. Other notable injury sites include the shoulder, neck, upper back, and quadriceps, each with 6.3%.

These findings suggest that injuries are relatively evenly distributed across various body parts, with a slight concentration in the biceps and hamstrings (Table 23).

The distribution of injury types is as follows: 1. Sprain: 20 individuals (31.7%)

2. Strain-muscle tear: 13 individuals (20.6%)
3. Unsure: 12 individuals (19.0%)
4. Dislocation: 10 individuals (15.9%)

Table 22. Types of injury.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Shoulder	4	6.3	6.3	6.3
	Wrist	3	4.8	4.8	11.1
	Hand	3	4.8	4.8	15.9
	Neck	4	6.3	6.3	22.2
	Bicep	7	11.1	11.1	33.3
	Triceps	3	4.8	4.8	38.1
	Elbow	3	4.8	4.8	42.9
	Upper back	4	6.3	6.3	49.2
	Lower back	3	4.8	4.8	54
	Groin	5	7.9	7.9	61.9
	Hamstrin g	7	11.1	11.1	73
	Quadriceps	4	6.3	6.3	79.4
	Knee	3	4.8	4.8	84.1
	Ankle	5	7.9	7.9	92.1
	Foot	5	7.9	7.9	100
	Total	63	100	100	

What part of your body was injured?

Table 23. Distribution of injury types among bodybuilders.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unsure	12	19	19	19
	Strain-muscle tear	13	20.6	20.6	39.7
	Sprain	20	31.7	31.7	71.4
	Dislocation	10	15.9	15.9	87.3
	General Inflammation and Pain	8	12.7	12.7	100
	Total	63	100	100	

What type of injury did you sustain?

5. General Inflammation and Pain: 8 individuals (12.7%)

Discussion

Bodybuilding is widely recognized as an effective and safe approach for engaging in physical activities, however it does include certain inherent risks. The primary hazards to the musculoskeletal system are related to excessive stress on the joints due to repeated movements and errors in technical performance. Bodybuilding is a prevalent kind of physical exercise. Given the background information and the limited knowledge regarding injuries sustained by bodybuilders, it is important to determine the potential risk variables that might help in planning for injury prevention in the future [21]. The objective of this research was to assess the prevalence of injuries among bodybuilders in Saudi Arabia.

A total of 163 participants took part in the current investigation. The sample is primarily composed of men, making up 67.5%, with females accounting for 32.5%. The most populous age group consists of those aged 20-29, accounting for 35% of the total population, with the 3039 age group following behind at 34.4%. Of the respondents, 61.3% said that they were not hurt, whereas 38.7% reported having had an injury. This suggests that while a considerable proportion of the sample has not had any injuries, a noteworthy percentage has really faced injuries. Injury is defined as the occurrence of any fresh musculoskeletal pain, discomfort, or sensation that arises from a weightlifting workout, prompting the individual to modify the duration, load, or set/rep, cease an ongoing training session, skip one or more training sessions, or seek assistance from a healthcare professional. Conversely, the aforementioned studies conducted in the United States and Italy define injury as any musculoskeletal pain, discomfort, or injury that arises from engaging in CrossFit, resulting in complete cessation of CrossFit training and other extraneous activities. Previous research has consistently shown a decreased prevalence of injury among people who engage in CrossFit, in comparison to the rate observed in this particular study.

Weisenthal, et al. [22] and Tafuri, et al. [23] found that 19.4% and 39.9% of those participating in CrossFit in the US and Italy, respectively, had injuries. Additionally, Montalvo, et al. [24] observed a 6-month injury rate of 26.1% in South Florida. The prevalence rate in the aforementioned studies is anticipated to be greater than the rate observed in this research due to the incorporation of several functional activities in CrossFit, including gymnastics, Olympic lifting, power lifting, and high-intensity endurance exercises [23].

The findings of our study indicate a strong correlation between gender and injury rates among bodybuilders over the course of the previous 6 months ($\chi2 = 12.962$, $p = 0.001 < 0.05$). The findings suggest that male bodybuilders in this particular group had a much higher likelihood of sustaining injuries in comparison to female bodybuilders. More precisely, the rate of injuries among men was 48.2%, which is more than double the rate of injuries among girls, which was 18.9%. Furthermore, we have seen a substantial correlation between different age groups and the occurrence of injuries among bodybuilders during the last 6 months ($\chi2 = 50.135$, $p = 0.001$). These data indicate that the incidence of damage differ significantly across different age groups. Significantly, the 20-29 age group exhibits the greatest percentage of injuries, with about 75% of persons in this demographic reporting an injury. Conversely, the age ranges of 30-39 and 40-49 have much decreased incidence of injury. Curiously, there has been a noticeable increase in the frequency of injuries among persons in the oldest age group (50-59), with half of them reporting being injured. This phenomenon might perhaps be ascribed to variables such as diminished flexibility or extended recuperation periods linked to the process of aging [1]. These findings emphasize the need of implementing injury prevention techniques tailored to certain age groups in the field of bodybuilding. Younger individuals who engage in bodybuilding may particularly benefit from receiving extra advice about correct form and strategies to avoid injuries. Likewise, older individuals who engage in bodybuilding may need customized strategies to reduce the chances of becoming injured while yet keeping up with their training routines [2].

Our data indicates a strong correlation between bodybuilding experience and the frequency of injuries during the last 6 months ($\chi2 = 27.780$, $p = 0.001$). The data indicate a distinct pattern: as bodybuilding experience grows, injury rates drop. Significantly, persons with less than two years of experience exhibit much higher rates of injuries, with more than half of the individuals in these groups reporting injuries. Conversely, bodybuilders who have greater expertise, especially those who have been training for 5 or more years, have much reduced incidence of injury. This trend may be ascribed to several sources. Inexperienced bodybuilders may have a higher susceptibility to injuries as a result of incorrect technique, excessive excitement resulting in excessive training, or a lack of understanding of appropriate recovery methods. As bodybuilders gain expertise, they are likely to acquire improved technique, a more sophisticated understanding of their body's limitations, and more efficient training and recuperation procedures [25].

The findings of our study indicated that there is no statistically significant correlation between multiple sessions per day and the occurrence of injuries among bodybuilders during the last 6 months ($\chi2 = 0.751$, $p = 0.24$). Although there is a little disparity in injury rates between the two groups, those who engage in numerous daily training sessions have a slightly greater injury risk. However, it is important to note that this difference lacks statistical significance. Engaging in several training sessions per day increases the overall amount of weightlifting training one undergoes, which has been recognized as a contributing factor to the risk of weight training injuries [24, 26]. Engaging in many training sessions without sufficient rest may result in tiredness, leading to a decline in focus and competence, eventually increasing the risk of injury.

The occurrence of injuries during the mid and late training sessions in this research may be attributed to fatigue.

There is a strong correlation between the level of supervision in bodybuilding and the rates of injuries that occurred in the last 6 months. This correlation is statistically significant, as shown by a chi-square value of 40.536 and a p-value of 0.001. These data reveal a significant disparity in injury rates between bodybuilding with supervision and bodybuilding without supervision. Bodybuilders who work out without supervision have an almost fivefold higher likelihood of experiencing injuries compared to those who train under supervision. This aligns with the findings of Weisenthal, et al. [22], which indicate that those who engage in supervised exercise had a decreased incidence of injuries compared to those who exercise without supervision. Coaches or supervisors are responsible for arranging the class, assisting in selecting the appropriate weight, leading the exercises, and offering comments during and after each exercise session. Continuous feedback may enhance awareness of good form, technique, weight room etiquette, equipment usage, and potentially unsafe postures [28].

There is a strong correlation between the length of training sessions and the occurrence of injuries in the last 6 months ($\chi2 = 17.441$, $p = 0.002$). Nevertheless, we found no significant correlation between the frequency of training sessions per week and the occurrence of injuries among bodybuilders during the previous 6 months ($\chi2 = 6.094$, $p = 0.413$). These data indicate that the frequency of injuries tends to rise as training sessions get longer, reaching

its highest point in the range of 60 to 119 minutes, and then somewhat declining for sessions lasting 120 minutes or more. It is worth mentioning that bodybuilders who exercise for less than 60 minutes each session have much reduced risk of injury compared to those who train for longer periods of time. Training sessions that go longer than 60 minutes seem to increase the risk of injury by more than two times [29].

Furthermore, we have identified a notable correlation between the quantity of weight lifted and the occurrence of injuries among bodybuilders throughout the last 6 months ($\chi 2 = 9.590$, $p = 0.048$). These data indicate that the incidence of damage varied across various weight groups. The individuals who lift weights between 20-39 kilograms had the greatest injury risk at 52.7%, followed closely by those who lift 80 kilos at 50.0%. Conversely, those who lift weights ranging from 60 to 79 kg have the lowest risk of injuries, which stands at 22.2%. This trend may be ascribed to many factors: The category of intermediate weights (20-39 kg) has the greatest prevalence of injuries, perhaps attributed to a variety of variables including incorrect technique, overestimation of one's lifting ability, or inadequate warm-up. Using heavier weights (80 kg): Despite the limited number of participants, the elevated incidence of injuries indicates that lifting very big weights may heighten the likelihood of becoming injured, most likely owing to the physical exertion and the possibility of using incorrect technique. The decreased injury incidence in the Moderate Weights group (60-79 kg) may suggest that persons who lift these weights are more experienced or careful, using superior techniques and recovery methods [30].

Sprains were the majority of reported injuries, comprising around 33% of the total. These findings indicate that ligament injuries are a prominent issue in the field of bodybuilding. Muscle tears caused by strain were the second most common form of injury, suggesting that muscle injuries are equally widespread. Similarly, Muonwe et al. (2021) found that sprain is the most often reported kind of injury [31]. The prevalence of injuries in the shoulder, wrist, and hand may be attributed to the occurrence of sprains in the joint ligaments [32]. Strain or muscle tear was one of the least often reported types of injury. This might perhaps be associated with the objective of weightlifting. Weightlifting prioritizes strength and hypertrophy, rather than flexibility, since flexibility workouts often result in strain and muscle damage [33]. Dislocations, albeit less frequent, nonetheless constituted a substantial proportion of injuries (15.9%) in our sample. These conditions may be very severe and may need medical intervention. Although it is the least prevalent category, general inflammation and discomfort nonetheless impacted a significant proportion of bodybuilders (12.7%).

There are some limitations in the current investigation. The selection of research participants was unconventional. Prior research acquired the sample of athletes from external sources, such as gyms or sports organizations, by using contact information [34, 35]. Additionally, there is a limitation in the presence of selection bias. Athletes who experience continuing training-related discomfort or have a history of injuries are more likely to participate than bodybuilders who have not been previously injured. Moreover, the findings in this research accurately represent the athlete's current state at the time of data collection, as a consequence of the cross-sectional study design.

Conclusion

The 6-month prevalence of injury among recreational bodybuilders in Saudi Arabia was 38.7%. The most commonly injured body parts are the bicep and hamstring, followed by the groin, ankle, and foot. A significant association was demonstrated between gender, age, bodybuilding experience, bodybuilding supervision, training session duration and injury rates among bodybuilders in the past 6 months. However, we observed no significant association between the number of training days per week or per day and injury rates among bodybuilders in the past 6 months. Sprains were the most common type of injury, followed by strain-muscle tears, dislocations, general inflammation and pain. The results of this research might provide valuable information to sports physiotherapists, coaches, recreational bodybuilders, and other health professionals on the injury profile, with the aim of decreasing the occurrence of injuries.

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