

The Frequency & Determinants of the Use of Nutritional Supplements and Hormones among Selected Gym Users in Karachi, Pakistan

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ABSTRACT

Purpose: The use of hormones/ anabolic androgenic steroids (AAS) and nutritional supplements (NS) has gained popularity worldwide for improving physical appearance and sports performance. There have been limited studies that examine the frequency and determinants of their use among gym users in Pakistan. Our objective was to estimate the frequency of NS and AAS consumption among gym users of Karachi and to determine the determinants of NS and AAS consumption.

Methodology: An analytical cross-sectional study was conducted on 435 gym users from five districts of Karachi using non-probability quota sampling and gyms were selected on a convenience basis. Data were collected on a pre-tested validated tool and the association of outcome with variables was assessed by applying multivariate logistic regression using Statistical Package for the Social Sciences (SPSS) version 20.0.

Findings: The frequencies of AAS and NS were 9.2% (n=40) and 42.5% (n=185) respectively. Reasons for use included increasing muscle size and strength, impressing the opposite gender, getting popularity on TikTok videos, and getting a boyfriend/girlfriend. Male gender (p=0.000) and gym users who were businessmen were more inclined to using hormones (p=0.033). Gym users of district Central were less likely to consume AAS (p=0.004).

Contribution to literature and practical implications: The study concludes that male gender and occupation are positively associated with NS consumption and the dwelling of gym attendees is also significantly associated with AAS intake. These findings can help policymakers to make decisions for improvement in addressing public health issues.

Keywords: Hormones, Anabolic androgenic steroids, Nutritional supplements, Gym attendees, Gym users, Reasons for consumption, Karachi

1. INTRODUCTION

Diet and nutrition play important roles in the maintenance of health and the prevention of disease. Nutrition that aids in sports performance has always been a point of interest for competitive athletes as well as recreational ones (Alshammari, AlShowair, & AlRuhaim, 2017; Prudhvi, Mohan, & Gopalakrishnan, 2019). Globally, the use of hormones and nutritional supplements has become prevalent. Excess consumption of these substances causes diseases such as kidney disease, hypertension, diabetes, etc. (Alshammari et al., 2017).

Several studies have been conducted worldwide to determine the level of knowledge, consumption patterns, and characteristics of the users of NS and AAS. Globally, the prevalence of NS use among gym users has been reported as being between 40% and 45% (Alfawaz et al., 2018; Attlee et al., 2018) and the most commonly reported purpose for NS consumption is muscle building and weight loss, consumed under the guidance of gym trainers (Alfawaz et al., 2018). Furthermore, studies also concluded that the gender of gym attendees is also significantly associated with NS use (Alshammari et al., 2017).

Internationally, the prevalence of AAS consumption among regular gym attendees is between 20% and 50% (Allafi, Almansour, & Alreshoud, 2019; Prudhvi et al., 2019). Furthermore, studies reported a strong association of AAS consumption with male gender, basic education level, and age (< 30 years) (Aljaloud et al., 2020; Smit, de Hon, Venhuis, Den Heijer, & De Ronde, 2020).

Studies in Pakistan, for example in Quetta and Islamabad, reported the prevalence of AAS use as being between 60% and 64% among bodybuilders or master athletes. Also, the main reported purpose for

consuming AAS was to increase muscle size, strength, and overall stamina for excellent sports performance and the majority (60%) of the local bodybuilders in Pakistan believed that AAS can be purchased and consumed without medical advice and is harmless (Uddin, Iqbal, Haider, & Saleem, 2019; Usman et al., 2015). The use of NS and AAS is also becoming prevalent among regular gym users who do not practice gym for sports competitions or tournaments. However, very limited data is available locally to explore the frequency of AAS and NS use among regular gym users in Pakistan. Thus, the present study aims to determine the frequency of use and possible reasons for NS and AAS consumption, and factors that promote the consumption of AAS and NS among gym users of Karachi.

2. MATERIAL AND METHODS

An analytical cross-sectional study was carried out in selected gyms from five districts of Karachi (East, West, South, Central & Malir) after getting relevant approvals. The data was collected from the attendees of 18 gyms through non-probability quota sampling and gyms were selected on a convenience basis. All of the selected gyms were located in upper-middle-class areas and had similar facilities including cardio or aerobic fitness, strength training, core exercises, balance training, and flexibility and stretching with a physical trainer at each facility. Approximately 20% of participants were selected from each district (Table 1). The participants were selected on the criteria that they should be above 18 years of age and of either gender. Also, they have been members of the selected gym for at least the past 3 months while gym users who were prescribed nutritional supplements or hormones due to some other illness such as PCOS, etc. were excluded.

Table 1. District-wise distribution of samples

District name	Frequency	Percentage
East	90	20.7%
West	80	18.4%
Central	84	19.3%
South	86	19.8%
Malir	95	21.8%

The sample size was calculated by using Open Epi Software as 384 with a confidence level of 95%, bound of error of 5%, and 47.9% previous prevalence (Alshammari et al., 2017). After inflation of 13% to account for non-responses, the final sample size was rounded off to 435 gym users.

The study tool was adopted with permission from the two previous studies conducted in Saudi Arabia and Portugal (Alshammari et al., 2017; Ruano & Teixeira, 2020) (Annexures 2 and 3). Face Validation was done by three subject experts. The study tool and informed consent form were translated into the local language and modified after pre-testing.

Study participants were selected on the criteria of being a member of the selected gym for at least the past 3 months and an adult of either gender. Written informed consent was also taken after a complete description of the study protocol to the participants and special attention was given to sensitivity to the communities' cultural practices of all the participants.

Data quality with regard to missing and incorrect data (improper units etc.) was cross-checked by the research team. The ethical approval of the proposed study was sought from the Institutional Review Board (IRB) of Jinnah Sindh Medical University (Ref No: Jinnah Sindh Medical University - JSMU/Research/2021/-17) (Annexure 1).

The factor variables included the district of residence, age, gender, education, occupation, smoking status, Body Mass Index (BMI), and frequency of exercise, while outcome variables were frequency of NS and AAS consumption, reasons for NS and AAS use, and knowledge regarding the side effects of NS and AAS use. SPSS Version 20.0 was used to analyze the data. Univariate and multivariate binomial logistic regression modeling was performed and an Odds Ratio with 95% Confidence Intervals was computed to determine the association between independent variables and the frequency of nutritional supplements and hormone consumption. A P-value of <0.05 was considered significant.

3. RESULTS

The mean age of the study participants was 27.5 + 6.4 years with 72.9% (n = 317) males. The results showed that 36.6 % (n= 159) participants were graduates and 41.4% (n=180) users were engaged in private jobs.

Among participants 71.3% (n=310) were non-smokers, 38.2% (n=166) were in the pre-obese category and 67.4% (n= 293) were not involved in any other sports activity [Table 2](#).

Table 2. Socio-demographic characteristics of study participants (n=435).

Socio-demographic variable	Frequency (n)	Percentage %
Age (in years)		
• 18 -22	111	25.5%
• 23- 27	125	28.7%
• 28 - 32	122	28.0%
• 33 & above	77	17.7%
Gender		
• Male	317	72.9%
• Female	118	27.1%
Education		
• Matric & below	75	17.2%
• Intermediate	149	34.3%
• Graduation	159	36.6%
• Masters & above	52	12.0%
Occupation		
• Unemployed	81	18.6%
• Student	96	22.1%
• Business	67	15.4%
• Private job	180	41.4%
• Government job	11	2.5%
Smoking status		
• Yes	125	28.7%
• No	310	71.3%
BMI		
• Underweight (< 18.5 Kg/m ²)	23	5.3%
• Normal weight (18.5 Kg/m ² –22.9 Kg/m ²)	106	24.4%
• Overweight (23.0 Kg/m ² – 24.9 Kg/m ²)	88	20.2%
• Pre-obese (25.0 Kg/m ² - 29.9 Kg/m ²)	166	38.2%
• Obese (≥ 30 Kg/m ²)	52	12.0 %
Involvement in exercise/ sports other than gym activities		
• Yes	142	32.6%
• No	293	67.4%

Among gym users, approximately 42.5% (n=185) reported the use of NS and 9.2% (n=40) AAS respectively ([Figure 1](#)).

The results of the current study revealed that 77.5% (n=31) of gym users get hormones from their gym trainers or coaches but some participants reported purchasing them from the pharmacy, online shopping, friends, and food shops. Whereas, 68.9% (n= 133) users reported that they purchase NS through their coach or trainer, followed by pharmacy and food shops.

There was a strong association between the occupation of study participants and hormone intake (Adjusted OR= 14.954; 95% CI= 2.473 to 90.426, p=0.033). Furthermore, there was a statistically significant association between the location of the gym (district) and hormone use ([Table 3](#)). The gym users of Central District were 0.291 times less likely to consume hormones (Adjusted OR= 0.291; 95% CI=0.085 to 0.997, p=0.004) ([Table 3](#)). A statistically significant association of gender of gym users with the NS intake (Adjusted OR= 0.176; 95% CI=0.083 to 0.373, p=0.000) was found using a logistic regression model. However, other predictors including age, district, education level, occupation, smoking status, BMI, and involvement in other sports were not significant in the model ([Table 4](#)).

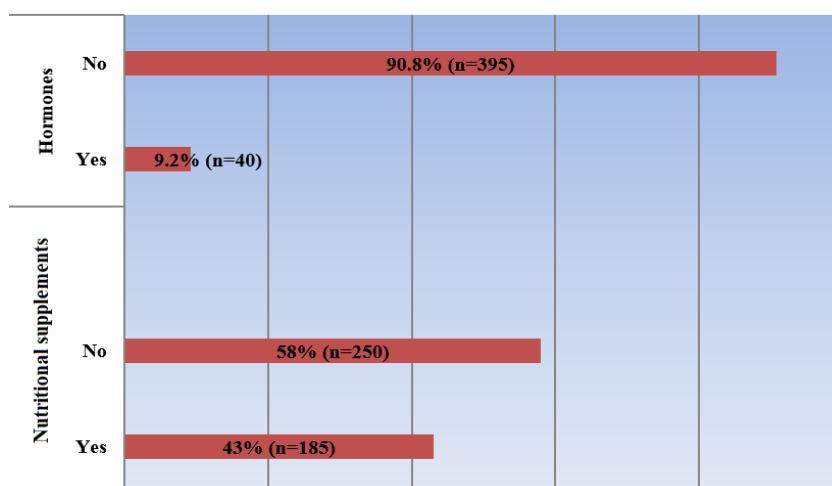


Figure 1. Frequency of consumption of hormones and nutritional supplements of study participants (n=435).

Table 3. Association of hormone consumption with the sociodemographic characteristics of study participants.

(n=435)				
Variable	Unadjusted OR (95% CI)	p-value[^]	Adjusted OR (95% CI)	p-value[^]
Districts of Karachi		0.012		0.004
East	Reference		Reference	
South	1.373 (0.602 to 3.132)		2.166(0.850 to 5.517)	
Malir	0.361 (0.122 to 1.070)		0.491(0.152 to 1.584)	
West	0.342 (0.106 to 1.108)		0.375(0.105 to 1.344)	
Central	0.325 (0.100 to 1.051)		0.291(0.085 to 0.997)	
Age (in years)		0.782		0.727
18- 22	Reference		Reference	
23-27	1.274 (0.542 to 2.996)		1.542(0.529 to 4.495)	
28-32	0.804 (0.314 to 2.059)		1.037(0.299 to 3.590)	
33 & above	1.010 (0.367 to 2.781)		0.936(0.253 to 3.461)	
Gender		0.491		0.125
Male	Reference		Reference	
Female	0.762 (0.351 to 1.652)		2.277(0.796 to 6.519)	
Education		0.631		0.132
Matric & below	Reference		Reference	
Inter	0.734 (0.286 to 1.880)		0.469(0.164 to 1.342)	
Graduation	0.746 (0.295 to 1.884)		0.375(0.128 to 1.098)	
Masters & above	1.303 (0.441 to 3.846)		1.123(0.318 to 3.959)	
Occupation*		0.057		0.033
Unemployed	Reference		Reference	
Business	7.759(1.655to 36.375)		14.954 (2.473 to 90.426)	
Private/govt. job	4.363(0.992to 19.191)		9.109(1.654 to 50.167)	
Student	3.591(0.740to 17.416)		6.960 (1.174 to 41.273)	
Smoking status		0.201		0.528
Smokers	Reference		Reference	
Non- smokers	1.555 (0.790 to 3.059)		1.302 (0.573 to 2.960)	
BMI *		0.165		0.509
Underweight/ normal weight	Reference		Reference	
Overweight/ obese	1.766 (0.791 to 3.946)		1.359 (0.547 to 3.372)	
Involvement in other sports		0.493		0.335
Yes	Reference		Reference	
No	1.266 (0.645 to 2.484)		1.463 (0.675 to 3.173)	

Note: *The categories of Occupation and BMI have been merged due to statistical purposes.

[^] Multinomial binary logistic regression used as a test of significance, p<0. 05.

Table 4. Association of nutritional supplement consumption with the sociodemographic characteristics of study participants.

(n=435)				
Variable	Unadjusted OR (95% CI)	p-value*	Adjusted OR (95% CI)	p-value*
Districts of Karachi		0.032		0.165
East	Reference		Reference	
South	0.726 (0.401 to 1.314)		0.977 (0.505 to 1.890)	
West	0.716 (0.391 to 1.310)		0.624 (0.314 to 1.241)	
Central	0.566 (0.310 to 1.034)		0.695 (0.359 to 1.345)	
Malir	0.384 (0.211 to 0.702)		0.481 (0.247 to 0.936)	
Age (in years)		0.137		0.469
18- 22	Reference		Reference	
23-27	0.978 (0.586 to 1.632)		0.982 (0.506 to 1.906)	
28-32	0.686 (0.407 to 1.155)		0.752 (0.359 to 1.577)	
33 & above	0.558 (0.306 to 1.018)		0.598 (0.267 to 1.339)	
Gender		0.000		0.000
Male	Reference		Reference	
Female	0.232 (0.140 to 0.384)		0.176 (0.083 to 0.373)	
Education		0.574		0.551
Matric & below	Reference		Reference	
Inter	0.837 (0.479 to 1.463)		0.858 (0.454 to 1.622)	
Graduation	0.730 (0.420 to 1.272)		0.769 (0.399 to 1.485)	
Masters & above	1.058 (0.521 to 2.149)		1.259 (0.546 to 2.904)	
Occupation		0.035		0.301
Unemployed	Reference		Reference	
Student	1.533 (0.822 to 2.858)		0.607 (0.249 to 1.484)	
Business	2.308 (1.179 to 4.519)		0.597 (0.240 to 1.486)	
Private job	2.004 (1.151 to 3.491)		0.603 (0.271 to 1.345)	
Government job	0.498 (0.100 to 2.473)		0.145 (0.025 to 0.837)	
Smoking status		0.006		0.710
Smokers	Reference		Reference	
Non- smokers	1.795 (1.181 to 2.730)		1.096 (0.675 to 1.779)	
BMI		0.782		0.863
Underweight	Reference		Reference	
Normal weight	0.774 (0.313 to 1.913)		1.124 (0.428 to 2.951)	
Overweight	0.755 (0.300 to 1.899)		1.049 (0.389 to 2.862)	
Pre-obese	0.757 (0.316 to 1.815)		1.159 (0.439 to 3.062)	
Obese	1.091 (0.409 to 2.913)		1.599 (0.526 to 4.865)	
Involvement in other sports		0.590		0.321
Yes	Reference		Reference	
No	1.118 (0.746 to 1.675)		0.783 (0.483 to 1.269)	

Note: * Multinomial binary logistic regression used as a test of significance, p<0. 05.

Among gym attendees, multiple reasons were given for consuming NS and AAS. Among the reasons given, the most common one for using NS and AAS was building muscle 78.2% (n= 151), followed by impressing the opposite gender 44.6% (n=86), to get popularity on TikTok videos 34.2% (n=66) and 26.9% (n= 52) used them in hope of getting a boyfriend/girlfriend (Figure 2).

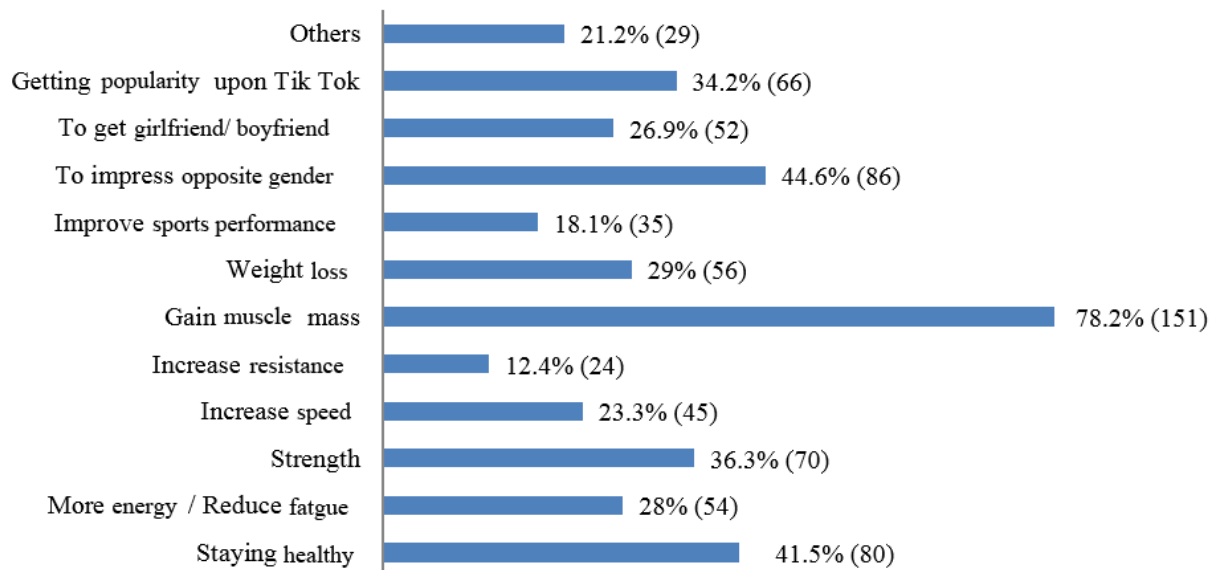


Figure 2. Reasons for the consumption of nutritional supplements and hormones by study participants *(n=225).
Note: *Multiple responses apply from 185 NS and 40 AAS users.

4. DISCUSSION

The present study aimed to assess the frequency of the use of nutritional supplements and hormones among gym users in Karachi. The current findings revealed that 42.5 % of gym attendees use NS. Similar prevalence has also been reported in studies conducted in Portugal, the United Arab Emirates, Iran, and Saudi Arabia (43%-48%) (AlRuthia et al., 2018; Attlee et al., 2018; Jalilian, Djazayery, Movahedi, & Keshavarz, 2019; Ruano & Teixeira, 2020).

However, a few studies reported a higher prevalence of NS consumption among gym users, i.e., between 50% and 85% (Alfawaz et al., 2018; Mettler, Bosshard, Häring, & Morgan, 2020; Valentine, Schumacher, Murphy, & Ma, 2018). The possible explanation for this difference from our study findings is that gym attendees from other countries might be more aware of these supplements due to media advertisements and there might have been easy accessibility through different purchasing sources as compared to our study population. Another reason for these results may be due to the social status (high income/low income) of participants being a distinguishing factor among countries.

The findings indicated that 9.2% of study participants consumed hormones for sports and exercise. Similar results were reported in studies conducted in Saudi Arabia, and Brazil that focused on regular gym users rather than master athletes or sports professionals (7% -10%) (Aljaloud et al., 2020; Pereira et al., 2019).

Our study findings reported that the majority of respondents received information and purchased AAS and NS from their coaches and trainers. Similar findings have been reported in the literature across the globe (Fijan, Eftekhari, & Dashtabi, 2018; Jalilian et al., 2019; Uddin et al., 2019).

A strong association between NS consumption and the male gender of the study participants was found in our study ($p=0.000$). Similar findings were reported in other studies showing that males were more likely to consume supplements as compared to females (Attlee et al., 2018; Ruano & Teixeira, 2020). The possible explanation for these findings is maybe because females are more inclined to weight loss instead of muscle building in gyms and thus they tend to reduce weight through exercise and diet control rather than consuming NS in Pakistan (Uddin et al., 2019; Usman et al., 2015).

Also, a significant association between AAS consumption and the occupation of the study participants was found. The odds of using hormones among businessmen were more likely compared to those who were unemployed ($p=0.033$). Similar findings were reported in studies conducted in other countries (Al-Harbi, Gamaleddin, Alsubaie, & Al-Surimi, 2020; Al Bishi & Afify, 2017).

Furthermore, a significant association between hormone consumption was found with the participants residing in different districts of Karachi. As compared to district East, study participants in district Central were less likely to consume hormones ($p =0.004$). Likewise, a study conducted in Brazil also reported a significant association between the districts/ area of residence with hormone consumption (Santos, Da Rocha, & Da Silva, 2011). However, few studies have reported no association between an area of residence and hormone consumption among gym attendees (Al-Harbi et al., 2020; Al Bishi & Afify, 2017). A possible explanation for

these contrasting findings might be because of differences in the socioeconomic status of the countries. Due to widespread poverty and struggling economies, a wide difference in social strata is observed. These differences in strata also lead to changes in localities for each class and they can in turn affect the purchasing capacity and consumption patterns of hormones as well.

Another aim of our study was to identify the possible reasons for NS and AAS consumption. It was reported that most of the study participants wanted to build muscle mass, while, half of them reported that they consumed supplements to impress the opposite gender, in hope of getting a boyfriend/girlfriend and getting popularity on TikTok. Several studies have reported the reasons for NS and AAS consumption, including increasing muscle size and strength, weight gain or loss, improved sports performance, competing with peers, etc. (Alfawaz et al., 2018; Aljaloud et al., 2020; Attlee et al., 2018; Mettler et al., 2020; Ruano & Teixeira, 2020). However, some of our study participants stated that they were consuming NS and hormones to impress the opposite gender and to get a boyfriend/girlfriend. Our study was conducted in Karachi, which is a metropolitan city of the world catering to people from different ethnicities and educational backgrounds, with easy access to social media and entertainment websites through cell phones. Since our study participants were people belonging to different social strata and different age groups who had access to the internet; this could have encouraged them to use more NS and AAS. Moreover, these entertainment sites provide monetary benefits to their users which also are a source of motivation for using NS and AAS to get the ideal physique. Furthermore, another possible reason might be that the younger generation is following western trends and with the advent of social media, such aspirations are considered normal for our younger generation nowadays.

4.1. Strengths and Limitations of the Study

This study is the first of its kind conducted in Karachi, Pakistan as it solely focused on the population which attends the gym regularly and is conscious of their physical health and assessed the burden of AAS and NS consumption amongst them. Also, data were collected from five districts of Karachi, considering the differences existing across districts. It also focuses on different influencing factors that lead to the consumption of NS and AAS. Another major contribution of this study is the possible reasons for consumption which can help the policymakers to make decisions for improvement in addressing public health issues. Furthermore, it tried to determine the role of socio-demographic factors in the overall consumption pattern of NS and AAS.

However, due to limited resources, there are a few unavoidable limitations to this study. Firstly, we tried to get a sampling frame but we couldn't find it from the KMC (Karachi Metropolitan Corporation). Furthermore, many of the gyms were also closed due to COVID-related restrictions. Thus, we were unable to make the sample size representative of the entire target population of gym attendees in Karachi and prevalence could not be estimated. This may affect the generalizability of the findings from this study. Moreover, limited variables were taken into account when checking for NS and AAS. Also, details of dosage and content of AAS and NS were not investigated which could be worth researching in the future.

4.2. Conclusion

This study observed that there is a high burden of NS consumption among the gym attendees of Karachi. These substances are easily accessible for use at gyms, pharmacies, and online. The most popular reason for use of NS and AAS was to increase muscle size and strength. Reasons for use also included impressing the opposite gender, getting popularity on TikTok / video, and hoping to get a boyfriend/girlfriend. Males were the more frequent consumers of NS as compared to females. AAS consumption was associated with the profession as businessmen were more inclined to using hormones as compared to unemployed gym users. Also, fewer hormones were consumed in the Central District of Karachi.

FUNDING

This study received no specific financial support.

ETHICAL STATEMENT

This study was approved by the Committee of Research Ethics in the Jinnah Sindh Medical University, Karachi, Pakistan (JSMU/IRB/2021/-413)

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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AUTHORS' CONTRIBUTIONS

All authors contributed equally to the conception and design of the study.

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ANNEXURE 1. IRB Approval.



Jinnah Sindh Medical University (JSMU)
Institutional Review Board (IRB)

Date: 07-05-2021

Ms. Nida Azhar
MSPH Student
Jinnah Sindh Medical University,
Karachi.

Subject: Institutional Review Board's approval for a research proposal.

Title of Study: Frequency of use of nutritional supplements and hormones: A study of selected gym users in Karachi

Principal Investigator: Ms. Nida Azhar, MSPH Student
Jinnah Sindh Medical University, Karachi.

Reference No: JSMU/IRB/2021-413

Dear Ms. Nida Azhar,

Thank you for submitting the above mentioned study proposal. I am pleased to inform you that the IRB-JSMU has reviewed this proposal in its 47th meeting held on 26th March, 2021 and gives approval for a period of one year to conduct this study.

Any change in the protocol or extension in the period of study should be notified to the board beforehand for approval. Interim report on progress of study should be submitted to IRB from time to time.

Thank you and regards.

Professor Aasim Ahmad
Chairman, Institutional Review Board (IRB), JSMU
Co-Chairperson Bioethics Group,
Hon. Senior Lecturer
Aga Khan University &
Dean & Chief Nephrologist
The Kidney Centre Post Graduate Training Institute

* The possession or approval from any other government agency is the responsibility of the investigator.

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ANNEXURE 2. Approval from Prof. Sulaiman Alshammari.

Date: Mon, 15 Jun 2020 12:21:55 +0000

Subject: Fwd: questionnaire of the study done on use of hormones and nutritional supplements among gym attendees in Riyadh.

Dear Dr Nida Azhar

Salaam and Good day

please find attached the questionnaire of the study done on use of hormones and nutritional supplements among gym attendees in Riyadh. IT was formulated in Arabic but I tried to translate to English for you. You can use it in your study and please cite us in your publication. Good luck with your study

regards

Prof Sulaiman Alshammari

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ANNEXURE 3. Approval from Prof. Vitor Hugo Teixeira.



Vitor Hugo Teixeira <vhugoteixeira@fcna.up.pt>

Mon, Jun 29, 2020, 10:34 PM ☆ ↶ ⋮

to me ▾

Good afternoon Nida,

Please find attached the questionnaire we have used.

You can also refer in the paper that you have used our questionnaire (<https://pubmed.ncbi.nlm.nih.gov/32093724/>).

Melhores cumprimentos | Best regards,

Vitor Hugo Teixeira

Professor Auxiliar | Assistant Professor

Faculdade de Ciências da Nutrição e Alimentação | Faculty of Nutrition and Food Sciences

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