



Oxidative Stress and Menstrual Complications Caused by Vaccination of COVID-19 Among Females Athletes

Manzoor Khan^{1,a}, Alamgir Khan^{2,b}, Muhammad Zafar Iqbal Butt^{1,c}, Samiullah Khan^{1,d}, Muhammad Jamil^{3,e}, Betül Özdemir^{4,f,*}, Elifsenä Canan Alp^{5,g}, Zeliha Selamoğlu^{6,h}

¹Department of Sports Sciences & Physical Education, Gomal University, Dera Ismail Khan, KPK, Pakistan

²Department of Sports Sciences & Physical Education, University of the Punjab, Lahore, Pakistan

³Junior Patrolling Officer, Punjab Hugh way Police, Lahore, Pakistan

⁴Department of Cardiology Faculty of Medicine, Nigde Omer Halisdemir University, Nigde, Turkey

⁵Necmettin Erbakan University Meram Faculty of Medicine Department of Obstetrics and Gynecology, Konya, Turkey

⁶Department of Medical Biology Faculty of Medicine, Nigde Omer Halisdemir University, Nigde, Turkey

*Corresponding author

Research Article

History

Received: 12/12/2021

Accepted: 20/03/2022

ABSTRACT

Objective: Social gathering particularly in public places was strictly banned in Pakistan from April 2019 to May 2021. In last few months, public places such as parks, grounds and gymnasium are opened for general masses as well as for players with SOPs (standart operating procedures) i.e. using of face mask and vaccination of COVID-19. As a result, all players got vaccinated for avoiding the problem of COVID-19 and getting chances of participation in their relevant sports activities. This study aimed to examine the Menstrual Problems and Oxidative Stress Caused by Vaccination of COVID-19 among Females Athletes.

Method: 10 elite level female athletes were randomly selected as a participants of the study. Thus the participants of the study were vaccinated (COVID-19). 5 milliliter blood sample from each subject before and after one month of vaccination was collected. For the measurement of oxidative stress FRAP assay protocol was used and similarly for the assessment of menstrual problems, a self-made questionnaire was used.

Results: The collected data were tabulated and analyzed through statistical package for social sciences (SPSS, Version-26). Vaccination of COVID-19, cause oxidative stress among female athletes. Result of posttest data in term of mean and standard deviation was (4.70 ± .674), T-Value was 22.00 and level of Significance was .000). Findings of the study also revealed that menstrual period duration and time also effect by COVID-19 vaccination. Result of posttest data in term of mean and standard deviation was (4.70 ± .674), T-Value was 22.00 and level of Significance was .000).

Conclusions: Based on analysis, the researcher arrived at conclusion that vaccination of COVID-19 caused menstrual problems and oxidative stress among female elite athletes.

Keywords: COVID-19, menstrual problems, oxidative stress, pakistan, vaccination

Kadın Sporcularda COVID-19 Aşılarından Sonra Meydana Gelen Oksidatif Stres ve Menstrual Problemler

Süreç

Geliş: 12/12/2021

Kabul: 20/03/2022

Öz

Amaç: Pakistan'da Nisan 2019'dan Mayıs 2021'e kadar özellikle halka açık yerlerde sosyal toplanma kesinlikle yasaklandı. Son zamanlarda parklar, sahalar ve spor salonu gibi halka açık yerler genel kitlelerin yanı sıra SOP'li (standart çalışma prosedürleri) oyuncular içinde serbestleşmiştir. Tüm oyuncular COVID-19'dan korunmak ve ilgili spor faaliyetlerine katılma şansı elde etmek için aşılandı. Bu çalışmada kadın sporcularda COVID-19 aşısının neden olduğu menstrüel problemleri ve oksidatif stresi incelemeyi amaçlamıştır.

Yöntem: Araştırmanın katılımcıları olarak 10 elit düzeydeki kadın sporcu rastgele seçilmiştir. Böylece çalışmanın katılımcıları aşılandı (COVID-19). Her denekten bir aylık aşılamadan önce ve sonra 5 mililitre kan örneği alındı. Oksidatif stres ölçümü için FRAP testi protokolü kullanıldı ve benzer şekilde menstrüel problemlerin değerlendirilmesi için kendi kendine yapılan bir anket kullanıldı.

Bulgular: Toplanan veriler, sosyal bilimler için istatistik paketi (SPSS, Versiyon-26) aracılığıyla tablolandırıldı ve analiz edildi. COVID-19 aşısı kadın sporcularda oksidatif strese neden olduğu saptandı. Ortalama ve standart sapma açısından son test verilerinin sonucu (4.70 ± .674), T-değeri 22.00 ve anlamlılık düzeyi .000 idi. Çalışmanın bulguları ayrıca adet dönemi süresinin COVID-19 aşısının da etkili olduğunu ortaya koydu. Ortalama ve standart sapma açısından son test verilerinin sonucu (4.70 ± .674), T-değeri 22.00 ve anlamlılık düzeyi .000 idi.

Sonuç: Analiz sonucunda COVID-19 aşısının kadın elit sporcular arasında adet sorunlarına ve oksidatif strese neden olduğu tespit edildi.

Anahtar sözcükler: COVID-19, menstrual sorunlar, pakistan, oksidatif stres, aşılama

Copyright



This work is licensed under Creative Commons Attribution 4.0 International License

^a manzoor.sspe@yahoo.com

^c zafarbutt666@hotmail.com

^e meharjamil88@gmail.com

^g escananalp@gmail.com

^b https://orcid.org/0000-0002-7176-3326

^d https://orcid.org/0000-0003-0613-1020

^f https://orcid.org/0000-0003-1759-6157

^h https://orcid.org/0000-0002-1956-1014

^b alamgir.sspe@pu.edu.pk

^d drsukhan@gu.edu.pk

^f betulozaltun@hotmail.com

^h zselamoğlu@ohu.edu.tr

^b https://orcid.org/0000-0002-8465-9878

^d https://orcid.org/0000-0001-6970-168X

^f https://orcid.org/0000-0003-4725-9522

^h https://orcid.org/0000-0001-9056-6435

How to Cite: Khan M, Khan A, Butt MZ, Khan MJ, Özdemir B, Alp EC, Selamoğlu Z (2022) Oxidative stress and menstrual complications caused by vaccination of COVID-19 among females athletes, Cumhuriyet Medical Journal, March 2022, 44 (1): 38-43

Introduction

First time the pandemic of COVID-19 was reported in December 2019 in Wuhan China and thus from March 2019 to February 2020 more than 82000 cases and 2800 deaths have been testified that approximately 95% of cases and 97% of deaths from China. Coronavirus belong to the family of single-stranded virus (RNA virus) which linked with Nidoviral¹. Coronavirus may get numerous shapes such as Coronaviridae, Roniviridae, and Arteriviridae. Based on effects, the family of coronavirus can be classified into Coronavirinae and Torovirinae and thus based on structure it can be divided into alpha, beta, gamma, and delta². COVID-19 was declared a global pandemic by World Health Organization on March 11, 2020 and thus it affected about 210 countries including Pakistan³. COVID-19 is a respiratory illness caused by virus named coronavirus^{1,4}. The general clinical symptoms of COVID-19 among the children are sore throat, headache, dizziness, vomiting, and abdominal pain. A few children do not exhibit fever, but only manifest cough or diarrhea, and even fewer can be asymptomatic carriers.

COVID-19 Pandemic was reports more serious among the adults more than or equal to 15 years of age^{5,6}. Many factors are involved in the severity of this pandemic among the young adults but the main reported factor was lack of adaptation of safety measures⁷.

Female Menstrual Cycle

Secretion of hormones and physical changes in sexual organs of female is called menstrual cycle or period. It is organized by the hypothalamic- pituitary-ovarian axis and influenced by many physiological factors as well as psychological factors. The average time period of menstrual cycle is 20 to 28 days depending upon the physiological characteristics of the body. Menstrual cycle may be of two types i.e. eumenorrhea refers to regular menstruation, oligomenorrhea to infrequent menstruation, and amenorrhea to the absence of menstruation⁸.

Menstrual Problems and Oxidative Stress Induced by Corona Virus and Its Vaccinations

For controlling the problem of COVID-19, world health organization suggested various safety measures such as using of mask, hand sanitizers, avoiding social gathering. Likewise various studies indicated that lack of adaptation of safety measures can cause an increase in COVID -19 pandemic. Corona virus affect the function of respiratory system, immune system and change in interleukin (IL)-6, IL-8, tumor necrosis factor- α (TNF- α) and other cytokines. Menstrual changes such as irregularities in menstrual timing among females also reported during COVID-19^{9,10}. People aging 50 years or more than also at risk of COVID-19 because corona virus effect immune system of the body. It is further reported that corona virus can cause changes in alteration on hypothalamic-pituitary-gonadal axis¹¹. Many of the females faces a problems of menstrual dysfunction i.e menorrhagia (menstrual bleeding),

frequent bleeding (metrorrhagia/polymenorrhea), or postmenopausal bleeding. Vaccination cause thrombocytopenia which effect the monthly cycle among the females^{12,13}.

Exercise with low intensity strengthen the function of immune system which helps the body to avoid health problems. The female athletes particularly the females performing high intensity exercise always complaints that have the problem of menstrual problems. In COVID-19, more health complaints such as stress, anxiety, and depression were noticed among the females¹⁴. Different factor including level of physical activity, high-energy intake and use of medicine effect the menstrual cycle among female's players.

Many physiological as well as sociological changes accrues in human body with aging. It means that age is also factor effecting human body functions^{15,16}. Research evidence shows that life expectancy is higher in female as compared to male. Likewise more health problems are experienced by female as compared to male^{17,18}. In addition cancer, heart problems are found higher in male. Smoking, drugs abuse, gender specific mortality and use of medication are the leading causes of health problems among both genders¹⁹.

Material and Methods

Participants of The Study

Ten elite level female athletes were randomly selected as participants of the study. Thus, the participants of the study were vaccinated (COVID-19).

Blood Sample Collection for Measurement of Oxidative Stress

5-milliliter blood sample was collected from all subjects. Each sample was marked with separate identification code. Blood serum of each sample was used for measurement of oxidative stress.

Instrument Used for the Measurement of Menstrual Problems

For the collection of data from participants about menstrual problems a self-made closed ended questionnaire was developed and filled from the all the subjects after vaccination of COVID-19.

FRAP Assay

For measuring oxidative stress FRAP assay was adopted by the researchers²⁰. The concentration of ferric tripyridyltriazine (Fe-TPTZ) compound decrease and convert to the ferrous form at acidic pH. A blue colored compound is observed at 593 nm. Degree of absorbance has been observed as to be directly associated to reduction of iron. To prepare the working FRAP reagents, TPTZ (2,4,6-Tripyridyl-s-triazine) and acetate buffer was mixed in 40 mM HCl as well as 20 mM FeCl₃.6H₂O in the ratio of 10:1:1

to give the working FRAP reagent. In 300 mL of distilled water, 1.5 g sodium acetate was dissolved and added 8 mL of glacial acetic acid in 500 mL volumetric flask and volume was then made up to the mark with distilled water. The pH of solution was adjusted and stored at 4 °C. 31 mg TPTZ was added to 10 mL of 40 mM HCl and dissolved at 50 °C. Then 3.2 mL of conc. HCl (11M) was diluted with distilled water to 1000 mL in 1000 mL volumetric flask and volume was made up to the mark with distilled water after shaking it well. It was stored at room temperature. 54 mg ferric chloride was added in 10 mL distilled water and dissolved well and volume was made up to mark in 1000 mL volumetric flask. All other chemicals used in the solution were also of analytical grades.

Statistical Analysis

The collected data were tabulated and analyzed through statistical package for social sciences (SPSS, Version-26).

Results

The above table 1 and figure 1 indicates the mean and Std. Deviation of all subject’s interim of age (24.40 ± 3.31) the level of Significance was .000.

The above table 2 and figure 2 indicates the Pre and Post test results regarding oxidative stress. Result of pretest data in term of mean and standard deviation was (109.00 ± 3.24), T-Value was 106.86. Result of posttest in term of mean and standard deviation regarding was (108.30 ± 2.79), T-Value was 122.7 and level of Significance was .000. It means that there is statistical difference in pre and posttest result in term of oxidative stress.

Table 1. Indicating the Age difference of EG of Participants

Testing Variable	N	Mean	Std	Sig
Age	10	24.40	2.31	.000

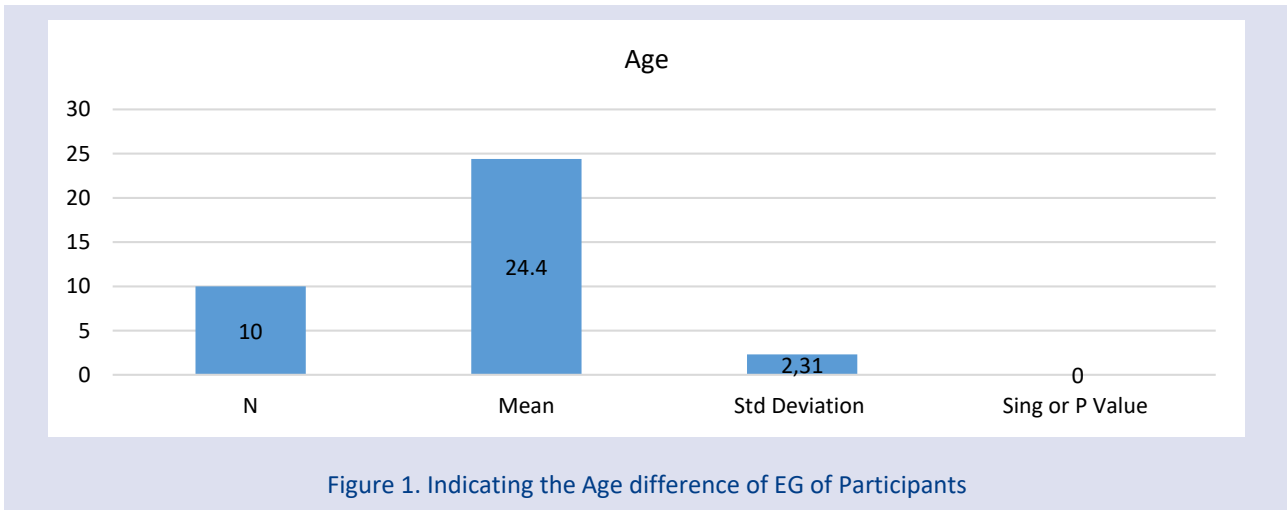


Figure 1. Indicating the Age difference of EG of Participants

Table 2. Data of EG in Term FRAP (Oxidative stress) before and after Vaccination

Testing Variable	N	Mean	Std	t	Sig
FRAP Pre	10	109.00	3.24	106.86	.000
FRAP Post	10	108.30	2.79	122.7	.000

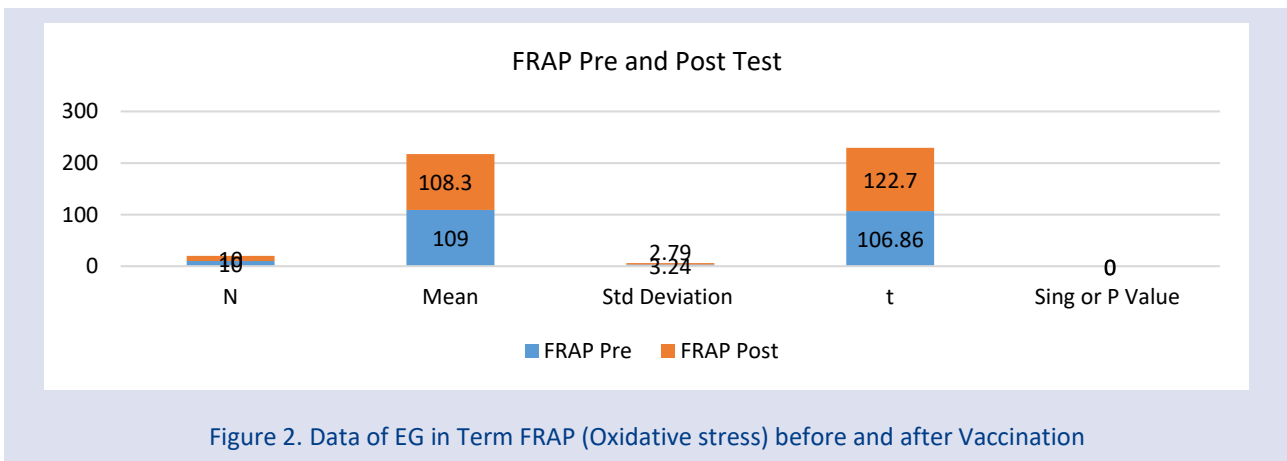


Figure 2. Data of EG in Term FRAP (Oxidative stress) before and after Vaccination

Table 3. Data of EG in Term of Period Duration before and after Vaccination

Testing Variable	N	Mean	Std	T	Sig
Pre Period Duration	10	5.20	.632	26.00	.000
Post Period Duration	10	4.70	.674	22.00	.000

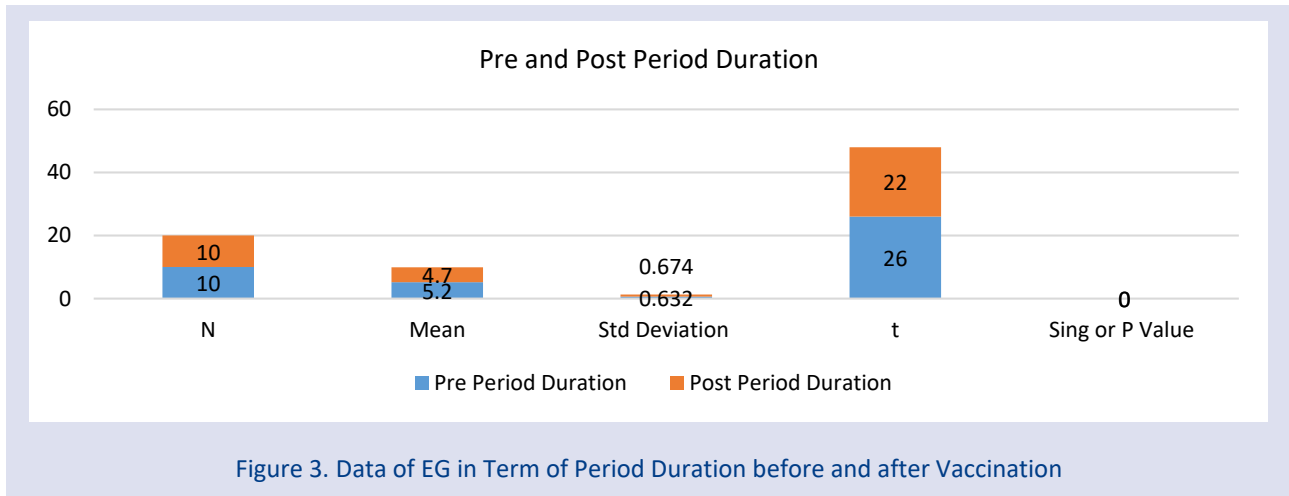


Figure 3. Data of EG in Term of Period Duration before and after Vaccination

Table 4. Data of EG in Term of Period Timing before and after Vaccination

Testing Variable	N	Mean	Std	T	Sig
Pre Time	10	21.00	.942	70.436	.000
Post Time	10	19.00	1.699	35.350	.000

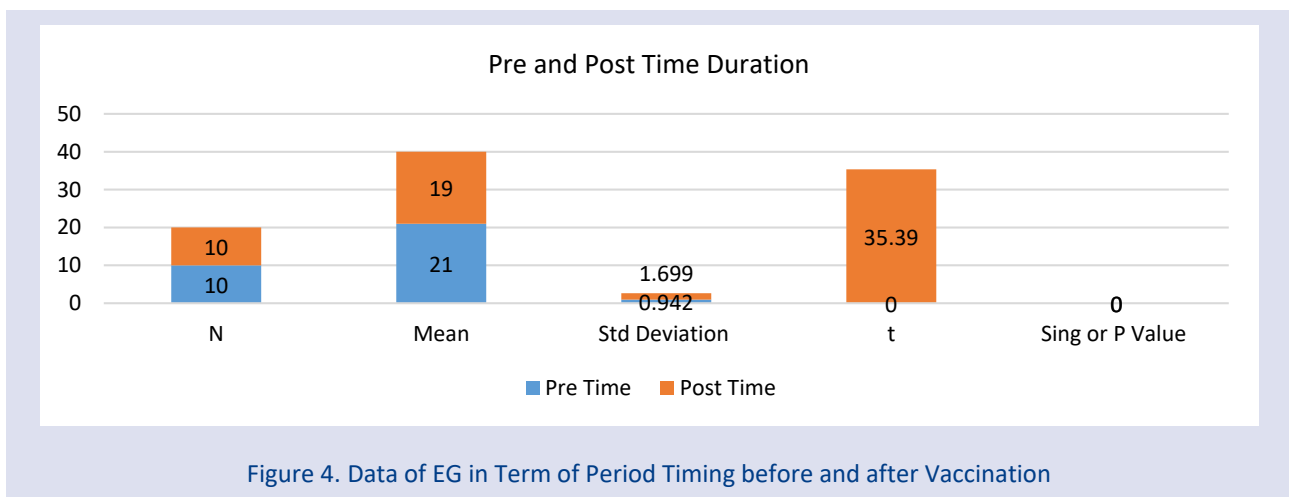


Figure 4. Data of EG in Term of Period Timing before and after Vaccination

The above table 3 and figure 3 indicates the Pre and Post test results regarding period duration. Result of pretest data in term of mean and standard deviation was (5.20 ± .632), T-Value was 26.00. Result of posttest data in term of mean and standard deviation was (4.70 ± .674), T-Value was 22.00 and level of Significance was .000. It means that there is statistical difference in pre and posttest result in term of period duration.

The above table 4 and figure 4 indicates the Pre and Post test results regarding period timing. Result of pretest data in term of mean and standard deviation was (21.00 ± 0.942), T-Value was 70.436. Result of posttest data in term of mean and standard deviation was (19.00 ± 1.69), T-Value was 35.350 and level of Significance was .000. It means that there is statistical difference in pre and posttest result in term of period timing.

Discussion

On the data analysis, the researcher find out that vaccination of COVID- 19, cause oxidative stress among female athletes (Result of pretest data in term of mean and standard deviation was (5.20 ± .632), T-Value was 26.00. Result of posttest data in term of mean and standard deviation was (4.70 ± .674), T-Value was 22.00 and level of Significance was .000). In line of this finding, the findings of the previous study showed that COVID-19 badly effect human being in term of health and healthy life style. In addition vaccination of COVID-19 also cause various health complication²¹⁻²³.

Findings of the study also revealed that menstrual period duration and time also effect by COVID-19 vaccination (Result of pretest data in term of mean and standard deviation was (5.20 ± .632), T-Value was 26.00. Result of

posttest data in term of mean and standard deviation was $(4.70 \pm .674)$, T-Value was 22.00 and level of Significance was .000). Such emerging concept was supported by other related research studies as oral contraceptive pills, vaccine other methods such as patch, vaginal ring, shot and intra uterine device (IUD) influence menstrual bleeding. Similarly the author further stated that contraceptive pills affect the time period of menstrual cycle. This finding is seemed to be inline of the present study²⁴.

Conclusion

On the basis of data analysis the researcher arrived at conclusion that vaccination of COVID-19 cause menstrual problems among the females' elite athletes. In addition the researcher also concluded vaccination of COVID-19 cause oxidative stress among females' elite athletes. It is clear that further investigation and more studies on the post the vaccination is needed to obtain the effects of vaccination of COVID-19 on the menstrual health systems of females' elite athletes. Oxidative stress is the basic structure of many diseases. This includes cardiovascular diseases and atherosclerosis. Although it is still not clear what effect it will have on the systems in the chronic period related to Covid-19 and its vaccines, many studies and researches are needed.

Acknowledgments

We would like to thank the University of the Punjab Lahore Pakistan.

Ethics

For the approval of all the protocols of the study, ethical approval was taken from the University of the Punjab Lahore Pakistan. A written informed consent was taken from each subject before participation in the study. Similarly all subjects were informed that all the collected information will be kept confidential and will only be used for research purposes.

Authors' Contribution

Study concept and design: Manzoor Khan and Alamgir Khan.

Analysis and interpretation of data: Manzoor Khan and Samiullah Khan.

Drafting of the manuscript: Alamgir Khan, Zeliha Selamoglu and Betul Ozdemir

Statistical analysis: Muhammad Zafar Iqbal Butt.

Administrative, technical, and material support: Manzoor Khan and Alamgir Khan.

Conflict of Intrest

Authors have declares that there is no conflict of interest.

Funding

No governmental as well as nongovernmental organization supported the study financially

References

- Hadi AG, Kadhom M, Hairunisa N, Yousif E, Salam AM. A review on COVID- 19: origin, spread, symptoms, treatment, and prevention. *Biointerface Research in Applied Chemistry* 2020;10(6):7234-7242.
- Peersen OB. Picornaviral polymerase structure, function, and fidelity modulation. *Virus Res.* 2017;234:4-20.
- Ohannessian R, Duong TA, Odone A. Global Telemedicine Implementation and Integration Within Health Systems to Fight the COVID-19 Pandemic: A Call to Action. *JMIR Public Health Surveill.* 2020;6(2):e18810.
- Lifen Y, Zhenyuan D, Mengqi D, Yang Z, Wanqiu D, Li P, Yating L, Zhuanggui C. Suggestions for medical staff from department of pediatrics during the treatment of 2019-nCoV infection/pneumonia. *Journal of new medicine.* 2020; 51:77-84.
- Wei M, Yuan J, Liu Y, Fu T, Yu X, Zhang ZJ. Novel Coronavirus Infection in Hospitalized Infants Under 1 Year of Age in China. *JAMA.* 2020;323(13):1313-1314.
- Wu J, Wu X, Zeng W, et al. Chest CT Findings in Patients With Coronavirus Disease 2019 and Its Relationship With Clinical Features. *Invest Radiol.* 2020;55(5):257-261.
- Saqlain M, Munir MM, Ahmed A, Tahir AH, Kamran S. Is Pakistan prepared to tackle the coronavirus epidemic? *Drugs Ther Perspect.* 2020;1-2.
- Millar RP, Sonigo C, Anderson RA, et al. Hypothalamic-Pituitary-Ovarian Axis Reactivation by Kisspeptin-10 in Hyperprolactinemic Women With Chronic Amenorrhea. *J Endocr Soc.* 2017;1(11):1362-1371.
- Jing Y, Run-Qian L, Hao-Ran W, et al. Potential influence of COVID-19/ACE2 on the female reproductive system. *Mol Hum Reprod.* 2020;26(6):367-373.
- Phelan N, Behan LA, Owens L. The Impact of the COVID-19 Pandemic on Women's Reproductive Health. *Front Endocrinol (Lausanne).* 2021;12:642755.
- Mauvais-Jarvis F, Klein SL, Levin ER. Estradiol, Progesterone, Immunomodulation, and COVID-19 Outcomes. *Endocrinology.* 2020;161(9):bqaa127.
- Wang C, Pan R, Wan X, et al. Immediate Psychological Responses and Associated Factors during the Initial Stage of the 2019 Coronavirus Disease (COVID-19) Epidemic among the General Population in China. *Int J Environ Res Public Health.* 2020;17(5):1729.
- Merchant H. CoViD-19 post-vaccine menorrhagia, metrorrhagia or postmenopausal bleeding and potential risk of vaccine-induced thrombocytopenia in women. *BMJ.* 2021; bmj-n958.
- Stanton R, To QG, Khalesi S, et al. Depression, Anxiety and Stress during COVID-19: Associations with Changes in Physical Activity, Sleep, Tobacco and Alcohol Use in Australian Adults. *Int J Environ Res Public Health.* 2020;17(11):4065.
- Fish EN. The X-files in immunity: sex-based differences predispose immune responses. *Nat Rev Immunol.* 2008;8(9):737-744.
- Oksuzyan A, Juel K, Vaupel JW, Christensen K. Men: good health and high mortality. Sex differences in health and aging. *Aging Clin Exp Res.* 2008;20(2):91-102.

17. Blum RW, Harmon B, Harris L, Bergeisen L, Resnick MD. American Indian--Alaska Native youth health. *JAMA*. 1992;267(12):1637-1644.
18. Kaura SA, Lohman BJ. Dating violence victimization, relationship satisfaction, mental health problems, and acceptability of violence: A comparison of men and women. *Journal of family Violence*. 2007; 22,6,367-381.
19. Agabio R, Campesi I, Pisanu C, Gessa GL, Franconi F. Sex differences in substance use disorders: focus on side effects. *Addict Biol*. 2016;21(5):1030-1042.
20. Benzie IF, Strain JJ. The ferric reducing ability of plasma (FRAP) as a measure of "antioxidant power": the FRAP assay. *Anal Biochem*. 1996;239(1):70-76.
21. Dinleyici EC, Borrow R, Safadi MAP, van Damme P, Munoz FM. Vaccines and routine immunization strategies during the COVID-19 pandemic. *Hum Vaccin Immunother*. 2021;17(2):400-407.
22. Guidon AC, Amato AA. COVID-19 and neuromuscular disorders. *Neurology*. 2020;94(22):959-969.
23. Woods JA, Hutchinson NT, Powers SK, et al. The COVID-19 pandemic and physical activity. *Sports Med Health Sci*. 2020;2(2):55-64.
24. Dutton C, Foldvary-Schaefer N. Contraception in women with epilepsy: pharmacokinetic interactions, contraceptive options, and management. *Int Rev Neurobiol*. 2008;83:113-134.