Original Article

Management of Nursing Human Resources in Covid-19 Pandemics Period

Elham Sadat Motaharian[1] | Zahra Sadeghi[2] | Leila Sadat Sharif Mousavi[3] | Reyhaneh Maleki[4] | Zobeyr Rigi[5] | Maryam Milani Fard[6] | Amir Mohammad Milani Fard[7] | Fatemeh Nomiri*[8]

[1]*Bachelor of Nursing, Iran University of Medical Sciences, Master of Nursing in Kashan University of Medical Sciences, Iran*
[2]*Bachelor of Anesthesiology, Kashan University of Medical Sciences, Kashan, Iran*
[3]*Bachelor of Anesthesiology, Iran University of Medical Sciences and Master of Biotechnology, majoring in Biophysics, Al-Zahra University, Tehran, Iran*
[4]*Department of Nursing, Bachelor of Nursing, Master of Internal Surgery, Ilam University of Medical Sciences, Iran*
[5]*Bachelor of Anesthesiology, Iranshahr University Employed in a hospital affiliated to Zahedan University of Medical Science, Iran*
[6]*Researcher at the Anesthesia and Pain, Molecular and cell Biology Research center, Faculty of Medicine Department of Anatomy, Iran University of Medical Sciences, Tehran, Iran*
[7]*Graduate of Nursing, School of Nursing and Medical Emergency, Alborz University of Medical Sciences, Researcher of Baqiyatallah Hospital Research Center, Tehran, Iran*
[8]*PhD student in Veterinary Medicine, Islamic Azad University of Karaj, Karaj, Iran*

Use your device to scan and read the article online

Citation E.S. Motaharian, Z. Sadeghi, L.S. Sharif Mousavi, R. Maleki, Z. Rigi, M. Milani Fard, A.M. Milani Fard, F. Nomiri, **Management of Nursing Human Resources in Covid-19 Pandemics Period.** *Eurasian J. Sci. Technol.*, **2022**, *2*(2), 156-165.

https://doi.org/10.22034/EJST.2022.2.4

Article info:
Received: 01 April 2021
Accepted: 01 August 2021
Available Online: 01 August 2021
ID: EJST-2107-1056
Checked for Plagiarism: Yes
Checked Language: Yes

Keywords:
COVID-19, Disease outbreak, General Hospital health power

ABSTRACT

Hospital nursing resources are among most occupied personnel during COVID-19 pandemics, the aim of the present study is to rule out the role of hospital nursing resources during covid-19 pandemics. The service allocation on the present hospitals were evaluated and reported to be justified in some centers. The base of human and supply distribution in some medical centers was scientific and reasonable while in other there was no definitive strategy toward this dilemma. In such centers, the preventive strategies against covid-19 was effective and the medical heads were effectively capable of infection control. The personnel and supply management in emergency conditions was also successful and showed promising results. But despite these, emergency conditions was with some standings including supply or allocation concealment, so it is suggested that, more focus should be noted on nursing allocation during emergency conditions in order to enhance service quality during covid-19 pandemics.

***Corresponding Author: Fatemeh Nomiri** (f.nomiri@yahoo.com)*

Introduction

Covid-19 is a newly emerged viral infection firstly reported on Wuhan, Habei, China on September 2019, which spreads quickly and turned into a pandemic condition in October 2020 [1-5]. The etiologic agent was reported to be a SARS-CoV-2 viral agent of Coronaviridae family which involves pulmonary compartment and caused intra- and extra-pulmonary manifestations [2, 4]. The main concern is about the disease transmission rate which turns this disease as type B infectious disease according to Chinese Center for Disease Control and Prevention classification [2]. The viral particles can easily transmits through different surfaces and airborne sources [4]. The present dilemma forced authorities to make a quarantine limitations for their citizens and this lead to a great international quarantine in almost all societies [6-9]. The main reason for this action relates to the disease high transmission rate and high daily reported cases. One of the main involved centers in this period of time were hospitals and emergency centers, which were involved with daily infected cases to save their lives. In this regard, the role of nursing personnel and supplement sources are at a great importance, since their nourished mental and physical needs help them to encounter the disease effectively. So, it is important to investigate the nursing personnel fulfillments in different societies in order to schedule the probable need for strength.

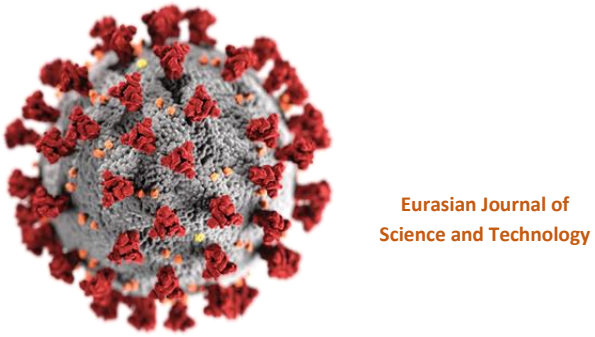

Figure 1 An Update on the Perioperative Considerations for COVID-19 severe acute respiratory syndrome

Method

In the present review study, electronic search was conducted on these online databases: PubMed, Cochrane Library, Embase, and ISI. With the present keywords: ("COVID19"[Mesh]) OR "coronavirus disease 2019" [Mesh]) AND "hospital nursing "[Mesh]) OR "nursing" OR "Nurses" OR "nursing manpower" OR "nursing department" [Mesh]. The list of electronic search results was imported to EndNote X9 (Clarivate system, California) and duplicate studies were detected and excluded from the review. Final remaining articles were reviewed in title and irrelevant studies were excluded, then remaining articles were abstract-reviewed and irrelevant studies and studies with incomplete data and studies published in languages other than English were excluded from the study. The final 23 articles were included in the study and reviewed by two blind reviewers separately.

Distribution of Emergency Human Personnel Resource

Since COVID-19 infected patients' control is difficult in need to be managed as a teamwork, it is important to take a skillful nursing personnel with high knowledge and skill toward critical care management, patients' selection. Also the role of team director is inevitable, because of team leadership and allocation concealment during pandemics [16-19]. The team leader can divide personnel team according to different wards needs and nursing personnel requests in different groups. Another role of team leader is to observe the quality of treatment services which was according to standard guidelines. The leader team ought to observe the entire health-care center in order

to check the staff according to their capability to encounter with emergency cases. Simultaneously, observation on knowledge and training status of nursing staff toward covid-19 pandemic condition is inevitable and the team leader should take all his endeavor to promote his teammates knowledge and attitude toward pandemics [10, 12].

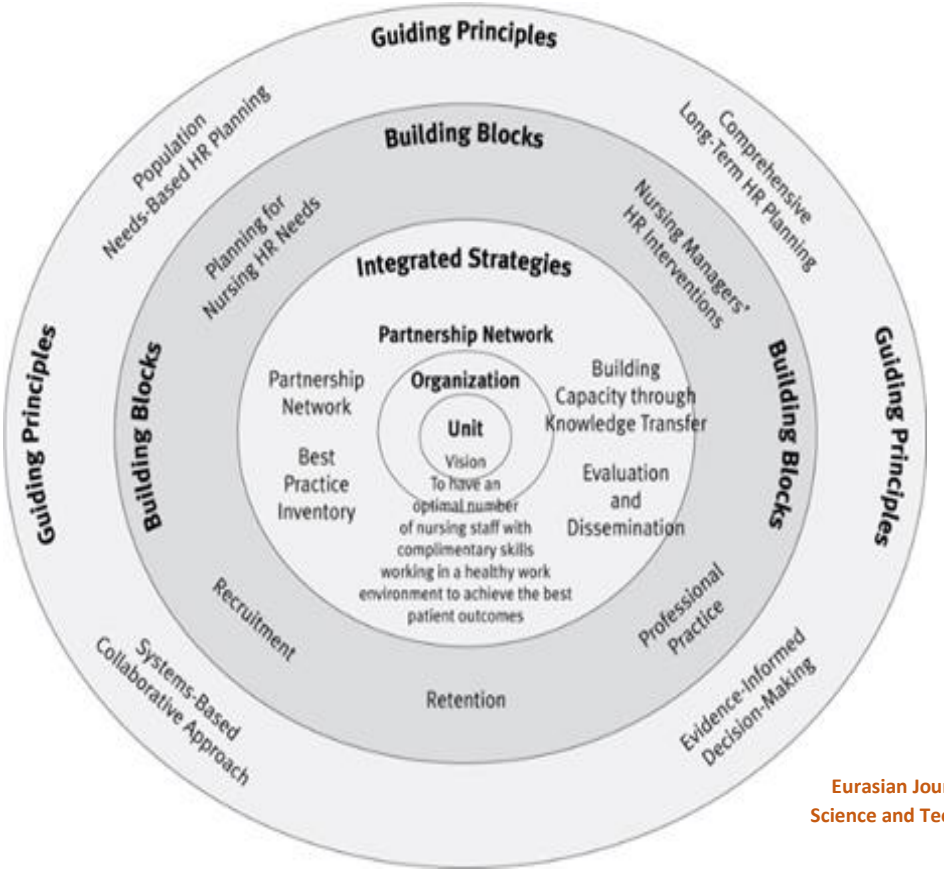

Figure 2 The Nursing Human Resource Planning Best Practice Toolkit

The hospital authorities should make some restrictive qualification criteria for nursing personnel in order to enhance human-power input quality; the qualifications should be flexible according to the pandemic conditions. All criteria should be the same for all the participants. For example for participants candidate for Covid-19 ward or infectious disease ward, work experience and emergency skill should be at the frontline of choosing criteria, to distribute personnel team power in different wards according to their capability. In most of hospital centers, work experience of more than two years was considered. Good physical condition and also capable of handling basic nursing skills, capability of doing intubation, patients' ventilation and removing airway obstruction are among qualification criteria for nursing personnel in covid-19 ward. So, it is important to dispatch nurses without abovementioned skills from infectious disease ward and also from ICU ward [20-22].

High physical burden in infectious disease and ICU ward is one of the main concerns of health authorities especially between nursing personnel. The best strategy to encounter such problem is to match work-loads between different medical staff as the same load. In some healthcare centers and hospitals, the health authorities take some strategies to increase nursing echelons with lower working hours, observing by some ICU and respiratory specialists, some hospitals with high volume of patients using from different models including

magnet hospital model [23-25] in which nursing staff were divided according to different wards requirement and the team staffs were changed together frequently in order to minimize workload between different nursing staff. The nursing team members voluntary also could affect team distribution, which nursing team heads can change team members with voluntary ones in different time periods [26-28].

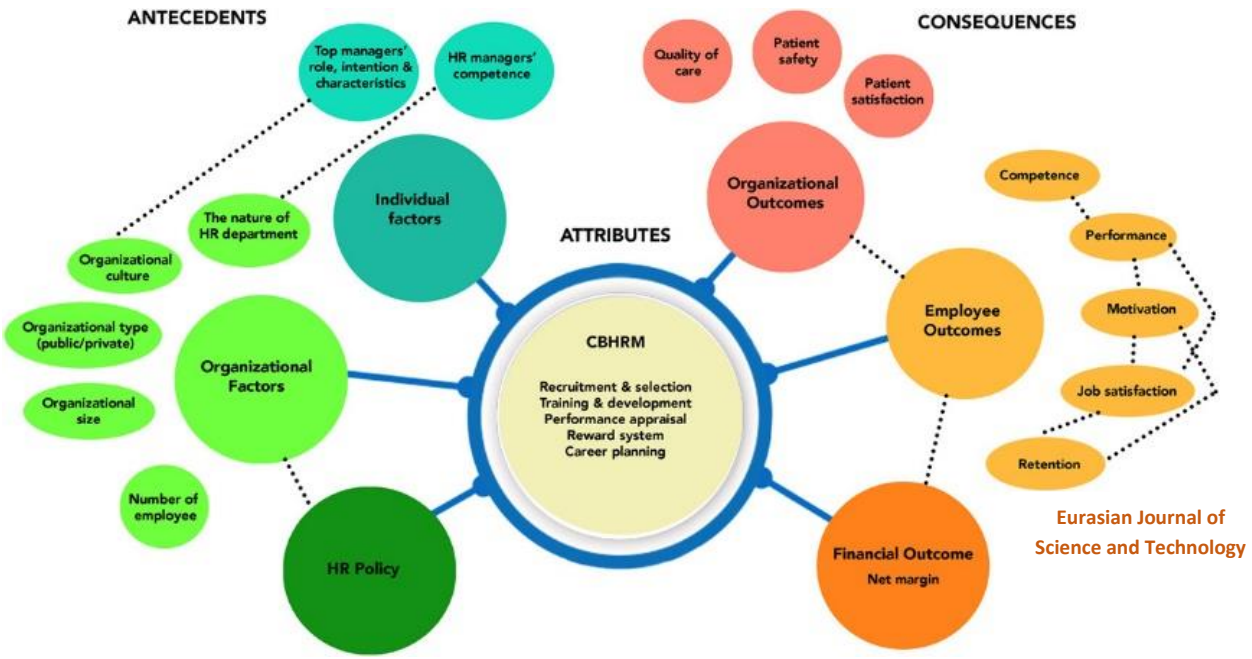

Figure 3 Competence-based human resource management in nursing

The number of nursing staff in each echelon can be a reflection of number of patients who referred to that ward, the hospital authorities can determine an average number of visited patients for each nursing daily and distribute nursing staffs according to that patient volume, for example each nursing staff in isolated department can visit 600 patients daily. Also team leaders can determine a quantities limit for nursing staff exchange to voluntary ones, for example four nurses a day. As the number of referred patients in the first daily hours are lower, it could be more flexible-predicted nursing staff shifts in order to make them more variable [29-31].

It is also important to predict an extra reinforcement group in cases of insufficient personnel in different wards. If the insufficiency was still continuous, the nursing team distribution in different wards can be modified in order to solve insufficiency problem. In a hospital in Beijing, China, during Covid-19 pandemics, the shift duration between different echelons was 6 h a day in infectious disease and isolation ward, and personnel teams were changed every two to three weeks. Later, by increasing pandemic burden and daily input cases to the hospital, there was an obvious need for more nursing staffs in abovementioned wards, in this situation, the hospital authority decided to lengthen each nursing personnel group duration to one month and after finishing this time period. The nurses were allowed to rest at home in quarantine condition for two weeks. In each rotation, there was a higher number of voluntary supplementary personnel to compensate the probable insufficiency in team workload. The team head adjusted the nursing personnel according to the initial disease stage. Each voluntary nursing staff were replaced with an exhausted or discomfort involving staff which reported his/her condition to the department. Also, there was a special team for personnel involved in emergency centers, and there was open-way for

inter-team communication in order to help better understanding of the condition and also to enhance their mental mood through communicating to each other [32].

Since Covid-19 infection is a slightly-novel disease, there was not still an approved treatment approach for infected or suspected patients except prevention through, vaccination, also most of the nursing staff, working in hospitals spent their education schedule in a time which covid-19 was not reported yet, and so there were no previously-predicted educational sessions toward COVID-19 infection and how to encounter it. So, it is important to predict supplementary educational sessions for undergraduate or postgraduate nursing staff about Covid-19 [33]. The training sessions should be predicted specially for nursing staff, working in isolated and infectious disease wards. The training sessions places should be near the wards in order not to exhaust nurses because of their transfer in different places. It is better to held educational sessions for nurses working in secondary centres instead of taking them to main hospital centres [34].

The training sessions should be held to educated nursing toward how to protect themselves against viral infection and how to respond in cases of susceptibility to viral infection. Further, the nurses should be educated, how to use personal protective equipment's like shield and facemask and how to take a service to patients as not to be infected with viral infection [35].

Also, the nursing staff should be educated toward the diagnostic criteria of COVID-19 and also how to fulfill physical and mental requirement of patients as well as to choose invasive or non-invasive intubation and ventilation, and also how to use oxygen-saturated therapy, closed suction etc. The nursing staff should be educated toward patient autonomy and also coping strategies [36].

The training sessions should be held in online mode in theatrical ones and face-to-face in practical ones, online classes should be held with seminar PowerPoint and video in order to enhance education quality. The nurses should take an exam to be assessed and immediately after qualification; the nursing team should be transferred to their predicted wards under the observation of nursing team senior or head [37].

One of the main sources of concern in isolation ward is to prevent infection transition cycle by Personal Preventive Equipment (PPE) distribution and removal on time. So, it is suggested to take experienced nursing staff in PPE use and distribution as first staff shift at the beginning [38].

In each shift, a staff head from infectious disease ward can supervise PPE wear and removal and disinfection process. Also, the team heads are responsible for other teammates' protection against infectious agents, so their supervision should be restrictive [39-41].

Certainly, most physical and mental burden is for Frontline staff, which in some situations is life-threatening, so it is necessary to choose most skillful leader teams with high encouraging and motivation capability at first groups of daily-personnel in order to overcome such amount of stress. These team leaders should be aware of complications of long-exposure to infected patients and also hazardous condition of wearing PPE for long time, like dry-throat, and also detect and isolate nursing staff with allergy to face-mask or shield. If one of the nursing staff got infected and approved with COVID-19 infection, preventive approaches should be taken to lower probability of infection transmission between staff, also the infected staff family should be screened and in cases of positive infection, further treatment actions should be taken to overcome the disease transmission. It is also suggested to use alarming devices like smartphones in order to minimize the probability of protection check ignorance between nursing staff and leaders. Besides the role of psychologists to minimize and overlook nursing staff emotional stress is inevitable during COVID-19 pandemics [42-45].

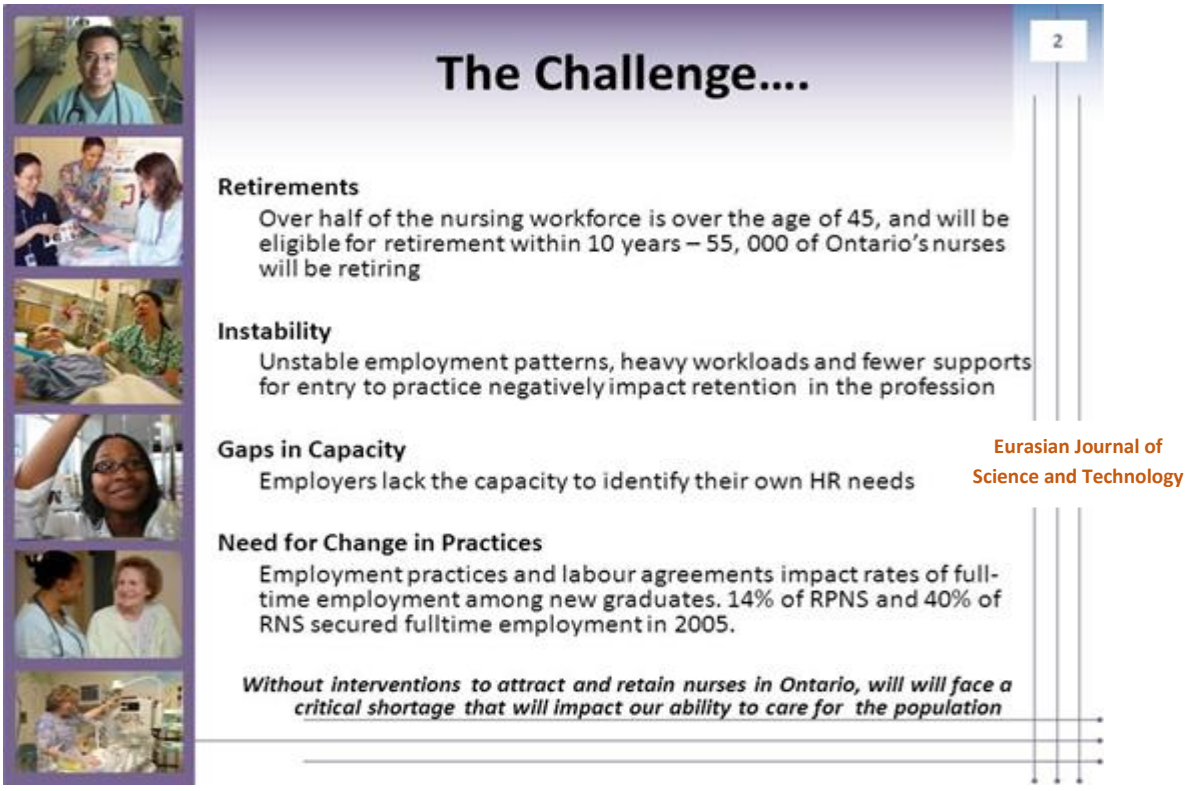

Figure 4 Nursing Demonstration Project in Nursing Human Resources Planning Building Capacity in Nursing

COVID-19 Management in Emergency Treatment between Nursing Staff

In emergency situations, it is important to predict, sufficient human staff and supplies and also their preparedness on time to encounter challenge effectively [7]. Covid-19 infection is a severe acute syndrome and an emergency condition and any hesitation in therapeutic services can affect patients' survival. In this scenario, hospital authorities predicts special approaches to overcome unpredicted emergency condition problems solely or with the aid of other institutes [46-48].

Infectious diseases and isolated wards are the frontline wards which Covid-19 patients are referred. The first strategy is to provide sufficient PPE and isolating materials in different wards of the hospitals. These strategies are in terms of supply channels and supply-providing teams. In cases of supply insufficiencies, the priority is for frontline wards like infectious disease and ICU wards, to overcome these shortages; the hospital authorities should sign a special contract with different PPE manufactures in order to provide PPE and isolating equipment's specially facemasks, disinfectants, ventilators as soon as possible. Also, predicted strategies should be taken in terms of hygiene services for nursing staff like special bathrooms or toilets etc [49].

As mentioned before, frontline medical staff needs a high number of PPEs [39-41]. One of the main sources of concern in hospitals are insufficient PPEs including N95 mask and shields. The justified allocation for these PPEs is crucial to hospitals and emergency centers [50-52]. Some hospital centers force nursing team leaders to inform them about PPEs condition and shortage and in cases of insufficient products, the department has to provide insufficient products as soon as possible.

In different hospitals, writing documents are used to report PPE shortage [53-55]. The life span of PPEs is variable according to daily usage and type of equipment. Also, it is

suggested to nursing staff to avoid unnecessary functions like eating and drinking in order not to waste PPEs each shift and ward should have two or three extra sets of PPEs in unpredictable conditions like vomiting, syncope or emergency surgeries. Still, it is suggested to use daily ventilation in order to prevent viral transmission through floating aerosols [56].

Figure 5 Romanian Ministry of Health, General Directorate of Human Resources

Conclusion

In Covid-19 pandemics, there are some special hospitals, but altogether there are not enough predictions and strategies to encounter these dilemmas. So, it leads to insufficient labor and supply resources at the beginning of the pandemics. The main duty of team leaders is to avoid misleading between team staff and to provide sufficient workflow and supply between team personnel and also make priority to emergency treatments during the pandemics. The first duty of team leaders is to observe and report daily affairs of nursing staffs to detect and overcome problems. If skillful head nurses were chosen, the nursing staff would act efficiently. The personnel group division should not be blind and should be according to certain criteria defined for each ward and patients referring to mentioned ward.

For better responding to public health emergencies in the future, it is suggested that the various grades of hospitals establish pools of emergency nursing staff and improve their nursing skills and abilities by targeted training and assessment.

ORCID

Fatemeh Nomiri
https://orcid.org/0000-0003-1769-6115
Maryam Milani Fard
https://orcid.org/0000-0002-0888-8847
Amir Mohammad Milani Fard
https://orcid.org/0000-0003-2635-2728

References

[1] A. Samimi, *Advanced Journal of Chemistry-Section A*, **2021**, 4 (3), 206-218. **[crossref], [Google Scholar], [Publisher]**
[2] A. Samimi, *Journal of Engineering in Industrial Research*, **2021**, 2 (2), 71-76. **[crossref], [Google Scholar], [Publisher]**
[3] A. Susanabadi, S. Etemadi, M.S. Sadri, B. Mahmoodiyeh, H. Taleby, M.M. Fard, *Annals of the Romanian Society for Cell Biology*, **2021**, *25*, 2875–2887. **[crossref], [Google Scholar], [Publisher]**
[4] B. Jamalvandi, *International Journal of Advanced Studies in Humanities and Social Science*, **2020**, *9*, 89-96. **[crossref], [Google Scholar], [Publisher]**

[5] B. Sahranavard, R. Hajhosseini, *International Journal of Advanced Studies in Humanities and Social Science*, **2019**, *8*, 332-349. **[crossref], [Google Scholar], [Publisher]**
[6] D. Di Mascio, C. Sen, G. Saccone, A. Galindo, Grünebaum A, Yoshimatsu J, Stanojevic M, A. Kurjak, F. Chervenak, M.J. Rodríguez Suárez, Z.M. Gambacorti-Passerini, *J. Perinat Med.*, **2020**, *48*, 950-958. **[crossref], [Google Scholar], [Publisher]**
[7] F. Zheng, C. Liao, Q.H. Fan, H.B. Chen, X.G. Zhao, Z.G. Xie, X.L. Li, C.X. Chen, X.X. Lu, Z.S. Liu, W. Lu, *Current medical science*, **2020**, *40*, 275-280. **[crossref], [Google Scholar], [Publisher]**
[8] F.E. Sadr, Z. Abadi, N.E. Sadr, M.M. Fard, *Annals of the Romanian Society for Cell Biology*, **2021**, *25*, 6839-6852. **[crossref], [Google Scholar], [Publisher]**
[9] G. Zaeri, *International Journal of Advanced Studies in Humanities and Social Science,* **2019**, *8*, 310-320. **[crossref], [Google Scholar], [Publisher]**
[10] H. Bastami, M. Panahi, *International Journal of Advanced Studies in Humanities and Social Science*, **2020**, *9*, 97-111. **[crossref], [Google Scholar], [Publisher]**
[11] H. Jalaeipour, A. Hajizadegan, *International Journal of Advanced Studies in Humanities and Social Science*, **2020**, *9*, 125-140. **[crossref], [Google Scholar], [Publisher]**
[12] H. Jenaabadi, B. Ruzrokh, *International Journal of Advanced Studies in Humanities and Social Science*, **2020**, *9*, 63-71. **[crossref], [Google Scholar], [Publisher]**
[13] H. Shi, X. Han, H. Jaing, Y. Cao, O. Alwalid, J. Gu, *The Lancet Infec. Dis.*, **2020**, *20*, 425-434. **[crossref], [Google Scholar], [Publisher]**
[14] H.Y.F. Wong, H.Y.S. Lam, A.H.T. Fong, S.T. Leung, T.W. Chin, C.S. Lo, M.M. Lui, J.C. Lee, K.W. Chiu, T.W. Chung, E.Y. Lee, *Radiology*, **2020**, *296*, E72-E78 **[crossref], [Google Scholar], [Publisher]**
[15] K. Ghajarzadeh, M.M. Fard, H. Alizadeh Otaghvar, S.H.R. Faiz, A. Dabbagh, M. Mohseni, S.S. Kashani, A.M.M. Fard, M.R. Alebouyeh, *Annals of the Romanian Society for Cell Biology*, **2021** *25*, 2449–2456. **[Google Scholar], [Publisher]**
[16] K. Ghajarzadeh, M.M. Fard, H. Alizadeh Otaghvar, S.H.R. Faiz, A. Dabbagh, M. Mohseni, S.S. Kashani, A.M.M. Fard, M.R. Alebouyeh, *Annals of the Romanian Society for Cell Biology*, **2021**, *25*, 2457–2465. **[crossref], [Google Scholar], [Publisher]**
[17] K. Ghajarzadeh, M.M. Fard, M.R. Alebouyeh, H. Alizadeh Otaghvar, A. Dabbagh, M. Mohseni, S.S. Kashani, A.M.M. Fard, S.H.R. Faiz, *Annals of the Romanian Society for Cell Biology*, **2021**, *25*, 2466-2484. **[crossref], [Google Scholar], [Publisher]**
[18] L. Hazarika, *International Journal of Advanced Studies in Humanities and Social Science*, **2020**, *9*, 111-124. **[crossref], [Google Scholar], [Publisher]**
[19] L. Zeng, S. Xia, W. Yuan, K. Yan, F. Xiao, J. Shao, W. Zhou, *JAMA Pediatr.*, **2020**, *174*, 722-725. **[crossref], [Google Scholar], [Publisher]**
[20] L.A. Rousan, E. Elobeid, M. Karrar, Y. Khader, *BMC Pulm. Med.*, **2020**, *20*, 1-9. **[crossref], [Google Scholar], [Publisher]**
[21] M. Alikhani, J. Khodayari, M. Dehnavi, J. Verij kazemi, *International Journal of Advanced Studies in Humanities and Social Science*, **2020**, *9*, 165-171. **[crossref], [Google Scholar], [Publisher]**
[22] M. Heidari, S. Heidari, *International Journal of Advanced Studies in Humanities and Social Science*, **2020**, *9*, 141-149. **[crossref], [Google Scholar], [Publisher]**
[23] M. Pour Kiani, M. Pourjafari Jozam, M. Pourjafari Jozam, *International Journal of Advanced Studies in Humanities and Social Science*, **2020**, *9*, 150-164. **[crossref], [Google Scholar], [Publisher]**
[24] M. Shafaee, H. Bahramzadeh, *International Journal of Advanced Studies in Humanities and Social Science*, **2019**, *8*, 321-331. **[crossref], [Google Scholar], [Publisher]**
[25] M.A. Marín Gabriel, I. Cuadrado, B. Álvarez Fernández, E. González Carrasco, C. Alonso Díaz, I. Llana Martín, L. Sánchez, C. Olivas, S. de Las Heras, E. Criado, *Acta paediatrica*, **2020**, *109*, 2302-2308. **[crossref], [Google Scholar], [Publisher]**

[26] M.Y. Oncel, I.M. Akın, M.K. Kanburoglu, C. Tayman, S. Coskun, F. Narter, I. Er, T.G. Oncan, A. Memisoglu, M. Cetinkaya, D. Oguz, *Eur. J. Pediatr.*, **2020**, *180*, 733-742. **[crossref], [Google Scholar], [Publisher]**

[27] N. Zhu, D.Y. Zhang, W.L. Wang, X.W. Li, B. Yang, J.D. Song, X. Zhao, B. Huang, W. Shi, R. Lu, P. Niu, *N. Engl. J. Med.*, **2020**, *382*, 727e33. **[crossref], [Google Scholar], [Publisher]**

[28] Chandrasekharan, M. Vento, D. Trevisanuto, E. Partridge, M.A. Underwood, J. Wiedeman, A. Katheria, S. Lakshminrusimha, *Am. J. Perinatol.*, **2020**, *37*, 813-824. **[crossref], [Google Scholar], [Publisher]**

[29] P. Liu, J. Zheng, P. Yang, X. Wang, C. Wei, S. Zhang, S. Feng, J. Lan, B. He, D. Zhao, J. Li, *The Journal of allergy and clinical immunology*, **2020**, *146*, 101-109.e1. **[crossref], [Google Scholar], [Publisher]**

[30] P. Yang, X. Wang, P. Liu, C. Wei, B. He, J. Zheng, D. Zhao, *Journal of clinical virology*, **2020**, *127*, 104356. **[crossref], [Google Scholar], [Publisher]**

[31] R. Yasin, W. Gouda, *Egypt. J. Radiol. Nuc. Med.*, **2020**, *51*, 217-232. **[crossref], [Google Scholar], [Publisher]**

[32] S. Abdollahyar, A. Masihpoor, *International Journal of Advanced Studies in Humanities and Social Science*, **2019**, *8*, 350-361. **[crossref], [Google Scholar], [Publisher]**

[33] S. Mirsadraee, M. Pourabdollah Toutkaboni, M. Bakhshayeshkaram, M. Rezaei, E. Askari, S. Haseli, N. Sadraee, *Iranian Journal of Pathology*, **2020**, *16*, 137-143. **[crossref], [Google Scholar], [Publisher]**

[34] S. Rahimipour, *International Journal of Advanced Studies in Humanities and Social Science*, **2020**, *9*, 72-83. **[crossref], [Google Scholar], [Publisher]**

[35] S.A. Mirmalek, F. Tirgari, H.R. Alizadeh, *Iranian Journal of Surgery*, **2005**, *13*, 48-54. **[Crossref], [Google Scholar], [Publisher]**

[36] S.E. Hasanpour, E. Rouhi Rahim Begloo, H. Jafarian, M. Aliyari, A.M. Shariati Moghadam, H. Haghani, H.R.A. Otaghvar, *Journal of Client-Centered Nursing Care*, **2017**, *3*, 223-230. **[Crossref], [Google Scholar], [Publisher]**

[37] S.E. Hassanpour, M. Abbasnezhad, H.R.A. Otaghvar, A. Tizmaghz, *Plastic surgery international*, **2018**. **[Crossref], [Google Scholar], [Publisher]**

[38] S.F. Omar, R.M. Habib, A.M. Motawa, *Egypt. J. Radiol. Nuc. Med.*, **2021**, *15*, 27-34. **[crossref], [Google Scholar], [Publisher]**

[39] S.M. Hashemi, M. Hashemi, G. Bahari, A. Khaledi, H. Danesh, A. Allahyari, *Asian Pacific Journal of Cancer Prevention*, **2020**, *21 (8)*, 2479-2484. **[Crossref], [Google Scholar], [Publisher]**

[40] S.M. Hashemi, M. Sadeghi, A.V. Tabas, S. Bouya, H.A. Danesh, HA Khazaei, A. Allahyari, *Health Sciences*, **2016**, *5 (9S)*, 662-666, **[Crossref], [Google Scholar], [Publisher]**

[41] S.M. Hashemi, M.Sadeghi, A. Vahedi Tabas, S. Bouya, H.A. Danesh, A. Khazaei, A. Allahyari, *International Journal of Cancer Management,* **2017**, *10 (12)* e11463. **[Crossref], [Google Scholar], [Publisher]** [45]

[42] S.M. Moosavizadeh, H.R.A. Otaghvar, M. Baghae, A. Zavari, H. Mohyeddin, H. Fattahiyan, B. Farazmand, S.M.A. Moosavizadeh, *Medical journal of the Islamic Republic of Iran*, **2018**, *32*, 99. **[Crossref], [Google Scholar], [Publisher]**

[43] S.M.S. Mirnezami, F. Zare Kazemabadi, A. Heydarinasab, *Progress in Chemical and Biochemical Research*, **2021**, *4*, 191-206. **[Crossref], [Google Scholar], [Publisher]**

[44] F.E. Sadr., Z. Abadi, N.E. Sadr., M.M. Fard., *Ann. Romanian Soc. Cell Biol.,* 2021, **25**:6839 [Crossref], [Google Scholar], [Publisher]

[45] S. Susanabadi., M.S. Etemadi., B., Sadri., H., Mahmoodiyeh., M.M. Taleby., M.M. Fard, *Annals of the Romanian Society for Cell Biology*, **2021**, *25*, 2875–2887. **[Crossref], [Google Scholar], [Publisher]**

[46] T. Riawati, W. Indrarto, A.R. Fauzi, W. Widitjiarso, Gunadi, *Ann Med Surg (Lond)*,

2021, *62*, 269-273. **[crossref], [Google Scholar], [Publisher]**

[47] T.A. Izadi, A. Borjali, A. Delavar, H. Eskandari, *Danesh-e-Entezami,* **2009**, *11 (344),* 182-207. **[Crossref], [Google Scholar], [Publisher]**

[48] W. Liu, H. Cheng, J. Wang, L. Ding, Z. Zhou, S. Liu, L. Chang, Z. Rong, *Am. J. Perinatol.*, **2020**, *37*, 1317-1323. **[crossref], [Google Scholar], [Publisher]**

[49] W. Liu, J. Wang, W. Li, Z. Zhou, S. Liu, Z. Rong, *Frontiers of medicine*, **2020**, *14*, 193-198. **[crossref], [Google Scholar], [Publisher]**

[50] W. Liu, Q. Zhang, J. Chen, R. Xiang, H. Song, S. Shu, L. Chen, L. Liang, J. Zhou, L. You, P. Wu, *New England Journal of Medicine*, **2020**, *382*, 1370-1371 **[crossref], [Google Scholar], [Publisher]**

[51] W. Xia, J. Shao, Y. Guo, X. Peng, Z. Li, D. Hu, *Pediatric Pulmonology*, **2020**, *55*, 1169-1174. **[crossref], [Google Scholar], [Publisher]**

[52] X. Hu, J. Gao, Y. Wei, H. Chen, X. Sun, J. Chen, X. Luo, L. Chen, *Neonatology*, **2020**, *117*, 592-598. **[crossref], [Google Scholar], [Publisher]**

[53] Y. Kamyabi, M. Salahinejad, *International Journal of Advanced Studies in Humanities and Social Science*, **2020**, *9*, 50-62. **[crossref], [Google Scholar], [Publisher]**

[54] S.M.S. Mirnezami, F. Zare Kazemabadi, A. Heydarinasab, *Progress in Chemical and Biochemical Research*, **2021**, *4*, 191-206. **[crossref], [Google Scholar], [Publisher]**

[55] F. Zare Kazemabadi, A. Heydarinasab, A. Akbarzadehkhiyavi, M. Ardjmand, Chemical Methodologies, **2021**, *5*, 135-152. **[crossref], [Google Scholar], [Publisher]**

[56] F. Zare Kazemabadi, A. Heydarinasab, A. Akbarzadeh, M. Ardjmand, *Artificial cells, nanomedicine, and biotechnology*, **2019**, *47*, 3222-3230. **[crossref], [Google Scholar], [Publisher]**