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Happy Nowruz! 1400

Editor-In-Chief's Message;

Nowruz is a long-standing connection of human with nature, which is celebrated every year with the beginning of spring. Now, it is the second year that Nowruz has arrived, but the world is still struggling with coronavirus pandemic and the coronavirus is still our guest. In the past year, we have all experienced difficult days and we may have lost our loved ones. This year, we start the New Year with praying and asking God to change our situation to the best with the intention of eradicating coronavirus disease, improving the health condition of all patients, and wishing health and well-being to our compatriots, especially the medical staff. May we witness the health, happiness and success of each of us in the New Year. Happy Nowruz!

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Opinion Article

Burden of musculoskeletal disorders: Challenges and solutions

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Musculoskeletal disorders, which are almost presented by low back pain or neck pain, are one of the most common complaints of the population. These disorders can lead to decreased functional capacities and work abilities (1, 2). In 2017, the global prevalence of musculoskeletal disorders was 1.3 billion (95% uncertainty interval (UI): 1.2-1.4 billion) (3). Also, these disorders were responsible for 138.7 million (95% UI: 101.9-182.6 million) disability-adjusted life years (DALYs) in the same year worldwide, although the attributable age-standardized DALY rate over 1990-2017 decreased by 3.5% (3). Regionally, high-income North America and eastern Sub-Saharan Africa populations had the highest and lowest age-standardized point prevalence numbers in 2017 (21,155.5 vs. 12,633.8). Furthermore, musculoskeletal disorders were more prevalent in females and the 50-54 age group in both male and female populations had the highest prevalent numbers. In the category of musculoskeletal disorders, low back pain (36.8%) had the largest proportion of prevalent cases, while gout (2.6%) and rheumatoid arthritis (RA) (1.3%) had the lowest values (3). Moreover, the global rank of musculoskeletal disorders in terms of age-standardized DALY rate has been elevated from tenth in 1990 to fifth in 2017 (4). With this background, we will describe the challenges and the proposed solutions regarding this crisis of musculoskeletal disorders in the population.

Challenges

Musculoskeletal disorders which affect 1.71 billion people, and in particular low back pain, are the leading conditions requiring rehabilitations (5). Nevertheless, there is a remarkable variation between citizens of low and high income countries in the attributable burden to musculoskeletal disorders and access to rehabilitation services. In addition, rehabilitation as a tertiary prevention has been neglected in most nations because of the fact that primary and secondary preventions are in priority. A retrospective study on the data of 2000 patients who were visited in primary health care centers in Sweden, resulted in a prevalence about 60% of some kinds of musculoskeletal disorders, while there were also drawbacks in the diagnosis and handling of the patients by the physicians (6).

The increased exposure to the risk factors of musculoskeletal disorders (e.g. lower back pain), which are related to poor general health (e.g. smoking and having chronic diseases), physical stresses (e.g. kneeling or squatting for more than 15 minutes and prolonged standing), and psychological stresses (e.g. dissatisfaction with life and depression) are also of great concern in recent years (7).

Solutions

From the cost-effective perspective, improving primary healthcare providers in the diagnosis, treatment, and referral or just triaging patients with musculoskeletal complaints to be initially visited by physiotherapists instead of general practitioners might be helpful methods for low- or low-to-middle income countries (5, 8). Furthermore, using telemedicine for musculoskeletal examinations and rehabilitations which has been accelerated by COVID-19 pandemic could also be a great strategy for the early evaluation and management of these disorders (9, 10).

Considering that musculoskeletal symptoms are one of the most prevalent complaints visited by family physicians, medical students, general practitioners, and even clinical experts, these healthcare providers should be trained through workshops or other appropriate methods on how to diagnose and manage these patients (11). Moreover, preventive interventions should focus on modifiable risk factors such as severe sleep problems, prolonged driving, standing, or walking in order to monitor and reduce the exposures to them (7). Policy makers and health care authorities should take into account the identifying requirements and barriers of patients who live with musculoskeletal disorders, prepare clarified guidelines and action plans for supporting these patients, develop multimedia programs and campaigns to increase public awareness, and invest in large-scale research programs to evaluate the efficacy of the proposed programs (12).

Keywords: Musculoskeletal disorders; elderly; low back pain.
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Mini-Review

Increasing social isolation in the elderly: an underappreciated consequence of the Covid-19 pandemic

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The spread of the corona virus in different parts of the world is a threat to public health. Although many countries and governments initially intended to ignore the pandemic, as the severity of the pandemic became more pronounced almost everywhere in the world performed containment measures such as various forms of quarantine, social distancing, avoiding mass gatherings, telecommuting, and closing schools and universities (1). This eventually slowed down the socio-economic circulation of societies around the world and in some societies somehow stopped (2). Covid-19 has affected all aspects the society, especially the biosocial aspect, which has led to depression, unhappiness, and despair in society. The effects and consequences of coronavirus pandemic in the elderly are not limited to the physical health problems caused by the cellular and systematic damage of virus in the body. Social isolation, mental health deteriorating, limited access to health care and other social deprivations are some of the concerns of the elderly in this pandemic (3).

Humankind has social nature and social interactions are the cornerstone of human life. Human social relationships (both quantitatively and qualitatively) greatly affect health, well-being, as well as the risk of disease and mortality. Although the role of “social support” has been recognized as one of the social determinants of health; recently “social isolation” (whether objective or perceived isolation) has also been considered as a social determinant of health. Social isolation can be defined as the limitation or lack of communication with others (family, friends, and neighbors) that is assessed by examining a person's social network interaction, social involvement (for example, belonging to a social group or religious community, the number of social contacts) and whether living alone or with someone (4, 5). The consequences of low social interaction and social isolation are similar to the effects of risk factors such as high blood pressure, physical inactivity, obesity, or smoking 15 cigarettes a day. Various studies have reported the consequences of social isolation. Social isolation increases the risk of cardiovascular disease (29%), decreased immune function, depression, anxiety, poor cognitive function, increased risk of Alzheimer's disease and other types of dementia (approximately 50% increased risk of dementia), increased risk of stroke (32%) and consequently it increases the costs of the health care systems (6-9).

Social isolation has long been observed in different populations and age groups, but the elderly has been more exposed to social isolation due to the special risks of old age so that social isolation is one of the public health problems in elderlies. The COVID-19 pandemic and its subsequent lifestyle changes, social distancing, quarantine, etc., have put the elderly at greater risk of social isolation and significantly increased the existing concerns (6). Prior to the COVID-19 epidemic, a significant proportion of the elderly participated in social activities such as attending religious centers, traveling, and many other social events, but in the current era, the social presence is severely limited. These restrictions increase social isolation and loneliness in the elderly and also increase the risk of stress, anxiety, and depression (10).

Elderly due to changes in social roles (retirement, loss of family or friends), physical changes (changes in health status, mobility, sensory function), and negative social attitudes (such as discrimination and elder abuse), are so prone to expose to social isolation. Despite progression in opposition to social isolation and loneliness, the problem remains a crisis. Therefore, innovative and effective efforts to neutralize the effects of social isolation and strengthen social relationships of the elderly seem more vital than ever (7).

Health care providers acknowledge that the virus is more dangerous to the elderly and that about 80 percent of all deaths from the virus are reported in the elderly (11). To this end, the elderly should limit their contact with others through social distance in order to be safe from the consequences of the disease (12). Although staying at home is recommended by public health officials; it is useful for

preventing COVID-19 and its spread, but limited physical and direct interactions with other people in society negate current efforts for reducing social isolation and improving communication among the elderly (6). Currently, the use of social distance programs has limited social participation among the elderly living in the community, the elderly in long-term care centers, and especially rural elderly. Besides, voluntary self-isolation has increased among vulnerable people and those concerned about the epidemic which leads to generating a risk of isolation, loneliness, and related negative effects among the elderly in the community (13, 14). Isolation itself has an adverse effect on the elderly, whose only social contact outside the home is in places such as parks, care centers, restaurants having a friendly meal with other people, and mosques. Those who do not have close family or friends and are dependent on volunteer support or social care, or living alone are at greater risk.

During COVID-19 and physical distance, traditional practices must be rapidly changed and replaced to prevent further social isolation of the elderly by strengthening social connections. Because physical interactions with the elderly should be limited, telecommunications can be an effective option. Telecommunications seeks to maintain and repair diminished structural, functional, physical, and qualitative aspects of social communication through telephone, computer, or other intelligent devices. One of the most effective solutions to deal with social isolation and loneliness during the pandemic is the use of online technologies that can be progressive in controlling social isolation and its consequences. However, poor technological education among the elderly, limited their access to digital media. Problems with utilizing smartphones and other similar products reduce the potential for these facilities. Therefore, simplified supportive measures, such as frequent phone calls to family, friends, and loved ones, while minimizing face-to-face appointments by following health protocols, can mitigate the effects of social isolation and loneliness in the elderly (13, 15).

Strategies include integrating concise and interactive screening to identify risks during telephone calls, as well as providing technology-based intervention and social support. In addition to strategies that provide safe access to the elderly over time and space, these strategies can also employ the elderly and support them in times of crisis to overcome social isolation of themselves and others (7, 16). Also, some of the strategies implemented in some countries encompass: raising awareness about the positive effects of health care services and medicine on social isolation and loneliness among people in the community, the development of technology-based interventions under the use of family members, community-based networks, and institutions examining social isolation and loneliness in the elderly and involving the health care system to begin the process of developing methods for identifying social isolation and loneliness in health care settings (6).

The COVID-19 pandemic will have a long-term and profound impact on the well-being and health of the elderly worldwide. Social isolation and loneliness are likely to be more important factors affecting the health status of the elderly, and this social isolation can reduce cognitive function, increase the susceptibility to depression and anxiety, sleep disorders, and even suicide in the elderly. Also, social isolation is more likely to cause an accelerating decline of the body's functional capacity, by moving away from a healthy lifestyle, also it can deteriorate many of the chronic and existing problems of the elderly. A review of previous pandemics and outbreaks shows that in the near future the effects of mental health will manifest in the form of physical disorders, and therefore the need for mental health services and prevention of the consequences of social isolation combined with economic problems should be regarded for several years.

Keywords: social isolation; Covid-19; pandemic.
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Research Project

Automatic reaction time recording and improving device and its application for elderly people

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Abstract

Physicians and researchers utilize several different measurements to evaluate brain performance. One of the main recordings is response or reaction time. It is defined as the amount of time, the subject spends to consciously respond to a more or less complicated stimulus. This time increases with some diseases and also with age. In the traditional method, the recording was performed manually by a practitioner. However, this approach has many downsides including the high risk of human errors. Also, the software is used to measure reaction time, which is not suitable for color-blind people. Additionally, a training device for improving this metric does not exist. Therefore, for the first time, a practical device has been designed which consists of two parts: a measuring tool and a control box. The measuring tool is a fiberboard that mounts on top of a rod or ruler and is implemented using a printed circuit board. The Control box consists of an input power source, electronic board and a monitor. The rod is released by the device , instead of the practitioner in the classic method, and the reaction time is measured automatically which can eliminate the possibility of any human errors. The mentioned device is designed to accurately measure the reaction time without any need for human intervention.

Figure 1 Traditional method to examine reaction time

Introduction

A broad range of research works has been done to explore the cognitive capabilities of the brain such as intelligence, memory, etc. One of the main neural functionalities of the brain is reaction time (1). It is defined as the amount of time, the subject spends to consciously respond to a more or less complicated stimulus (2). This measurement is for people in different conditions. For ex-

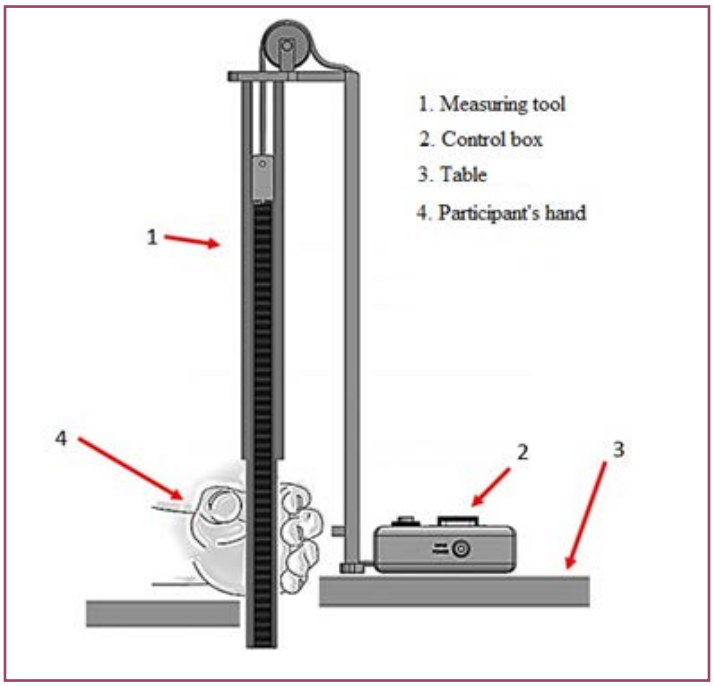

Figure 2 Primary design

ample, it is increased in people with sleep deprivation or the elderly people (3). An increase in reaction time can cause many problems. One of the main causes of road accidents is the improper response time of the faulty driver that increases the break time(4). Even a few milliseconds delay in break time can cause a fatal accident. Therefore, neuroscientists have chosen this field as a crucial research topic.

Nowadays one of the widespread methods of measuring reaction time is by releasing a ruler or rod (5,6). In this approach, a practitioner stands by the subject and vertically releases the ruler (7,8). The subject has to catch the falling object as soon as possible and prevent it from hitting the ground. The displacement of the rod is then measured and processed into an approximate response time. There are lots of downsides associated with this method. First of all, the experiment should be repeated to account for the randomness. However, high repetitions can tire both practitioner and the subject and result in inaccurate recordings. However, the gestures of a tired practitioner can further affect the response of the subject. Furthermore, the tiredness of the practitioner can have an effect on the decision-making ability impacting the validity of the experiment. The main purpose of this invention is to completely eliminate the possibility of human errors. Additionally, this device is designed to train and improve the reaction time of patients, the elderly, athletes and sensitive groups.

Material and Methods

The implementation steps of the design are as following:

- Examining the existing methods for measuring the reaction time
- Designing a novel automatic using Solidworks
- Production of the main tool
- Performing the functionality tests

The primary design consists of two main parts (figure 2):

- Measuring tool
- Control box

The measuring tool is a fiberboard that mounts on top of the rod or ruler and is implemented using a printed circuit board.

The control box consists of a power source, electronic board and monitor. The processor along with some other electronic components are mounted on the electronic board to provide the appropriate voltage levels required for the measuring tools. Then, the returning current and the displacement of the rod or ruler are measured. The processor computes the reaction time based on the mentioned recordings along with a statistical report of the number of experiments and average reaction time.

The performance of the design was evaluated in two exhibitions on groups of people. The feedback was encouraging. As expected, the reaction time of older people was weaker.

Result

The main result of this design is a successful device for automatic measurement of reaction time that has a broad applications in the field of cognitive sciences and neuroscience both in research and clinical practices, specifically in the elderly. Figure 3 depicts a visual demonstration of the device. Cognitive abilities are one of the most important fields in neuroscience and cognitive science research. Therefore, a device, capable of automatic re-

Figure 3 Final tool

cording and improving the response time is absolutely crucial.

This device performs similar to the traditional method. However, the recordings have far better accuracy and are performed automatically. The cognitive science research centers along with hospitals, advising clinics, professional athletes and elderly care centers can be a possible market for this device. The mentioned markets are already being equipped with novel tools to update their service and provide better quality. The advantage of this device is its similarity to the classical method, eliminating the need for a practitioner, enabling enhanced efficiency and accuracy.

Discussion

With advancements in medical sciences and specifically neuroscience, designing new equipment for better evaluation of the brain and nervous system is gaining more interest. Furthermore, devices for improving cognitive abilities in normal people such as police officers, drivers, firefighters, athletes, patients with neuromuscular disorders, etc are crucial. This provided us with the motivation to design a device to eliminate problems caused by human errors and improper experiment settings. Additionally, the device can train and improve reaction time in the mentioned groups.

Conclusion

The device designed and built in this technological project showed that in psychology and psychiatry, cognitive sciences and neuroscience, there are opportunities to work in the field of devices and assistive devices in the field of treatment and diagnosis that can help production in the country.

Keywords: reaction time, neuroscience, elderly.
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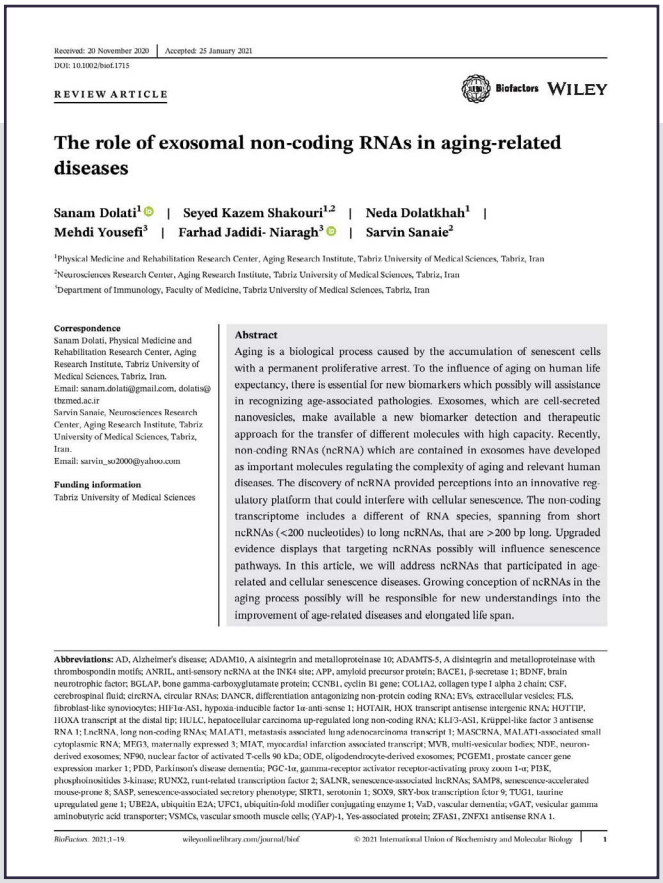

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REVIEW ARTICLE

Biofactors WILEY

The role of exosomal non-coding RNAs in aging-related diseases

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Abstract
Aging is a biological process caused by the accumulation of senescent cells with a permanent proliferative arrest. To the influence of aging on human life expectancy, there is essential for new biomarkers which possibly will assistance in recognizing age-associated pathologies. Exosomes, which are cell-secreted nanovesicles, make available a new biomarker detection and therapeutic approach for the transfer of different molecules with high capacity. Recently, non-coding RNAs (ncRNA) which are contained in exosomes have developed as important molecules regulating the complexity of aging and relevant human diseases. The discovery of ncRNA provided perceptions into an innovative regulatory platform that could interfere with cellular senescence. The non-coding transcriptome includes a different of RNA species, spanning from short ncRNAs (<200 nucleotides) to long ncRNAs, that are >200 bp long. Upgraded evidence displays that targeting ncRNAs possibly will influence senescence pathways. In this article, we will address ncRNAs that participated in age-related and cellular senescence diseases. Growing conception of ncRNAs in the aging process possibly will be responsible for new understandings into the improvement of age-related diseases and elongated life span.

Abbreviations: AD, Alzheimer's disease; ADAM10, A disintegrin and metalloproteinase 10; ADAMTS-5, A disintegrin and metalloproteinase with thrombospondin motifs; ANRIL, anti-sensory ncRNA at the INK4 site; APP, amyloid precursor protein; BACE1, β-secretase 1; BDNF, brain neurotrophic factor; BGLAP, bone gamma-carboxyglutamate protein; CCNB1, cyclin B1 gene; COL1A2, collagen type I alpha 2 chain; CSF, cerebrospinal fluid; circRNA, circular RNAs; DANCR, differentiation antagonizing non-protein coding RNA; EVs, extracellular vesicles; FLS, fibroblast-like synoviocytes; HIF1α-AS1, hypoxia-inducible factor 1α-anti-sense 1; HOTAIR, HOX transcript antisense intergenic RNA; HOTTIP, HOXA transcript at the distal tip; HULC, hepatocellular carcinoma up-regulated long non-coding RNA; KLF3-AS1, Krüppel-like factor 3 antisense RNA 1; lncRNA, long non-coding RNAs; MALAT1, metastasis associated lung adenocarcinoma transcript 1; MASCRNA, MALAT1-associated small cytoplasmic RNA; MFG3, maternally expressed 3; MIAT, myocardial infarction associated transcript; MVB, multi-vesicular bodies; NDF, neuron-derived exosomes; NF90, nuclear factor of activated T-cells 90 kDa; ODE, oligodendrocyte-derived exosomes; PCGEM1, prostate cancer gene expression marker 1; PDD, Parkinson's disease dementia; PGC-1α, gamma-receptor activator receptor-activating proxy zoom 1-α; PI3K, phosphoinositides 3-kinase; RUNX2, runt-related transcription factor 2; SALNR, senescence-associated lncRNAs; SAMP8, senescence-accelerated mouse-prone 8; SASP, senescence-associated secretory phenotype; SIRT1, serotonin 1; SOX9, SRY-box transcription fctor 9; TUG1, taurine upregulated gene 1; UBE2A, ubiquitin E2A; UFC1, ubiquitin-fold modifier conjugating enzyme 1; VaD, vascular dementia; vGAT, vesicular gamma aminobutyric acid transporter; VSMCs, vascular smooth muscle cells; (YAP)-1, Yes-associated protein; ZFAS1, ZNFX1 antisense RNA 1.

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Top Article

Congratulations to Dr. Sanam Dolati, Assistant Professor of Immunology, TUOMS, on having her article entitled: "The role of exosomal non-coding RNAs in aging-related diseases", published in BioFactors (IF=4.734), which has been selected as the top article of this issue. Aging Research Institute expresses the warmest greeting to her.

COVID-19

A glance on the published articles about aging

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frontiers in Endocrinology

SYSTEMATIC REVIEW

Understanding the Clinical Features of Coronavirus Disease 2019 From the Perspective of Aging: A Systematic Review and Meta-Analysis

OPEN ACCESS

The 2019 novel coronavirus (2019-nCoV) or severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), responsible for 2019 coronavirus disease (COVID-19) pandemic, caused more than 22,054,300 infections and 779,443 deaths worldwide until August 19, 2020 (1). Interpersonal transmission of this new virus causes a huge challenge for the global health system, especially for developed communities with a high proportion of elderly people (2).

Aging is characterized by a progressive physiological dysfunction and disability to stabilize the homeostasis, leading to an increased incidence of degenerative diseases and deaths (3). Among signifcant modulations at the cellular and system level during aging, the most obvious phenomenon is the disorder of the immune system, including immune decline caused by changes in the number and proportion of immune cells and chronic infammation caused by high expression of infammatory factors, which was also called “infammaging” (4). It weakens the immune function of the elderly population against pathogens such as the coronavirus, and the state of chronic infammation increases the risk of cytokine storms.

A study by Chen et.al have systematically reviewed the single-center or multicenter observational studies of older patients with COVID-19 and comprehensively dissected the true impact of age as a complex variable on COVID-19 disease. In this systematic review four studies, all from china, including 2046 infected patients were precisely evaluated, and the results show that the elderly group has a higher risk of hypertension, diabetes, and cardiovascular disease than the younger patients. It shows the clinical manifestations of elderly patients are not signifcantly different from those of younger patients. As the risk of fever is slightly increased in the elderly group among the common symptoms, and the risk of fatigue in aging patients is slightly decreased, but there are no statistically signifcant differences between the two groups. Laboratory tests show high variability of white blood cells in aging patients, which means a fragile unsteady state caused by COVID-19 in the elderly population. When it comes to lymphocytes, the situation is opposite. All these fndings support the high infammatory state in elderly patients because the total white blood cells increase in aging patients while the lymphocytes decrease inversely. The decline of lymphocytes also shows a fragile immune defense of the elderly population. This certain signifcant difference between the blood routine and some serological indicators, which may be used as a guide for subsequent treatment selection and continuous monitoring. (5)

This is obviously unexpected from what we thought in the past that the elderly would suffer severe symptoms once they became ill. Indifference in initial symptoms and subsequent high mortality make us boldly speculate that the indifference in symptoms of elderly patients with COVID-19 may cause a kind of confusion that they are not very serious, thereby delaying the treatment of the elderly.(5)

Keywords: COVID-19; SARS-CoV-2; aging.
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Health anxiety in older adults

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Health anxiety (HA) is a chronic worry or fear about having or developing a serious illness, which is usually a medical one (1, 2). The hallmark of health anxiety is persistent concern about having or confronting an illness, which results in frequent bodily checking for signs of disease, permanent health monitoring, web browsing, reassurance-seeking through frequent consulting with several specialists, or avoidance from medical appointments because of being afraid about the diagnosis of a serious disease (1-3). Health anxiety has been associated with numerous negative consequences such as increased usage of medical services, higher medical costs, and experiencing higher levels of concern when taking routine medical care (4). The HA is associated with high incidences of depression, anxiety, and physical restriction and places an unnecessary burden on healthcare services (5). Individuals with HA have dysfunctional patterns of response to illness-related information.

The prevalence of health anxiety in medical settings is 24.7%. This amount is high compared to the primary care population (0.26-8.5%)(6). In the study conducted by Sunderland et al., it is reported that HA affects approximately 5.7% of the non-clinical Australian population (7). The HA prevalence rate is higher in clinical populations than non-clinical populations. For example, Zhang et al study found that the HA prevalence rate differs in different clinics: cardiology (47.69%), rheumatology (47.17%), neurology (42.62%), rehabilitation (41.94%), and endocrinology (34.48%) (8).

As a person ages, the fear or worry about health and illness increase. Due to the high prevalence of negative life experiences (e.g., bodily injuries from falls, illness, and death of social network members) and health problems in later life, the elderly people become more preoccupied with their health and worry about it (9, 10). Researches show that the global population is moving toward aging. According to World Health Organization (WHO), the aging population (aged 60 years and above) will increase from 900 million in 2015 to 2 billion in 2050 (11). In Iran, the aging population has increased from 6.6% in 1995 to 10% in 2010 and is estimated to reach 25.1% in 2061 (12).

Along with the increase of the elderly population, health conditions associated with aging which including chronic physical and mental disorders increase (12). Mental disorders are prevalent among individuals aged 65 years and without dementia (about 20% suffer from mental dis-

orders). It is also reported that among individuals aged 95 years without dementia 17% have depression, 9% have anxiety, and 7% have a psychotic disorder (13).

Frequent occurrence of health problems and comorbidity with physical health conditions in the aging process makes health anxiety a common condition in older adults (14). It leads to increased and intensified health worries (e.g., the overestimating the outcomes of the disease) and generalized health-related worry (e.g., an older adult who has confronted a serious disease such as diabetes will be concerned about other diseases) (9, 14). However, some changes occurring in aged adults, like deteriorating health, social isolation, loss of control, and dependency make them susceptible to severe health anxiety (9). It is indicated that poorer physical function and frailty predict health anxiety in older adults (5). Researches demonstrate that in addition to health status other mediators including decreased positive environmental reinforcement, emotional preoccupation, anxiety sensitivity, genetic vulnerabilities, neuroticism, and social isolation might be involved in presenting health anxiety (5, 15, 16).

As mentioned, worrying about somatic sensations, health, and physical impairment is prevalent in older adults (about 3% of older adults worry about their health most or all of the time) (10, 17). The majority of these health-based worries may lead to the representation of mild forms of health anxiety. The severe form of health anxiety may have negative impacts on mental health (e.g., life satisfaction), physical health (e.g., functioning), and quality of life (7, 18).

Although severe health anxiety has adverse impacts on individuals' health, especially in older adults, mild health anxiety may motivate them to seek appropriate medical care and be functionally adaptive (19). Mild health anxiety makes older adults be aware of their vulnerability to various health problems and be hyper-vigilant to any somatic changes. Seeking health services resulting from health-related concerns may lead to the detection of health problems in the very early stages of disease progression (9).

Considering the higher rate of health problems and health care utilization in older age compared to other age groups, it is momentous to pay attention to health anxiety in late life (20). Detection and treatment of health anxiety in older adults are important because early detection and treatment can help to decrease the burden on the healthcare system, prevent the development of a distressing and debilitating condition and improve quality of life among individuals suffering from a severe health anxiety disorder.

Keywords: Health anxiety; older adults; mental health.
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Student Letter

Anticholinergic Challenge of the Elderly

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As it's known the aging population is growing regularly, and among the multiple ailments, cognitive impairment in this susceptible group of populace is of concern. Although the aetiology of cognitive function disorders is multifactorial, one of the most determinant causes of this disorder is the medication that elderly individuals take. Of this vast burden of medication, anticholinergics play an important role in arising cognitive impairment as a side effect.

Anticholinergics are the agents that supress the action of acetylcholine by affecting its receptors for parasympathetic nervous system on glands, smooth muscle cells and central nervous system. Examples of these drugs include: Atropine, Clidinium, Darifenacin, Dicyclomine, Fesoterodine, Glycopyrrolate, Hyoscyamine, Ipratropium, Oxybutynin, Scopolamine, Solifenacin, Tiotropium and etc. Cholinergic receptors are usually classified to two groups of nicotinic and muscarinic receptors (which are divided to smaller subtypes) and anticholinergic drugs perform different activities by blocking different receptors types and subtypes. Anticholinergics act diversely to parasympathetic nervous system and have antisecretory activities like decrease in salivation, nasal and bronchial secretion, lacrimation, gastric acid production, sweating and also secretion of inflammatory agents. As well anticholinergics relax smooth muscle cells in bladder, gastrointestinal tract and lungs and have effects on heart by increasing heart rate and treating bradycardia (1). So that these drugs are used to treat many conditions such as Asthma, Chronic obstructive pulmonary disease (COPD), Diarrhea, Gastrointestinal disorders, Overactive bladder, Urinary incontinence, Motion sickness, Poisoning, Muscle spasms and Allergies. Anticholinergics are sort of safe drugs but the patients taking the medication might face some side effects like dry mouth and eyes, headache, decreased sweating and hyperthermia, visual blurring, constipation, anxiety and cognitive dysfunctions. Hence, anticholinergic medication shouldn't be prescribed unless in essential conditions for elderly people to avoid side effects in this susceptible group, particularly the cognitive side effects (specially for elderlies with prior cognitive impairment) (2).

Drugs with anticholinergic activities (like antihistamines and antidepressants) which are used to treat many conditions, have peripheral and central side effects. Cognitive impairment also is a result of central side effect of drugs with anticholinergic properties (3).

As mentioned above older patients are sensitive to side effects of anticholinergic drugs. This sensitivity is due to decrease in cholinergic neurons or receptors in their brain, the increase in blood–brain barrier permeability and the reduction of renal exertion and hepatic metabolism of medications (3). Since the muscarinic receptors are in charge of learning, short-term and long-term memory, and attention, use of anticholinergics may cause cognitive impairment and even lead to delirium (4). The extent of adverse effects on cognition depends on the total anticholinergic burden, the basic cognitive function and the individual pharmacokinetic and pharmacodynamic variability (5,6). The adverse effects of anticholinergic medication on cognition are discussed in two major classes: 1- acute anticholinergic effects and 2- chronic anticholinergic effects (7).

Acute anticholinergic effect, demonstrated as delirium (acute and severe cognitive impairment), is diagnosed by the presence of four signs: acute onset of cognitive

changes fluctuating in course, inattention, disorganized thinking, and altered level of consciousness (8). First two items associated with any of third or fourth item is diagnosed as delirium (9).

Chronic cognitive effect is described as worsening dementia or new onset of dementia, mild cognitive impairment or global decline in cognition not caused by delirium. Mini-Mental State Exam (MMSE) is a tool used to evaluate cognitive performance. Areas of cognition such as memory, recall, orientation, language and attention are screened in this method and due to scoring, individuals with a score below 24 are considered to have cognitive impairment (10). In patients receiving anticholinergics, commonly MMSE score decreases.

serum anticholinergic activities assay (SAA) is a method that evaluates the amount of anticholinergics in human body. SSA estimates the anticholinergic activity not only caused by medication but also generated by endogenous factors as a result of hyperthermia and stress (11). The higher SAA values colleague with cognitive impairments. SAA technique is an expensive method that is not always available for physicians. A drug list is a simple way to determine anticholinergic amounts in body (4), so that by decreasing the burden of drug we will face less side effects. As a conclusion, to diminish cognitive impairments, as a side effect of anticholinergic medication, prescription of this category of drugs should be reduced and controlled specially in elderly and individuals with prior cognitive impairments. The drug should be administered at the minimum affective dose possible, accommodated with patients past medical and drug history, and a close follow-up is also needed to reduce the cognitive impairment as a side effects in patients receiving anticholinergics.

Keywords: Anticholinergic; Cognitive Impairment; amnesia.
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