EDITORIAL

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Radiographers' Occupational Health Assessments and their Radiation Exposure during COVID-19 era; A Call for an Action

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Dear Editor

X-ray based imaging modalities have special diagnostic, prognostic, and predictive roles in the management of various communicable and non-communicable diseases. According to international reports, approximately 20% of X-ray examinations were CT exams but it contributes almost 40-60% of the total collective dose or diagnostic reference levels (DRLs) from diagnostic radiology(UNSCEAR, 2008; NCRP, 2019). Interestingly, this contribution can be increased significantly in some situations. Epidemiological data indicate that excess occupational exposure from low dose ionizing radiation sources such as radiology and CT scanners, can increase the risk of stochastic biological effects such as solid cancers, leukemia and genetic effects as a result of routine occupational exposure (Richardson et al., 2015; Siegel et al., 2018).

From the beginning of COVID-19 pandemic, which respiratory symptoms were the dominant symptoms of infected patients the computerized tomography (CT) scan of mediastinum and lungs gains a special attention. The sensitivity, specificity, and accuracy of High-resolution CT (HRCT) of the chest in diagnosis of COVID-19 are high enough to be considered as the first-line diagnostic procedure considering its availability and cost. The importance of CT scan of mediastinum and lungs has risen, considering its availability, immediate results, and lower costs comparing to the polymerase chain reaction (PCR) test for COVID-19, particularly in developing countries with extremely limited resource. Moreover, it may have a role in the treatment of the infected patients. (Ghahramani-Asl et al., 2020).

Studies, in Australia and Ireland, have shown that the Covid-19 Pandemic changed the pattern of clinical work and services in diagnostic radiology departments while imposing the use of appropriate personal protective equipment (PPE).

Simultaneously with the start of the Covid-19 disease in September 2019, as shown in Figure 1(A), an increasing trend in the number of HRCT exams performed in CT scan wards of Sabzevar city in the years of 2020 and 2021 can be seen (shown in orange and blue color, respectively). The maximum number was reached in October 2020 and September 2021, and also the decreasing trend of the number in 2022 can be seen (yellow color). Figure 1(B) also compares the ratio of the number of HRCT exams performed in three graphs, i.e 2020 to 2019, 2021 to 2020 and 2022 to 2021, according to which, the highest ratio was related to October 2020 and then March 2021. Approximately this ratio was seven times for October and four times for March compared to the previous year. As shown in Figure 1(B), the third peak of the pandemic coincided with October 2020 and the fourth peak of the pandemic coincided with March 2021 in Iran. Significantly, a decreasing trend in ratios can be seen in 2022 compared to 2021, which shows almost the same situation before the start of the pandemic in Iran and the return to normal conditions.

Although the number of referrals and CT scans which were performed this year (i.e. 2022) may not be significantly different from the aforementioned year which is most probably, due to more extreme observance of health policies and preventive efforts such as public vaccination, but totally the number of referrals in this year, is the same. And it is still at the highest level of referrals to these sections.

Certainly, various factors have controlled this disease and reduced the trend of HRCT tests in recent years in Sabzevar and other cities in Iran, including general vaccination, strict observance of health procedures and legal restrictions such as travel cancellation and family parties. However, according to the studies performed and the graphs drawn, in the last two years and at different time periods, there has been a significant increase in the number of referrals and CT scan diagnostic exams, and these sections may still be repeated and the number of referrals reach to the highest level for various reasons.

From the point of view of radiation protection, rapid intensification in the number of patients referred for lung CT scan which subsequently increases the workload of radiology units all around the world that can increase both population radiation dose and occupational radiation dose among the staff. Although National Council on Radiation

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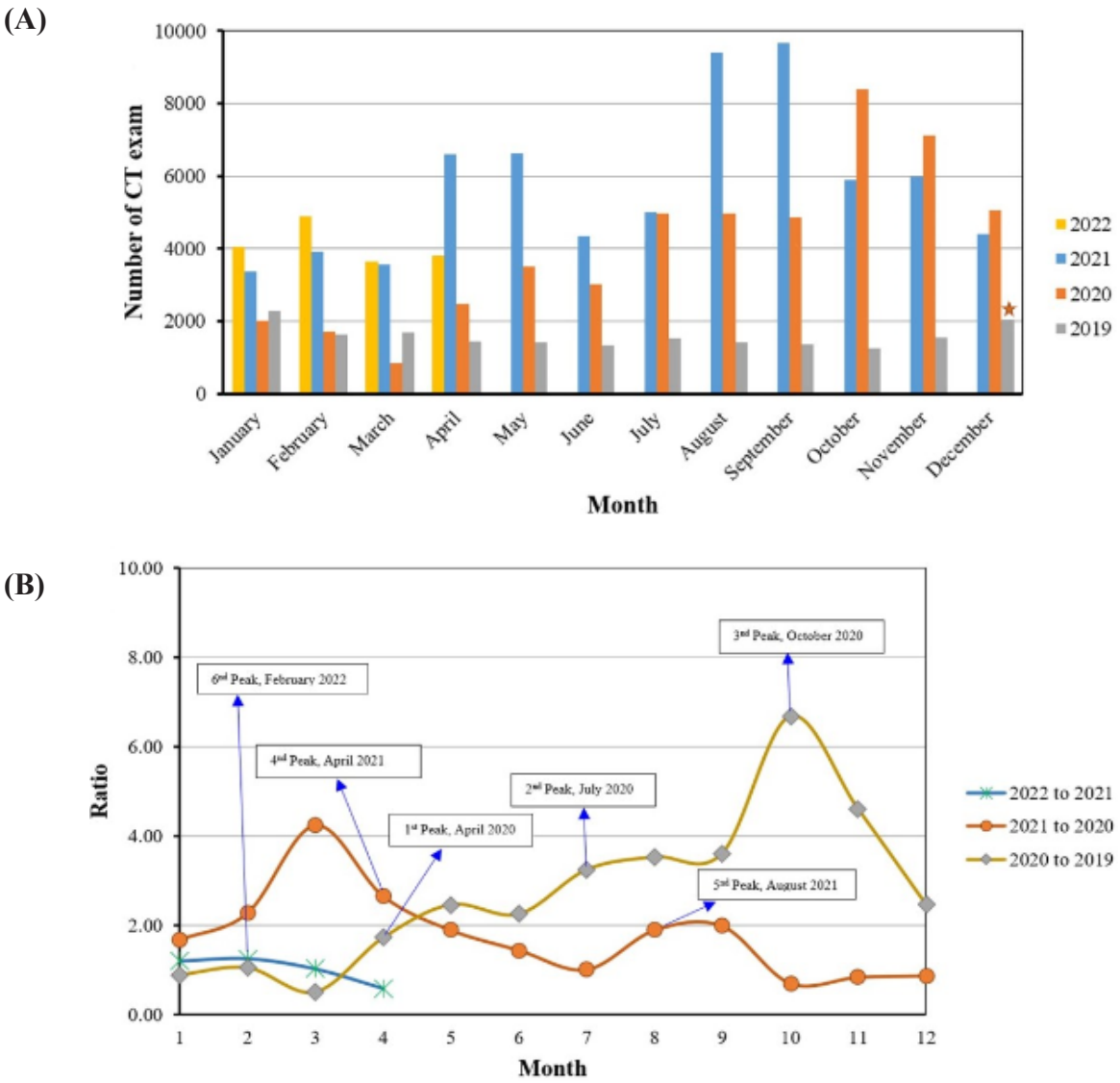

Figure 1. (A) Frequency of total HRCT exam during four last years in Sabzevar province and (B) the ratio of total HRCT exams in each year separately. The star symbol in the Figure (A) indicates the beginning of the Covid-19 pandemic.

Protection (NCRP) and International Commission on Radiological Protection (ICRP) have announced some criteria such as maximum permissible occupational doses (MPD) based on stochastic effects are 50mSv/year for the whole body and based on deterministic effects are 150 mSv/year for the eye lens and 500mSv/year for organs including hands and feet to measure occupational radiation, due to the possible increase in workload and the outbreak of similar pandemic conditions, these values may need to be modified and revised (NCRP,2019 ; ICRP,2007). Also, increasing the workload of CT scanners declines the lifetime of major components of imaging systems such as X-ray tubes, electronic and mechanical components. This doubles the necessity of quality monitoring and periodic maintenance services.

Therefore, it is predictable that, huge requests for lung CT scans during upcoming pandemics of diseases and impossibility of benefitting from one's paid leave days since other employees may be unexpectedly on their medical leave; consequentially, the probability of staff burnout and exhaustion will increase and may even lead to severe mistakes.

Increasing the support and welfare strategy of the staff can take action to eliminate the burnout symptoms as well as changing jobs or retiring the radiology staff since the COVID-19 crisis (Shanahan et al., 2021; Foley et al., 2020; Rad et al., 2017; Koushan et al., 2014). Moreover, considering the possibility of similar pandemic conditions or recurrence of the Covid-19 disease that will lead to an increase in the workload of CT scan departments, it seems that the quantitative criteria of occupational exposure are not enough and need to be revised. Also, applying other basic procedures such as using dose reduction techniques for example beam filters, tube current modulation, automatic pitch adaptation and low tube voltage for chest HRCT, may be helpful for patient dose reduction without losing image quality in similar pandemic situations. Furthermore, it is recommended to reduce hours of work in each work shift, hold advanced training courses for new personnel, increase the training of radiation workers, decrease the time intervals of periodic laboratory tests for staff or more specialized medical laboratory tests such as

genetic cancer tests..

Author Contribution Statement

All authors contributed equally in this study.

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Conflicts of interest

There are no conflicts of interest to disclose.

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