sure that the observed alterations are attributed to radiation induced effects, people with gingivitis or people with periodontitis were not included in the study. We found that about 5 years of mobile use and more than 60 min of close exposure to EMF emitted by the phone had lowered, but not significantly, the concentrations of salivary IgA. Critical analysis of the data with the inflammation may relate the absence of the positive effect to the fact that most of the participants were using earphone (51%) or handheld set (46%) as a precautionary measure i.e. they were not keeping their phones near the ear while calling.

These results do not depart from those reported in literature, where levels of salivary flow, concentration of protein and of IgA in saliva [6,13,38-40] and blood [41] of people were not significantly affected by exposure to RF radiation. Contrary to this, speaking on mobile phone over an hour decreased total antioxidant capacity of saliva and salivary IgA [42]. Three studies on the effect of use of mobile phones on the level of salivary anti-inflammatory cytokine (IL-10) reported three different results; decrease [17], increase [43] and no change [44]. The proinflammatory cytokine IL-1β values in subjects who used mobile phones for more than 10 years presented higher differences between ipsilateral versus contralateral parotids [17].

Likewise, in vitro human studies gave no convincing evidence that exposure to RF field initiate adverse modifications in immune cells or cytokines characteristic of human disease [12,45-47]. It was proposed [48] that pulse-modulated microwaves may represent the potential of immunotropic influence, stimulating preferentially the immunogenic and proinflammatory activity of monocytes of cultured human blood at relatively low levels of exposure. A small but significant downregulation of expression of CD95 gene, which regulates immunologic response in lymphocytes, was found [49] in cells taken from older (88 ± 2 years), but not younger (26 ± 5 years) donors. Results from experiments with RFF exposure at 2.45GHz SAR at 10 W/kg have shown very little or no effects on either chemotaxis or phagocytosis in neutrophil-like human HL-60 cells [50].

Although it is better to limit the discussion on one model organism as the findings may be totally different (or to an extent) in two different species, it may deserve mentioning some of the similar studies. Animal studies reached no definite conclusions regarding the immunologic effects of mobile phone and microwave radiation; no change was detected in humoral response of young rats exposed in utero and postnatal to non-ionizing radiofrequency field regardless of the types of biomarker and SAR levels [51]. In contrast, exposure of rats to EMF resulted in significant decrease in immunoglobulin levels (IgA, IgE, IgM, and IgG); total leukocyte, lymphocyte, eosinophil and basophil counts [52]. The presence of more inflammatory cells especially large and small lymphocytes, which are characteristic of chronic inflammation, has been shown recently in gingival tissues of rabbits exposed to mobile phone radiation [53].

In the present work, the salivary IL-33 concentration was measured by ELISA, however, no absorbance was detected. This may due to the fact that IL-33 is detected in serum of people with chronic diseases, or that the IL-33 kit was not sensitive enough to detect a probably extremely low salivary IL-33 level [54]. The salivary MPO ODs values measured in this study were not significantly affected neither by time of call per day, nor by the duration (year) of phone use. Up-to-date, no experimental human studies describing changes in the salivary MPO levels due to the exposure RFR have been encountered in the published literature. The available literature on the effect of RF fields on MPO using laboratory animals is scarce. In line with our data are those found by others, who demonstrated no significant ($p>0.05$) alterations in MPO concentrations in livers [55] and submandibular glands [56] of rats exposed to 100 and 500 μT extremely low frequency magnetic field (ELF-MF) (2 h/day, 7 days/week, for 10 months) corresponding to the safety standards for public and occupational exposure [56,57]. In contrast, significant increases in MPO were observed in various organs, such as rat kidney and guinea pig's liver after RFR exposure [58,59].

One point of strength of the present study is the fact it was conducted on both sexes. However, it is limited by small sample size and only with saliva from relatively young volunteers. The disadvantage of epidemiological studies; small sample size and a lack of prospective data acquisition should be kept in mind. For this reason, it is difficult to evaluate the results on a person basis. Another methodological issue concerns the different mobile phone types assessed in the study. Therefore, it is recommended that future studies should plan to examine whether or not the reported results herein represent adaptive response to radiation stress and to evaluate effect of frequent mobile phone use on salivary flow rate and other immunological parameters. To arrive at a more confirmatory conclusions sample size should be larger and with people of various age groups from different geographical regions. A sample of deaf people may serve as negative control for the mobile phone users.

## CONCLUSION

Salivary IgA and MPO levels were lower, but not significantly, in saliva from people whose daily use exceeded 60 min as compared with those observed in shorter period callers. Likewise, duration of phone use had no significant effect on the IgA and MPO values. However, higher IgA concentrations were noticed in saliva of subjects who used phone longer than 5 years as compared to scores of the shortest time less than 1 year. Whether or not the slight alterations in the immune system relevant to RFR have any clinical implications deserves further investigation.

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