

## Alterations in TSH and Thyroid Hormones Following Mobile Phone Use

### Dear Editor,

Lack of ionizing radiation and the low level energy emission from cell phones initially led to a public perception that use of mobile phones is safe. However, the dramatic increase in the use of cell phones has generated great concerns about their potential adverse effects. We have previously found no association between self-reported illness symptoms and the exposures to microwave radiation emitted by mobile phones or electromagnetic field induced by other major sources.<sup>1</sup> We have also reported that microwave radiation emitted by mobile phones may increase the level of mercury, the most non-radioactive toxic element, released from dental amalgam restorations.<sup>2</sup>

The thyroid gland is one of the most exposed vital organs and may be a target for electromagnetic radiation. It has been established that even a small change in circulating thyroid hormone levels is sufficient to alter the brain functions.<sup>3</sup> However, we have found only one published paper reporting the effect of microwave radiation emitted by mobile phones on thyroid hormones of rat.<sup>4</sup> The aim of the present study was to assess the potential alterations of circulating thyroid hormones levels after exposure to microwave radiation emitted by mobile phones.

Seventy seven students were divided into three groups; average daily use of mobile phones in talk mode 5-20 minutes (group 1, 25 individuals); those used mobile phones more than 120 minutes in talk mode (group 2, 31 individuals); and those who did not use mobile phones before the study (control group, 21 individuals).

The average number of daily calls and the average duration of each call in group 1 were  $3.39 \pm 1.87$  (ranged 1-10), and  $4.23 \pm 2.01$  minutes (ranged 1-10), respectively. The average number of daily calls and the average duration of each call in group 2 were  $6.54 \pm 5.64$  (ranged 2-30), and  $31.96 \pm 22.31$  minutes (ranged 4-120), respectively. The average daily times for mobile phone use in groups 1 and 2 were  $12.68 \pm 5.24$  and  $147.4 \pm 53.91$  minutes respectively. In group 1, the minimum and maximum period of mobile use was 6 months and 5 years (mean $\pm$ SD= $2.06 \pm 1.33$  years), respectively. In group 2, the minimum and maximum periods of mobile use were 1 and 10 years (mean $\pm$ SD= $2.90 \pm 2.40$  years), respectively. The average serum levels of T3, T4 and thyroid stimulating hormone (TSH) in the students of group 1 were  $1.25 \pm 0.27$  ng/ml (range: 0.9-2),  $7.76 \pm 1.73$   $\mu$ g/dl (range: 1.3-9.6) and  $4.25 \pm 2.12$   $\mu$ u/l (range: 1.9-10.1) respectively. The average levels of T3, T4, and TSH in group 2 were  $1.18 \pm 0.30$  ng/ml (range: 0.8-1.8),  $7.75 \pm 1.14$   $\mu$ g/dl (range: 6-11), and  $3.75 \pm 2.05$   $\mu$ u/l (range: 1.5-10.0), respectively. The average levels of T3, T4 and TSH in the control group were  $1.15 \pm 0.27$  ng/ml (range: 0.8-1.7),  $8.42 \pm 2.72$   $\mu$ g/dl (range: 5.1-18.1), and  $2.70 \pm 1.75$   $\mu$ u/l (range: 0-6.8), respectively. ANOVA test did not show statistically significant difference between the levels of T3 and T4 in groups 1 and 2, and the control. However, the difference between TSH levels in these 3 groups was statistically significant ( $P=0.028$ ). These findings confirm the early reports on alterations of blood levels of TSH or thyroid hormones following exposure to electromagnetic fields. Additional large-scale research will further clarify the extent of alterations caused by mobile phone use on the function of human glands.

Seyed Mohammad Javad Mortazavi<sup>1,2</sup>, Asadollah Habib<sup>3</sup>, Amir Hossein Ganj-Karimi<sup>4</sup>, Razieh Samimi-Doost<sup>5</sup>, Atefeh Pour-Abedi<sup>5</sup>, Ali Babaie<sup>5</sup>

<sup>1</sup>The Center for Radiological Sciences Research,

<sup>2</sup>Department of Radiology, School of Paramedical Sciences,

<sup>3</sup>Department of Endocrinology,

<sup>4</sup>Department of Immunology, School of Paramedical Sciences,

<sup>5</sup>Department of Paramedical Sciences,

Shiraz University of Medical Sciences,

Shiraz, Iran.

### Correspondence:

Seyed Mohammad Javad Mortazavi PhD,  
Department of Radiology,  
The Center for Radiation Research,  
School of Paramedical Sciences,

Shiraz University of Medical Sciences,  
P.O. Box: 71345-1755,  
Shiraz, Iran.

**Tel:** +98 711 2295023  
+98 711 2294720

**Fax:** +98 711 2289113

**Email:** [mmortazavi@sums.ac.ir](mailto:mmortazavi@sums.ac.ir)

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