

# Neurobehavioral effects among inhabitants around mobile phone base stations

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## Abstract

### Background

There is a general concern on the possible hazardous health effects of exposure to radiofrequency electromagnetic radiations (RFR) emitted from mobile phone base station antennas on the human nervous system.

### Aim

To identify the possible neurobehavioral deficits among inhabitants living nearby mobile phone base stations.

### Methods

A cross-sectional study was conducted on (85) inhabitants living nearby the first mobile phone station antenna in Menoufiya governorate, Egypt, 37 are living in a building under the station antenna while 48 opposite the station. A control group (80) participants were matched with the exposed for age, sex, occupation and educational level. All participants completed a structured questionnaire containing: personal, educational and medical histories; general and neurological examinations; neurobehavioral test battery (NBTB) [involving tests for visuomotor speed, problem solving, attention and memory]; in addition to Eysenck personality questionnaire (EPQ).

### Results

The prevalence of neuropsychiatric complaints as headache (23.5%), memory changes (28.2%), dizziness (18.8%), tremors (9.4%), depressive symptoms (21.7%), and sleep disturbance (23.5%) were significantly higher among exposed inhabitants than controls: (10%), (5%), (5%), (0%), (8.8%) and (10%), respectively ( $P < 0.05$ ). The NBTB indicated that the exposed inhabitants exhibited a significantly lower performance than controls in one of the tests of

attention and short-term auditory memory [Paced Auditory Serial Addition Test (PASAT)]. Also, the inhabitants opposite the station exhibited a lower performance in the problem solving test (block design) than those under the station. All inhabitants exhibited a better performance in the two tests of visuomotor speed (Digit symbol and Trailmaking B) and one test of attention (Trailmaking A) than controls. The last available measures of RFR emitted from the first mobile phone base station antennas in Menoufiya governorate were less than the allowable standard level.

## Conclusions and recommendations

Inhabitants living nearby mobile phone base stations are at risk for developing neuropsychiatric problems and some changes in the performance of neurobehavioral functions either by facilitation or inhibition. So, revision of standard guidelines for public exposure to RER from mobile phone base station antennas and using of NBTB for regular assessment and early detection of biological effects among inhabitants around the stations are recommended.

**Keywords:** Neurobehavioral effects; Mobile phone base stations; Radiofrequency radiations (RFR)

## Article Outline

- 1. [Introduction](#)
- 2. [Subjects and methods](#)
  - 
  - 2.1. [Statistical analysis](#)
- 3. [Results](#)
- 4. [Discussion](#)
- 5. [Conclusion and recommendations](#)
- [References](#)

### View Within Article

### View Within Article

Table 1. Personal characteristics of exposed and control participants



Exposed and controls were of the same age, sex, educational levels, smoking habits and mobile phone use ( $P > 0.05$ ).

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Table 2. Measurements of power density for mobile phone base station antennas upon the building under the study by National Telecommunication Institute (NTI, 2000)



NB: The maximum permissible level for intermittent exposure is  $0.4 \text{ mW/cm}^2$  that decreased to  $0.0080 \text{ mW/cm}^2$  for continuous exposure (Egyptian Protocol of Criteria for Construction of Mobile Phone Stations, 2000).

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Table 3. Neurological complaints among exposed and controls



Fischer exact test was used as the calculated expected number in this cell was lower than five.

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Table 4. Neurological complaints among inhabitants living under and opposite the station



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Table 5. Mean  $\pm$  S.D. of neurobehavioral performance and personality scores of exposed and controls




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Table 6. Mean  $\pm$  S.D. of neurobehavioral performance score of inhabitants living under and opposite the station



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