Japan EMF Information Center

Rapid Response Group

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Paper: Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case–control study. Interphone Study Group. International Journal of Epidemiology 2010; 1–20. doi:10.1093/ije/dyq079.

Summary: The rapid increase in the use of mobile telecommunications has raised questions about whether exposure to the radiofrequency (RF) signals from mobile telephones, with their antennas located close to the head when making a call, could be associated with an increase in the incidence of head and neck cancers.

Following a recommendation for more research from the International Electromagnetic Fields (EMF) Project of the World Health Organization (WHO), the International Agency for Research on Cancer (IARC), a WHO specialized agency on cancer, coordinated an international case-control epidemiological study in 13 countries using the same core protocol. Countries participating in the study were: Australia, Canada, Denmark, Finland, France, Germany, Israel, Italy, Japan, New Zealand, Norway, Sweden and the UK. The Interphone study is the largest and most comprehensive epidemiological study conducted to date on mobile phone use and brain tumours, and contains the largest number of long-term phone users.

The purpose of the study was to determine whether use of mobile phones is associated with an increased incidence of brain tumours, specifically gliomas, meningiomas, acoustic neuromas or salivary gland tumours. This paper presents results for gliomas and meningiomas. Information was collected on past mobile phone use during face-to-face interviews with patients who had gliomas or meningiomas (called **cases**) and compared answers to the same questions with people who did not have these cancers (called **controls**). If the case died before interview, or was too sick to answer questions, a proxy was interviewed.

Case and control groups were matched for age, sex and residence, and information was collected on other exposures to RF fields and ionizing radiation, medical history, educational level (as a surrogate for socio-economic status), occupation, smoking etc. Exposure to mobile phone RF signals was determined by how often and for how long the phone was used. To be considered "exposed" to mobile phone all subjects participating had to have made or received an average of at least one call per week during a period of at least 6 months ("regular users"). The frequency of brain tumour cases in this group was compared with a group of "not-regular users". This reference group included never users of mobile phone and occasional users. "Never users" could not be used as a reference because their number was very small, particularly among young men.

To examine whether brain tumour risk depended on duration and intensity of mobile phone use, regular users were divided into categories of increasing time since start of use; cumulative number of calls, and cumulative call time (in hours). As exposure to radiofrequency fields (RF) from mobile phones during voice calls is extremely localized, further analyses accounted for tumour location.
For this purpose, the side of the head that the user claimed to be the predominant side for phone use was requested at interview, the lobe of the brain in which the tumour occurred was determined for each case (from diagnostic imaging, clinical records or surgical reports), and controls were assigned the tumor location of their matched cases.

The relation between mobile phone use and tumor location was explored in two ways. First, separate analyses (by regular use, duration and intensity of mobile phone use) were carried out to assess the risk of brain tumors located in specific areas of the brain: temporal lobe (which adsorbs most of the RF energy emitted by the phone antenna), frontal or parietal lobes, and in other brain areas. A second set of analyses was carried out using two alternative classification of exposure to mobile phones. Exposure was classified as "ipsilateral" if the preferred side of use of the mobile phone corresponded to the side of the head where the tumour was located, and "contralateral" if the preferred side of use was on the side of the head opposite to that where the tumour was located. Laterality was not assigned if the tumour crossed the midline of the brain or if the subject reported switching the side on which the phone was used.

When combining all countries, interviews were completed for 2425 meningioma cases (78% of total identified), 2765 glioma cases (64% of total identified) and 7658 controls (53% of those asked to participate). Slightly smaller numbers are included in the matched analyses. These differences raise the possibility of selection bias. An ad hoc separate study provided evidence that non-users of mobile phones were more likely than users to refuse to participate in the study, but this was true among cases and controls to the same extent. Considering the differences in case- and control-response rates, however, a participation bias could have ensued and it was estimated to produce a reduction of the risk by 5-15%. In fact there is a consistent reduced risk of about 20% reported in most of the analysis.

Other biases that can affect the results are also likely to be present and include the possibility that cases will over report mobile phone use, as it was a publicized risk, especially when it was known that the study was about phone use and cancer. Also, in separate papers published within the Interphone study, it was found that cases may have tended to over-report their phone use compared to controls or report the use to be the same as the side of tumour occurrence because they want to blame their cancer on some cause.

Conclusions: No increased risk of glioma or meningioma was observed in relation to mobile phone use., although there was a reduced risk of both glioma and meningioma observed among regular users of mobile phones, likely reflecting bias.

No indication of any excess risk of meningiomas or gliomas emerged in relation to increasing time since first mobile phone use. The risk of brain tumours was not increased in those who had been using mobile phones for the longest period of time (10 or more years).

There was no tendency for the risk of brain tumours to increase with increasing cumulative number of calls or cumulative call times. An increased risk of glioma was observed only among the 10% of subjects in the highest cumulative call time category, particularly pronounced among short-term users, rather than medium- or long-term users. However, the authors agree that this result is most likely due to biases or other sources of error in the study.

Analyses to determine whether meningiomas or gliomas occurred on the same side of the head as the mobile phone was used did not find any excess risk for these cancers. While the risk of glioma seemed to be increased for regular users when the phone was used on the same side of the head as the tumour (ispsilateral), biases could account for this result.

No excess risk of these cancers was found for regular users whether they used analogue or digital mobile phones.

The authors concluded that, overall, no increase in risk of either glioma or meningioma was observed with use of mobile phones. There were suggestions of an increased risk of glioma, and much less so for meningioma, at the highest exposure levels, for ipsilateral exposures and, for glioma and for tumours in the temporal lobe. However, biases and errors limit the strength of the conclusions that can be drawn from these analyses and prevent a causal interpretation.