Bundesamt
für Strahlenschutz

Spotlight on EMF Research

Spotlight on "Trends in brain cancers (glioma) in New Zealand from 1995 to 2020, with reference to mobile phone use" by Elwood et al. in Cancer Epidemiology (2022)

Category [radiofrequency, epidemiology]

Spotlight - Oct/2023 no.1 (Eng)

Competence Centre Electromagnetic Fields (KEMF)

1 Putting the paper into context by the BfS

The number of mobile phone (MP) subscribers started to increase steeply in the early 1990s, reaching a penetration rate of 50% in Europe in 2000 [2]. Currently MPs emit radiofrequency electromagnetic fields (RF-EMF) in the range of 700–3600 MHz (2^{nd} – 5^{th} generation). Exposure to RF-EMF was classified as "possibly carcinogenic to humans" [3], based on limited evidence from earlier epidemiological case-control studies and animal experiments. Meanwhile, a lot of epidemiological research into a possible link between MP use and brain cancers has been done, mostly not suggesting such an association, although some risk elevations have been observed as well [4]. If indeed MP use increases the risk of developing cancer, the corresponding incidence rates worldwide should have risen substantially after a sufficient latent period.

2 Results and conclusions from the authors perspective

To analyze the implications of a potential glioma risk from MP use, Elwood et al. studied incidence time trends in New Zealand for the period 1995–2020. To this end data on incident brain tumors was obtained from the national cancer registry. MP use on the population level was estimated based on surveys. Annual percentage changes of age-standardized incidence rates of glioma (as the most common malignant brain tumor) were calculated, stratified by sex, age and anatomical site.

Between 1995 and 2020, 6,677 gliomas (90% of all brain tumors) were newly diagnosed in New Zealand, giving age-standardized incidence rates (per 100,000) of 6.04 in men and 3.95 in women. MP use increased rapidly from 1998 onwards, with the number of accounts exceeding the population in 2006. For ages 10–69,

glioma incidence tended to decrease within the 25-year period. A similar trend was observed for glioma of the temporal and parietal lobes, which are the sites of maximum radiofrequency exposure from conventional MP use. Likewise, for adults aged 20–39, which were assumed to use MPs most frequently, a slight decrease in glioma incidence was found. Comparison of actual and predicted incidence trends in glioma, at ages 10–69, did not suggest any risk elevations from MP use as found previously in some case-control studies. In contrast, glioma incidence increased substantially in those over 70 years, reaching statistical significance at ages 80 and older. Time trends in glioma incidence were similar in both sexes.

The authors conclude that, in line with published time trends in brain tumor incidence in several other countries, the present study does not indicate any increase in glioma rates related to MP use. The observed increase in gliomas in the elderly is consistent with the literature and likely the consequence of improved diagnostic procedures. Yet, the available data cannot exclude a small effect in a small subset of the population.

3 Comments by the BfS

The authors provide a well-conducted, informative approach to further elucidate a possible cancer risk from MP use. Investigating cancer incidence time trends is appropriate for hazard identification in this context for several reasons. First, RF-EMF exposure of the head has changed from negligible to almost universal within a few decades. Second, glioma as the possible outcome is well recorded by population-based cancer registries, although challenges related to diagnosis and reporting of brain tumors have to be kept in mind [5,6]. Third, there are hardly any known competing environmental causes for glioma, with high-dose ionizing radiation being the only established risk factor [7]. Finally, incidence trends are not affected by selection bias as often present in case-control designs. The study question is analyzed using appropriate statistical methods, including calculation of age-standardized incidence rates, their annual changes, and comparison of observed and predicted incidence time trends. Moreover, inclusion criteria for the main analyses (e.g., age range 10–69, since site distribution and diagnosis of brain tumors are distinct at younger and older ages) and subgroup analyses are based on biological considerations. However, a closer inspection of the possible age specificity of glioma incidence trends would have been informative. Measurable incidence increases are expected to be seen first and to be stronger among those who were in their 30s to 50s when MP usage began to spread [4], which would be those aged 55–75 at the end of this study period. In addition, the divergent pattern of brain cancer not only in children but also in adolescents could have been better met by raising the lower age limit [5]. Potential limitations of the scientific approach and explanations for the observations could have been discussed in more detail [8]. For instance, the observed decreases in glioma incidence are not consistent with the overall global picture, although such trends have been reported [5].

From a radiation protection perspective this time trend study is a valuable contribution to the body of epidemiological literature on the health effects of MP use. It provides no evidence of an increased glioma risk that could be attributed to MP use. The findings are consistent with other studies of incidence time trends in glioma [4, 9] as the most common malignant brain tumor. The study cannot, however, rule out possible adverse effects of MP use for latent periods of more than 25 years, for rare brain tumor subtypes, in children and adolescents and vulnerable population subgroups.

References

The first reference is the manuscript at hand.

[1] Elwood JM et al. Trends in brain cancers (glioma) in New Zealand from 1995 to 2020, with reference to mobile phone use. Cancer Epidemiology (2022); DOI: 10.1016/j.canep.2022.102234.

[2] ITU (Int. Telecommun. Union). 2017. Key ICT indicators for developed and developing countries and the world (totals and penetration rates). ITU Key ICT Indicators. https://idp.nz/Global-Rankings/ITUKey ICT-Indicators/6mef-ytg6.

[3] IARC Work. Group Eval. Carcinog. Risks Hum. 2013. Non-Ionizing Radiation, Part 2: Radio-frequency Electromagnetic Fields. Lyon: IARC.

[4] Röösli M et al. Brain and Salivary Gland Tumors and Mobile Phone Use: Evaluating the Evidence from Various Epidemiological Study Designs. Annu Rev Public Health. 2019 Apr 1;40:221-238. doi: 10.1146/annurev-publhealth-040218-044037.

[5] Miranda-Filho A et al Cancers of the brain and CNS: global patterns and trends in incidence. Neuro Oncol. 2017 Feb 1;19(2):270-280. doi: 10.1093/neuonc/now166.

[6] Ohgaki H. Epidemiology of brain tumors. Methods Mol Biol Clifton NJ. 2009;472:323–342. doi:10.1007/978-1-60327-492-0_14.

[7] Ostrom QT et al 2015. Epidemiology of gliomas. Cancer Treat Res. 163:1–14.

[8] Vandenbroucke JP et al. STROBE initiative. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. Ann Intern Med. 2007 Oct 16;147(8):W163-94. doi: 10.7326/0003-4819-147-8-200710160-00010-w1.

[9] Deltour I, Poulsen AH, Johansen C, Feychting M, Johannesen TB, Auvinen A, Schüz J. Time trends in mobile phone use and glioma incidence among males in the Nordic Countries, 1979-2016. Environ Int. 2022 Aug 24;168:107487. doi: 10.1016/j.envint.2022.107487.

Impressum

Bundesamt für Strahlenschutz
Postfach 10 01 49
38201 Salzgitter

Tel.: +49 30 18333-0
Fax: +49 30 18333-1885
E-Mail: spotlight@bfs.de
De-Mail: epost@bfs.de-mail.de

www.bfs.de

Please always use the following URN when citing this document:
urn:nbn:de:0221-2023111740440

Spotlight - Oct/2023 no.1 (Eng)