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Meta-analysis of association between mobile phone use and glioma risk

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Abstract

Objective: The purpose of this study was to evaluate the association between mobile phone use and glioma risk through pooling the published data. **Methods:** By searching Medline, EMBSE, and CNKI databases, we screened the open published case–control or cohort studies about mobile phone use and glioma risk by systematic searching strategy. The pooled odds of mobile use in glioma patients versus healthy controls were calculated by meta-analysis method. The statistical analysis was done by Stata12.0 software (http://www.stata.com). **Results:** After searching the Medline, EMBSE, and CNKI databases, we ultimately included 11 studies range from 2001 to 2008. For ≥1 year group, the data were pooled by random effects model. The combined data showed that there was no association between mobile phone use and glioma odds ratio (OR) =1.08 (95% confidence interval [CI]: 0.91–1.25,$P > 0.05$). However, a significant association was found between mobile phone use more than 5 years and glioma risk OR = 1.35 (95% CI: 1.09–1.62, $P < 0.05$). The publication bias of this study was evaluated by funnel plot and line regression test. The funnel plot and line regression test ($t = 0.25$,$P = 0.81$) did not indicate any publication bias. **Conclusion:** Long-term mobile phone use may increase the risk of developing glioma according to this meta-analysis.

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Full Text

Introduction

The association between microwave radiation exposure from cell phone use and the risk of developing glioma has been much investigated, yet remains controversial.[1],[2] Several well-designed studies have demonstrated little evidence for the correlation between mobile phone use and glioma risk.[3] However, other studies did not found the association between mobile phone use and glioma risk.[4],[5],[6] Hence, according to the present open published studies, the results were a conflict to each other. To further evaluate the mobile phone usage and glioma risk, we searched the databases and included all the open published case–control or cohort studies related to mobile phone usage and glioma risk and pooled the results by meta-analysis method.

Methods

By searching Medline, EMBSE, and CNKI databases, we screened the open published case–control or cohort studies about mobile phone use and glioma risk by systematic searching strategy. The electronic searching terms included: mobile phone, cellular phone, mobile phone, cell phone, glioma, and brain tumor. The publications were screened by two reviewers independently and cross checked. The inclusion criteria included (1) Case–control or cohort study; (2) Papers published in English or Chinese; (3) Cell phone use frequency was provided in case and control group; and (4) Glioma diagnosis was confirmed by magnetic resonance imaging or pathology. Exclusion criteria: (1) Repeated published data or study; (2) Review, case report or comments study type; (3) Publication with other language; (4) Other brain tumors; and (5) Without enough data to calculate the odds ratio (OR). The data and information of each included study were extracted by two reviewers independently with cross checked. The controversy was solved by discussion or consulted to the third reviewer. The year of paper publication, authors, cell phone use frequency of case and control group were extracted from each study. The data were pooled according to statistical heterogeneity across the studies.

Statistics

The association between mobile phone use and glioma risk was demonstrated by OR and its 95% confidence interval (95% CI). The statistical heterogeneity among the studies was evaluated by Chi-square test. The publication was assessed by funnel plot and line regression test. Stata12.0 statistical software was used for all the statistical analysis (http://www.stata.com). Two-tail $P < 0.05$ was deemed as statistical significance.

Results

Main characteristics of included publications

After searching the Medline, EMBSE, and CNKI databases, we ultimately included 11 studies [3],[4],[5],[6],[7],[8],[9],[10],[11],[12],[13] range from 2001 to 2008. The detailed information was demonstrated in [Table 1].{Table 1}

Heterogeneity evaluation

The statistical heterogeneity was evaluated by Chi-square test and expressed by I2-test. There were significant statistical heterogeneity across the included 11 studies for both ≥1 year group ($I2 = 85.7\%$, $P = 0.00$) and ≥5 year group ($I2 = 91.9\%$, $P = 0.00$).

Meta-analysis

For ≥1 year group, the data were pooled by random effect mode. The combined data showed that there was no association between mobile phone use and glioma OR = 1.08 (95% CI: 0.91–1.25, $P > 0.05$). However, a significant association was found between mobile phone use more than 5 years and glioma risk OR = 1.35 (95% CI: 1.09–1.62, $P < 0.05$) [Figure 1].{Figure 1}

Publication bias

The publication bias of this study was evaluated by funnel plot [Figure 2] and line regression test. The funnel plot and line

regression test (t = 0.25, P = 0.81) did not indicated any publication bias.{Figure 2}

Discussion

Glioma is one of the most diagnosed malignant carcinomas of central nervous system in adults with extremely poor prognosis.[6] The distinct histopathology and cellular origin of gliomas are probably associated with different etiological pathways and mechanisms of carcinogenesis than other types of brain carcinomas.[6] Moreover, the etiology of gliomas, however, remains unclear. Whether mobile phone long-term use increases the risk of developing glioma was not clear for inconsistent results. Most published epidemiological studies on mobile phone use and gliomas risk have not generally reported any increased risk either overall or with long-term use. However, several well epidemiology studies found that long-term mobile phone use can little increase the risk of glioma. Hardell et al.[3] pooled analysis of two case–control studies on the use of cellular and cordless telephones and the risk for malignant brain tumors diagnosed in 1997–2003. In their study, they found cumulative lifetime use for >2000 h yielded for analog cellular phones OR = 5.9, 95% CI = 2.5–14. They believe increased risk of developing glioma was obtained for cellular phone usage, highest in the group with >10 years latency period.

In this study, we pooled the results of 11 studies range from 2001 to 2008. For ≥1 year group, the data were pooled by random effect mode. The combined data showed that there was no association between mobile phone use and glioma OR = 1.08 (95% CI: 0.91–1.25, P > 0.05). This results in accordance with the most published study. However, a significant association was found between mobile phone use more than 5 years and glioma risk OR = 1.35 (95% CI: 1.09–1.62, P < 0.05). Long-term mobile phone use may increase the risk of developing glioma according to this meta-analysis. However, the correlation was weak with significant statistical heterogeneity. The linkage between mobile phone usage and glioma risk should be further investigated and discussed.

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Conflicts of interest

There are no conflicts of interest.

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