

ORIGINAL PAPER

The Amount of Electromagnetic Fields around Students

Aysel Özdemir, MSc

Lecturer in Medical Nursing, Uludag University School of Health Department of Nursing, Bursa, Turkey

Neriman Akansel, RN, PhD

Assistant Professor in Medical Nursing, Uludag University School of Health Department of Nursing, Bursa, Turkey

Hicran Yildiz, RN, PhD

Associate Professor in Medical Nursing, Uludag University School of Health Department of Nursing, Bursa, Turkey

Ergün Haldun Sümer,

Professor Doctor in the Public Health. Cumhuriyet University Medicine Faculty, Department of Public Health, Sivas, Turkey

Correspondence: Hicran YILDIZ, RN, PhD, Associate Professor in Medical Nursing, Uludag University School of Health Department of Nursing, Bursa, Turkey. E-mail: hicran_yildiz@yahoo.com

Abstract

Background: The aim of the study was to determine the amount of the source of generating an electromagnetic field around the students.

Methods: The study consisted of 224 students. The data were gathered by a form prepared by the researchers.

Results: Of the students' living environment, 16.7% was only transformers; 14.1% was only cellular line base stations, 12.8% were only high-voltage electric transmitter lines and transformers; 11.5% were high voltage transmitter lines, transformers and cellular phones base station. The students %19.6 lived around high-voltage electric lines, transformers, cellular phone base stations, radio-TV and wireless transmitters, four too.

Conclusion: There are a great number of the source of generating an electromagnetic field around the students.

Key Words: electromagnetic field, health, student

Introduction

Radioactive waves that form electromagnetic fields are harmful to human health and particularly increase the risk of cancer. (Miyakoshi 2006; Hardell 2008; Türkkán 2009; Özgüner 2006; Phillips 2009; Habash 2009).

However; in daily life human are exposed to many electromagnetic fields caused by electric lines, transformers, cellular phones base stations, radio-television and wireless devices, microwave ovens, televisions, cellular phones (Hardell 2008; Repacholi 1998; Viel 2009; Calvente 2010).

Their studies till now has demonstrated that the exposure to the electromagnetic field cause, local heating of tissues; changes in ion channels, changes in structure and susceptibility of neurons

and other cells causing vertigo, disability in concentration ear ache, pallor and pain in post-auricular region, numbness in face and burning sensation, fatigue, tiredness, nauseas palpitation, digestive problems, infections, immune system diseases, allergic diseases, brain tumor, leukemia, neurodegenerative diseases like Alzheimer disease, breast cancer, cardiovascular system disorders (Miyakoshi 2006; Hardell 2008;

Habash 2009; Repacholi 1998; Ahlbom 2000; Greenland 2000; Baliatsas 2011; Deveci 2007; Rösli 2004; Rösli 2008; Frei 2011; WHO 2005; Nkomidio 2010; Johansson 2009; Seyhan 2010). The density of electromagnetic field, duration of exposure, and distance to the source of the electromagnetic field are important in

elucidation of these effects (Türkkan 2009; Calvente 2010).

These effects are increasing in case of getting near to the source of high voltage transmission lines, transformers, cellular line base stations, radio-television and wireless transmitters, cell phones and microwave ovens (Türkkan 2009). Particularly lymphoproliferative and myeloproliferative diseases risk increase in people living in places near high-voltage electric transmitter lines (Loventhal 2007).

The study is performed to determine the amount of the source of generating an electromagnetic field around the students.

Methodology

The target population consisted of students of the Uludag University School of Health in 2011 autumn, and the study population consisted of 224 students who accepted to take part in the survey.

The data about sociodemographic status, electromagnetic fields in their environment, devices that make up the electromagnetic field and the duration of exposure were gathered by a questionnaire is prepared according to the literature by researchers.

The data were analyzed by computer software and means and percentages were used in data evaluation.

Results

The mean age of the whole study group was 21.15 ± 1.96 years. Sixty percent of the cases were 1st and 2nd year students and of the whole group females consisted 86.2%. The students were living in the same area for 7.88 ± 7.63 years. Among the students 34.82% stated that their house were in a region that had electromagnetic field. 19.2% of the students said that in the area they lived high voltage electrical lines, transformers, cellular phone base stations, radio-television and wireless transmitters. 16.7% had only transmitters, 14.1% had only cellular phone base stations, 12.8% had high voltage electrical lines and transformers; and 11.5% had high voltage transmitter lines, transformers and cellular lines base stations.

The mean distance of the house of the students to the high-voltage electric transmission lines was 558 meters; to the transformers was 258 meters;

cellular phones base stations 339 meters and to radio-television-wireless stations was 629 meters.

The students were asked also for the places that they lived previously and 24.4% had high voltage electrical lines, transformers, cellular phone base stations, radio-television and wireless transmitters; 20% had only transformers; 15.6% had only cellular phones base stations; 11.1% had transformers and cellular phones base stations.

The places that were previously lived in were meanly 643 meters away from the high-voltage electric transmission lines; 1283 meters away from the transformers; 790 meters away for the cellular phone base stations and 704 meters from the radio-television and wireless stations.

Among the students 51.9% used television and computers at home; 19.3% used television, computer and microwave oven; 13.9% used only television; 10.2% used only computer; 4.3% used television and microwave oven; 0.5 used only computer and microwave oven.

The students had been using television for $17 (17.06 \pm 7.38)$ years; computers for $5.5 (5.67 \pm 3.65)$ years and microwave ovens for $8 (8.40 \pm 6.55)$ years. All the students were using cellular phones. The mean duration of cellular phone usage was 6 years (6.12 ± 2.41).

Discussion

Röösli et al. (2004) in their study reported that the cases were exposed to electromagnetic fields from high voltage electricity in 31.97%, from cellular phone base stations in 80.45%, from cellular phones in 21.82%, from transformers in 18.74%, from televisions in 81.97%, from computers in 48.98%. Baliatsas et al. (2001) In a study reported that 34.2% of the cases had base station and 14.9% had high-voltage electric transmission lines nearby.

In this study; we noticed that we are under effect of many electromagnetic fields in daily life. But also we have many ways to get rid of or minimize these effects. We can minimize the number of base stations, or if possible move them to distant parts from human life, make educational activities to increase the awareness of public. We can plan the electricity network to minimize the health burden and a complete city planning taking account into these factors.

Table 1. Distribution of the electromagnetic field surrounding the residential house		
Electromagnetic field surrounding the residential house	n	%
High-voltage electric transmitter lines	3	3.8
Transformers	13	16.7
Mobile phone base stations	11	14.1
Radio-television and wireless transmitters	1	1.3
High-voltage lines + Transformers	10	12.8
High-voltage lines + Radio-television and radio transmitters	2	2.6
Transformers + mobile phone base stations	3	3.8
Transformers + Radio-television and radio transmitters	2	2.6
Mobile phone base stations + Radio-television and radio transmitters	3	3.8
High voltage lines + Transformers + mobile phone base stations,	9	11.5
High voltage lines + Mobile phone base stations, + Radio-television and radio transmitters	1	1.3
Transformers + mobile phone base stations + Radio-television and radio transmitters	5	6.4
Mobile phone base stations, high voltage lines + Transformers + + Radio-television and wireless transmitters	15	19.2
Total	78	100.0

In a study conducted by Loventhal et al. (2007) reported that leukemia and lymphoma risk increases in people born and grown up until age of 15 years old in places closer than 300 meters to high-voltage electric transmission lines. Feizi and Arabi (2007) reported that risk of leukemia in children increased in case of living in places closer than 500 meters to high-voltage electric transmission lines and Sohrabi et al. (2010) in their study reported a range of 600 meters or closer for the same risk. Ha et al. (2007) in another study in the age group of 0-14 years for all types of leukemias the risk increased in people living in a place closer than 2 km to a radio transmitter. Michelozzi et al. (2002) in their study reported that in children living in places closer than 6 kilometers to a radio transmitter; and Hocking and Gordon (1996) in another study in children living in places closer than 4 kilometers

to a television transmitter leukemia risk increased and the distance was negatively correlated to the risk rate.

In this study we demonstrated that in daily life students are in increased exposure rate to electromagnetic fields including transformers, base stations, and high voltage lines.

The students had been using television for 17 (17.06±7.38) years; computers for 5.5 (5.67±3.65) years and microwave ovens for 8 (8.40±6.55) years. Deveci et al. (2007) in a study conducted in primary school students reported that 59.3% used computers and 99.9% watched television. This shows that the rate of exposure in younger age group is also higher.

All the students were using cellular phones. The mean duration of cellular phone usage was 6

years (6.12±2.41). Deveci et al. reported that 25.9% of primary school children used cellular phones; 11% owned the phones they used and 22.9% of them always got their phones with them and the daily duration of talking was 34.68±38.41 (Deveci 2007).

In conclusion the results of this study demonstrated high rate of the source of generating an electromagnetic field around the students and the increased rate of technological devices.

References

- Ahlbom A, Day N, Feychting M, et al. (2000). A pooled analysis of magnetic fields and childhood leukaemia. *Br J Cancer*, 83: 692-698.
- Baliatsas C, Van Kamp I, Kelfkens G, Schipper M, Bolte J, Yzermans J, Lebreit E. (2011). Non-specific physical symptoms in relation to actual and perceived proximity to mobile phone base stations and powerlines. *BMC Public Health*, 11:421: 1471-2458.
- Calvente I, Fernandez MF, Villalba J, Olea N, Nuñez MI. (2010). Exposure to electromagnetic fields (non-ionizing radiation) and its relationship with childhood leukemia: A systematic review. *Science of the Total Environment*, 408: 3062-3069.
- Deveci SE, Açıık Y, Gülbayrak C, Demir AF, Karadağ M, Koçdemir E. (2007). Elementary students use frequency devices that emit electromagnetic fields, such as cell phones, computers, televisions. *Firat Tıp Dergisi*, 12(4): 279-283. (in Turkish)
- Feizi AA, Arabi MA. (2007). Acute childhood leukemias and exposure to magnetic fields generated by high voltage overhead power lines: a risk factor in Iran. *Asian Pac J Cancer Prev.*, 8(1):69-72.
- Frei P, Mohler E, Braun-Fahrlander C, Fröhlich J, Neubauer N, Martin Röösli M, Qualifex-team. (2011). Cohort study on the effects of everyday life radio frequency electromagnetic field exposure on non-specific symptoms and tinnitus. *Environment International*, 38: 29-36
- Greenland S, Sheppard AR, Kaune WT, Poole C, Kelsh MA. (2000). A pooled analysis of magnetic fields, wire codes, and childhood leukaemia- EMF Study Group. *Epidemiology*, 11: 624-634.
- Ha M, Im H, Lee M, Kim HJ, Kim BC, Gimm YM et al. (2007). Radio-frequency radiation exposure from AM radio transmitters and childhood leukemia and brain cancer. *Am J Epidemiol*, 166:270-279.
- Habash RWY, Elwood JM, Krewski D, Lotz WG, McNamee JP, Prato FS. (2009). Recent advances in research on radiofrequency fields and health: 2004-2007. *Journal of Toxicology and Environmental Health, Part B*, 12: 250-288.
- Hardell H, Sage C. (2008). Biological effects from electromagnetic field exposure and public exposure standards. *Biomedicine & Pharmacotherapy*, 62: 104-109
- Hocking B, Gordon IR, Grain HL, Hatfield GE. (1996). Cancer incidence and mortality and proximity to TV towers. *Medical Journal of Australia*, 165:601-5
- Johansson O. (2009). Disturbance of the immune system by electromagnetic fields-A potentially underlying cause for cellular damage and tissue repair reduction which could lead to disease and impairment. *Pathophysiology*, 16: 157-177.
- Loventhal RM, Tuck DM, Bray IC. (2007). Residential exposure to electric power transmission lines and risk of lymphoproliferative and myeloproliferative disorders: a case-control study. *Intern Med J*, 37:614-9.
- Michelozzi P, Capon A, Kirchmayer U, Forastiere F, Biggeri A, Barca A, et al. (2002). Adult and childhood leukemia near a high-power radio station in Rome, Italy. *Am J Epidemiol*, 155:1096-103.
- Miyakoshi J. (2006). Biological responses to extremely low-frequency electromagnetic fields. *Journal of Dermatological Science Supplement*, 2: 23-30
- Nkomidio AM, Wofo P. (2010). Effects of imperfection of ionic channels and exposure to electromagnetic fields on the generation and propagation of front waves in nervous fibre. *Commun Nonlinear Sci Numer Simulat*, 15: 2350-2360
- Özgüner F, Mollaoğlu H.(2006). The biological effects of magnetic fields on the organism. *S.D.Ü. Tıp Fakültesi Dergisi*, 13(1): 38-41. (in Turkish)
- Phillips JL, Singh NP, Lai H. (2009). Electromagnetic fields and DNA damage. *Pathophysiology*, 16: 79-88
- Repacholi MH. (1998). Low-level exposure to radiofrequency electromagnetic fields: health effects and research needs. *Bioelectromagnetics*, 19: 1-19.
- Röösli M, Moser M, Baldinini Y, Meier M, Braun-Fahrlander C. (2004). Symptoms of ill health ascribed to electromagnetic field exposure- a questionnaire survey. *Int. J. Hyg. Environ. Health*, 207:141-150
- Röösli M. (2008). Radiofrequency electromagnetic field exposure and non-specific symptoms of ill health: A systematic reviews. *Environmental Research*, 107: 277-287

- Seyhan N. (2010). Electromagnetic Pollution and Our Health. *Nöropsikiyatri Arşivi*, 47: 158-61(in Turkish)
- Sohrabi MR, Tarjoman T, Abadi A, Yavari P. (2010). Living near overhead high voltage transmission power lines as a risk factor for childhood acute lymphoblastic leukemia: a case-control study. *Asian Pac J Cancer Prev.*,11(2):423-7.
- Türkkan A. (2009). Electromagnetic fields and childhood leukemia. *Güncel Pediatri*, 7: 137-41. (in Turkish)
- Viel J F, Clerc S, Barrera C, Rymzhanova R, Moissonnier M, Hours M, Cardis E. (2009). Residential exposure to radiofrequency fields from mobile phone base stations, and broadcast transmitters: a population-based survey with personal meter. *Occup Environ Med*, 66:550-556.
- WHO: Fact Sheet No. 296: Electromagnetic fields and public health World Health Organization; 2005 [http://www.emfandhealth.com/WHO_EMSSensitivity.pdf].