INCREASED INCIDENCE OF CANCER NEAR A CELL-PHONE TRANSMITTER STATION.

RONNI WOLF MD[1]

DANNY WOLF MD[2]

From:

The Dermatology Unit, Kaplan Medical Center, Rechovot, and
the Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, ISRAEL.

The Pediatric Outpatient Clinic, Hasharon Region, Kupat Holim, ISRAEL.

Running title: Cancer near a cell-phone transmitter station.

Address for correspondence: Ronni Wolf, MD, Dermatology Unit, Kaplan Medical Center, Rechovot 76100, ISRAEL.
Fax 972-9-9560978. E-mail: wolf_r@netvision.net.il

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Increased Incidence of Cancer near a Cell-Phone Transmitter Station

by Ronni Wolf and Danny Wolf

Abstract

Significant concern has been raised about possible health effects from exposure to radiofrequency (RF) electromagnetic fields, especially after the rapid introduction of mobile telecommunications systems. Parents are especially concerned with the possibility that children might develop cancer after exposure to the RF emissions from mobile telephone base stations erected in or near schools. The few epidemiologic studies that did report on cancer incidence in relation to RF radiation have generally presented negative or inconsistent results, and thus emphasize the need for more studies that should investigate cohorts with high RF exposure for changes in cancer incidence. The aim of this study is to investigate whether there is an increased cancer incidence in populations, living in a small area, and exposed to RF radiation from a cell-phone transmitter station.

This is an epidemiologic assessment, to determine whether the incidence of cancer cases among individuals exposed to a cell-phone transmitter station is different from that expected in Israel, in Netanya, or as compared to people who lived in a nearby area. Participants are people (n=622) living in the area near a cell-phone transmitter station for 3-7 years who were patients of one health clinic (of DW). The exposure began 1 year before the start of the study when the station first came into service. A second cohort of individuals (n=1222) who get their medical services in a clinic located nearby with very closely matched, environment, workplace and occupational characteristics was used for comparison.

In the area of exposure (area A) eight cases of different kinds of cancer were diagnosed in a period of only one year. This rate of cancers was compared both with the rate of 31 cases per 10,000 per year in the general population and the 2/1222 rate recorded in the nearby clinic (area B). Relative cancer rates for females were 10.5 for area A, 0.6 for area B and 1 for the whole town of Netanya. Cancer incidence of women in area A was thus significantly higher ($p<0.0001$) compared with that of area B and the whole city. A comparison of the relative risk revealed that there were 4.15 times more cases in area A than in the entire population.

The study indicates an association between increased incidence of cancer and living in proximity to a cell-phone transmitter station.

Key Words:

Radiofrequency radiation; Cell-phone transmitter station (cell-phone antenna); Cancer incidence study; Netanya.

Introduction

Much concern has been expressed about possible health effects from exposure to radiofrequency (RF) electromagnetic fields, particularly following publication of scientific reports suggesting that residence near high voltage power lines may be associated with an increased risk of developing childhood leukemia. While interest tended to focus on microwave ovens and radar equipment in the past, it is now mobile telecommunication that attracts the most attention. The rapid introduction of mobile telecommunications systems, the exponential increase in the use of such phones, and the many base stations needed for serving them have engendered renewed concerns about exposure to RF radiation.

The biological effects of low level electromagnetic fields and a possible potential relation to cancer causation are controversial. There have been several epidemiological studies of the possible adverse health effects associated with environmental exposure to extremely low frequency (0-300 Hz) non-ionizing radiation, such as that emitted by power cables and electric substations, linking such exposure to leukemia, brain cancer, male breast cancer and skin and eye melanoma (1-11).

Far less attention has been paid to health hazards from environmental exposure to radiation in the RF range (100 kHz to 300 GHz), including the radiation emitted from cell-phone equipment, in the frequencies of 850 MHz, at field strengths much below those required to produce thermal effects. The few epidemiologic studies that did report on cancer incidence in relation to RF radiation (mainly from occupational exposure including microwave and radar and from living in proximity to TV towers) have generally presented negative or inconsistent results, or were subject to possible confounding from other exposures (12-20).

Laboratory studies in this area have also been confusing and conflicting. While some animal studies suggested that RF fields accelerate the development of cancers, other studies found no carcinogenic effect (21).

Obviously, there is an urgent need for extensive, well-conducted epidemiological and laboratory studies (21-24).

An opportunity for studying the effect of RF radiation presented itself in South Netanya, where a cell-phone transmitter station was located in the middle of a small area. We took advantage of the fact, that most of the population in the investigated area belong to one outpatient clinic (of DW), and undertook an epidemiologic assessment, in which we compared the cancer incidence of this area to those of a nearby clinic, to the national incidence rates of the whole country and to the incidence rates in the whole town of Netanya.

Material and methods

Radio-frequency radiation

The cell-phone transmitter unit is located at the south of the city of Netanya in an area called Irus (area A). It first came into service in 7/96. The people in this area live in half a circle with a 350 meter radius centered on the transmitter.

The antenna is 10 meters high. The antenna bears total maximum transmission power at frequencies of 850 MHz of 1500 watt when working at full power.

Both measured and predicted power density (for the frequencies of 850 MHz) in the whole exposed area were far below 0.53 $\mu w/cm^2$ thus the power density is far below the current guidelines which are based on *the thermal effects of RF exposure.* Exact measured power density in each house are described in table 1.

The current Israeli standard uses 50 packets/sec with Time-Division-Multiple-Access (TDMA) quadrature modulation. The antenna produces 50 packets/sec, using a 3:1 multiplexed Time-Division-Multiple-Access (TDMA) modulation with a 33% duty cycle.

Statistical analysis:

We conducted a cancer incidence study to investigate the incidence of cancer cases of individuals exposed to a cell-phone transmitter station, in comparison to those of a nearby clinic, to the national incidence rates of the whole country and to the incidence rates in the whole town of Netanya.

The cohort included 622 people living in the Irus area (area A) for at least 3-7 years and were patients of one health clinic (of DW). The exposure began in 7/96 which was 1 year before the start of our study.

Statistical analysis was based on the comparison of observed and expected numbers of cancer cases.

In order to compare incidence rates, 95% confidence intervals were computed.

The observed number of cancer cases is the number of all the cancer cases in the exposed cohort in the period between 7/97 - 6/98.

In order to estimate relative risk, rate ratios were computed using the rate of 3 different cohorts as the base (the expected values):

The rate in a nearby clinic (which serves a population of 1222 people, all of them living in area B) during the same period of time, i.e. 7/97 - 6/98. In order to compare area A and area B populations we used:

χ^2 test to compare origin and sex division

t- test to compare age means

The national incidence rates of the whole country.

The incidence rates in the whole town of Netanya where the 2 clinics (of area A and B) are located. The data of 2 and 3 were given to us by the Israel cancer registry and are updated to the years 91-94.

We also examined the history of the exposed cohort (of the A area) for malignancies in the 5 years before the exposure began and found only 2 cases in comparison to 8 cases detected one year after the transmitter station came into service.

Results

Of the 622 people of area A, eight cases of different kinds of cancer were diagnosed in a period of only one year (from July 1997 to June 1998). Details on these cases are presented in Table 1. Briefly, we found 3 cases of breast carcinoma, and one case of ovary carcinoma, lung carcinoma, Hodgkin’s disease, osteoid osteoma, and hypernephroma.

This rate of cancers in the population of area A was compared both with the rate of 31 cases per 10,000 per year in the general population and the 2/1222 rate recorded in a nearby clinic. To each one of the rates, a 95 percent confidence interval was calculated (Table 2): the rates in area A were significantly higher than both those in area B, and the population as a whole.

A comparison of the relative risk revealed that there were 4.15 times more cases in area A than in the entire population.

The population characteristics of areas A and B were very similar (Table 2-5). The χ^2 test for comparing gender and origin frequencies showed no significant differences in these parameters between the two areas. Age means, as compared by t-test and age distribution stratum also showed no significant difference between the two groups.

Table 2a lists the rates of cancer incidence of areas A and B compared to data of the whole town of Netanya. The comparison clearly indicated that the cancer incidence of women in area A is significantly higher ($p<0.0001$) compared with that of the whole city.

Discussion

Our study indicates an association between an increased incidence of cancer and living in proximity to a cell-phone transmitter station.

Studies of this type are prone to biases. Possible methodological artefacts to explain our alarming results were considered:

Differences in socioeconomic class and employment status, and demographic heterogeneity due to differences in age, sex and ethnicity were excluded. The two areas that were compared have very closely matched environment, workplace and occupational characteristics.

Confounding variables affecting individuals could not be absolutely adjusted for, however, there was no ionizing radiation that could affect the whole community except the previously mentioned mobile antenna station. There is no traffic density in this area, neither is there any industry or any other air pollution. The population of area A (on which adequate data could be gathered) did not suffer from uncommon genetic conditions, nor did they receive carcinogenic medications.

Differences in diagnosis and registration of cancer cases. Although we cannot altogether exclude the possibility that higher awareness of the physician responsible for area A led to an artificial increase in cancer cases in this area, this possibility seems to us very unlikely, since both are qualified family physicians.

Several findings are of particular interest:

The measured level of RF radiation (power density) in the area was low; far below the current guidelines based on the thermal effects of RF exposure. We suggest, therefore, that the current guidelines be re-evaluated.

The enormous short latency period; less than 2 years, indicates that if there is a real causal association between RF radiation emitted from the cell-phone base station and the cancer cases (which we strongly believe there is), then the RF radiation should have a very strong promoting effect on cancer at very low radiation!

Although the possibility remains that this clustering of cancer cases in one year was a chance event, the unusual sex pattern of these cases, the 6 different cancer kinds, and the fact that only one patient smoked make this possibility very improbable and remote. It should be noted that 7 out of 8 cancer cases were women, like in the work of Maskarinec (25) who found 6 out of 7 leukemia cases in proximity to radio towers to occur in girls. Such unusual appearances of cancer cases due to one accused factor on two completely different occasions is alarming.

We are aware of at least 2 areas in which a drastic increase in the incidence of cancer cases occurred near a cell-phone antenna, however, the setup was not suitable for a well design study of those cases. In one of them (which also got publication in the daily newspapers) there were 6 out of 7 cancer cases in women working in a store in close proximity to a cell-phone antenna.

In conclusion, the results of this study showed that there was a significantly greater incidence of cancers of all kinds within the vicinity of a cell-phone transmitter station.

It would be certainly too premature to draw any conclusions from our results before they are confirmed and repeated by other studies from other areas, particularly in view of the fact that a great majority of papers on this subject showed that RF fields and mobile telephone frequencies were not genotoxic, did not induce genetic effects in vitro and in vivo, and were not found to be teratogenic or to induce cancers (24). The results of this paper should, however, serve as an alarm and emphasize the need for further investigations.

Addendum

At one year following the close of the study, 8 new cases of cancer were diagnosed in area A and two cases in area B. Among the cases diagnosed in area A was one of osteoid osteoma, the second case from the beginning of the study.

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Table 1: Cancer cases in area A

NAME	AGE	SEX	ORIGIN[1]	SMOKING	CANCER TYPE	Measured power density in μw/cm^2
Hemda	52	f	ash	No	Ovary ca stage 1	0.3μw/cm^2
Edna	42	f	sph	No	Breast ca in situ	0.4μw/cm^2
Tania	54	f	ash	No	Breast ca	0.5μw/cm^2
Neli	67	f	ash	Yes	Breast ca	0.4μw/cm^2
Galit	24	f	ash	No	Hodgkins	0.5μw/cm^2
Miriam	61	f	sph	No	Lung ca	0.3μw/cm^2
Masal	37	f	sph	No	Osteoid osteoma	0.4μw/cm^2
Max	78	m	ash	No	Hypernephroma	0.3μw/cm^2

1. Origin: ash - Ashkenazien Jews   sph - Spharadic Jews

Table 2: Cancer rates in area A, B and the total population.

	No. of cancer cases	population size	Rate per year per 10,000	confidence interval lower limit	(95%) upper limit	relative risk
Area A	8	622	129	40.1	217.2	4.15
Area B	2	1222	16	-6.3	39.0	0.53
total populat	31	10,000	31	20.1	41.9	1.00

Table 2a: Cancer rates in area A, B and the whole town.

	Male		Female	
	rate	Relative rate	rate	relative rate
Area A	33	1.4	262	10.5
Area B	17	0.7	16	0.6
Whole town	24	1	25	1

Table 3: Comparing area A to area B by gender.

Gender	Area A		Area B	
	N	%	N	%
male	290	49	669	49
female	305	51	685	51

Table 4: Comparing area A to area B by origin.

Origin	Area		Area	
	N	%	N	%
Sfaradic	340	55	551	45
Ashkenaz	239	38	620	51
Russian	41	7	51	4

Table 5: Comparing age means in both areas.

	Area A		Area B	
	mean	Std	mean	std
age	26.5	17.9	25.5	12.4

Table 5: Age distribution by stratum.

	0-1	**1-10**	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**	**>70**
IRUS	16	143	157	65	70	88	41	21	21
POLEG	31	285	257	139	180	158	83	55	34