

A Survey Study on Some Symptoms and Sensations Occurred in Eyes Caused by Daily Talking Durations of Mobile Phones

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Short Abstract— A survey study was conducted to investigate the possible effects of daily talking duration of mobile phone on eye related symptoms and sensations. These are obscuration of vision, redness on the eyes, vision disorders, crust round the eyes, inflammation in the eyes and water round the eyes. There is no effect on redness on the eyes and vision disorders, but some statistical evidences are found that mobile phone may cause obscuration of vision, crust round the eyes, inflammation in the eyes and water round the eyes.

Keywords-component; eye, mobile phones, daily talking duration, Biological Effects, Microwaves

I. INTRODUCTION

In the recent few years, the extensive use of mobile phones (MP) raises the question of possible health effects of the radio-frequency electromagnetic fields emitted by these phones. Mobile phones operate on wireless technology, with communication typically occurring via a 900-1800 MHz signal that is pulsed at 217 Hz. This signal carries essentially no power when the user is not talking or receiving, but when the user communicates the power of this pulsed electromagnetic field reaches a maximum of 250 mW (Croft *et al.*, 2002).

The effects of electromagnetic fields on biological systems have been extensively investigated over the last years (Gos *et al.*, 2000; Jech *et al.*, 2002; Braune *et al.*, 2002; Cook *et al.*, 2002). Particular attention has been given to the effects of microwave exposure on the central nervous system (Herman *et al.*, 1997; Croft *et al.*, 2002; Mause *et al.*, 2001; Beason *et al.*, 2002; Hossmann *et al.*, 2003) because of their use in close vicinity to the human brain. Unfortunately there are neither experimental nor survey studies concerning eye related symptoms caused by use of mobile phone found in the literature. In the literature only two survey studies carried out by the researchers about some other symptoms and sensations are found.

In the first survey study, some biological effects of mobile phones on people living or not in vicinity of mobile phone base station were tested in 530 people (Santini *et al.*, 2002 a). In the study, non specific health symptoms such as tiredness, headache, sleep disturbance, discomfort, dizziness, irritability, depression, lose of memory, etc. were detected depending on distance from base station and sex. It was suggested that minimal distance of people from mobile phone base stations should not be < 300 m in view of radioprotection.

One another survey study was conducted in 161 students and workers in a French engineering school on symptoms experienced during use of digital cellular phones (Santini *et al.*, 2002 b). According to the results, concentration difficulties, sleep disturbance, discomfort, warmth, and pricking of the ear during phone conversation as a function of calling duration per day and number of calls per day were experienced.

The main goal of this study in which a survey study, using questionnaire, was conducted in 695 people living in a city in Turkey, where these phones are extensively used, to detect the possible optical symptoms experienced by the users of mobile phones as well as by daily talking durations in order to light the way of further studies. The investigated eye symptoms are obscuration of vision, redness on the eyes, vision disorders, crust round the eyes, inflammation in the eyes and water round the eyes.

II. MATERIAL AND METHODS

A. Questionnaire

Questionnaire used in this study was composed of two sections. In the first section, general questions were asked to individuals to learn about their general health, use of mobile phone and physical environment to prevent miss leading positives. In the second section questions were asked to directly detect the effects of long term use of mobile phone on each individual's health.

In the survey, questions were asked to investigate the following symptoms and sensations; obscuration of vision,

redness on the eyes, vision disorders, crust round the eyes, inflammation in the eyes and water round the eyes.

If an individual gave positive answer to the questions about any above symptoms and sensations, some extra questions were also asked to detect the beginning of the symptoms and sensations. Otherwise the statistical results yielded would be meaningless, unless person has not the symptoms and sensations after he has started to use mobile phone.

B. Study Population

The study group was consist of 193 female and 503 male randomly selected from different ages, educations, earnings, locations and occupations in Elazig which is located in the east part of Turkey. Total number of attendant was 695. For simplicity, from now the person who has got a mobile phone and the person who has not got any mobile phone will be named as “mobile phone user” and “non-mobile phone user” respectively.

Among female, 157 women were mobile phone users whereas 36 were non-mobile phone users. 502 male attendants were consisting of 392 mobile phone users and 110 non-mobile phone users. These are summarized in Table 1.

Usage	Female	Male	Total
Mobile Phone Users	157 (81.3%)	392 (78.1%)	549 (79.0%)
Non-Mobile Phone Users	36 (18.7%)	110 (21.9%)	146 (21.0%)

Table 1: Number of people attended to the survey

As clearly seen in Table 1, although individuals were selected randomly around 80% of people were mobile phone users. This shows that mobile phone usage is very much common in the selected region and the results yielded from the survey could be valuable.

Since the aim of this survey is to investigate the possible eye symptoms and sensations experienced by daily talking durations, attendants were grouped according to daily total time of talking. Daily talking durations were divided into three sub-groups. These are 1 to 10 minutes, 10 to 20 minutes, 20 to 60 minutes respectively. Table 2 shows these intervals.

Daily Talking Duration	Female	Male	Total
1-10 min.	111 (71.2%)	306 (70.5%)	417 (70.7%)
10-20 min.	22 (14.1%)	97 (22.4%)	119 (20.2%)
20-60 min	23 (14.7%)	31 (7.1%)	54 (9.2%)

Table 2: Talking durations committed in a day

Table 2 showed that more than 70% of both female and male uses their mobile phone at least 10 min. every day.

C. Statistical Analysis

For this survey, an analysis of variance (ANOVA) were used and differences were considered significant at $P < 0.05$.

III. RESULTS

As mentioned in Section 2.A, some extra questions were also asked to detect the starting time of the symptoms and sensations. The answers were sorted and written in Table 3.

Symptoms and Sensations	Time	
	After Mobile Phone	Before Mobile Phone
Obscuration of vision	268 (68.3%)	122 (31.3%)
Redness on the eyes	74 (66.7%)	37 (33.3%)
Vision disorders	67 (57.8%)	49 (42.2%)
Crust round the eyes	24 (64.9%)	13 (35.1)
Inflammation in the eyes	76 (66.7%)	38 (33.3%)
Water round the eyes	67 (63.2%)	39 (36.8%)

Table 3: Starting time of the symptoms and sensations

When Table 3 were analyzed closely, majority of the mobile phone users reported that they had the symptoms and sensations after they had started using the cellular phone. With Table 3, statistical results found in this contribution should be taken into account.

Since analysis of variance (ANOVA) was used to analyze data, P -values of each symptom and sensation were given in Table 4. The first column of the table shows the considered symptoms and sensations. In the second column, P -values were calculated and written for mobile phone users and non-mobile phone users. For this column P -values of 4 out of 6 found to be meaningful. These symptoms and sensations are obscuration of vision, crust round the eyes, inflammation in the eyes and water round the eyes.

Symptoms and Sensations	Mobile Phone user & non-user	How long they use the phone
Obscuration of vision	0,000	0,000
Redness on the eyes	0,110	0,280
Vision disorders	0,149	0,445
Crust round the eyes	0,031	0,047
Inflammation in the eyes	0,034	0,203
Water round the eyes	0,031	0,164

Table 4: P -values (*: $p < 005$) for ANOVA

In the last column of Table 4, daily talking durations that individuals committed by the mobile phone were taken into account. For this case 2 out of 6 values of symptoms and

sensations which were obscuration of vision and crust round the eyes were found to be meaningful.

The main goal of this survey is to investigate the optical effects of mobile phone for total daily duration. As seen in Table 4, there are 6 eye related symptoms and sensations were investigated. Results were summarized including number of people attended to each case in Table 5 and their percentages were given in Table 6. The statistical results found here as follows;

Obscuration of Vision: According to the results given in Table 5 and 6, the use of mobile phone may cause obscuration of vision, because the percentages of having obscuration of vision were increased from 52.7% to %71.0. Moreover there was statistical evidence that the percentages were increased for long daily talking durations. Because the percentages of 1-10 min, of 10-20 min. and of 20-60 min. were 68.6%, 74.0% and 85.5% respectively.

Redness on the Eyes and Vision Disorders: As a result of Tables 3, 5 and 6, the use of mobile phone had no visible effects on any of the above symptoms and sensations.

Crust Round the Eyes : Our data showed an indication of causing crust round the eyes, this is why the percentages of having crust round the eyes were increased from 2.1% to 6.7% Moreover talking mobile phone for a long period in a day may increase the possibility of having crust round the eyes too. This was because the percentages increased from 5.8% to 9.1% when the survey attendants talk 10 min more in a day.

Inflammation in the Eyes: As a result of Table 5 and 6, the use of mobile phone may cause inflammation in the eyes. This is why the percentages of possibility of having increase inflammation in the eyes were increased from 13.0% to %20.8. But there were no statistical evidence that the percentages were increased for long talking duration. This was because total number of people, who users mobile phone, were almost equal to people who had were using mobile phone for 1-10 min. in a day. These percentages were 20.8% and 20.9% respectively.

Water Round the Eyes: According to data, the use of mobile phone may cause water round the eyes because the percentages were increased from 11.6% to %19.3. But there were no statistical evidence that for longer duration usage increases the possibility of having water round the eyes.

IV. DISCUSSION

As result of the survey, there were no evidence that the use of mobile phone may cause redness on the eyes and vision disorders. Unfortunately there are nothing available in the

literature for the above symptoms and sensations to compare with.

The use of mobile phone may cause obscuration of vision and crust round the eyes as results of our data. In addition talking with mobile phone for longer period in a day may increase possibility of having above symptoms and sensations. Again no published date was available in the literature for obscuration of vision and crust round the eyes as well.

Finally there were some evidence that the use of mobile phone may trigger inflammation in the eyes and water round the eyes. Likely no evidence that the more the mobile phone users talk the more they get the above two symptoms were available. No published journals concerning above two symptoms are available either.

REFERENCES

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Symptoms and Sensations	Non-Mobile Phone Users		Mobile Phone Users							
	Total		Durations						Total	
			1-10 min.		10-20 min.		20-60 min.			
	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Obscuration of vision	77	69	286	131	57	20	47	8	390	159
Redness on the eyes	21	125	87	330	12	65	12	43	111	438
Vision disorders	23	123	91	326	14	63	11	44	116	433
Crust round the eyes	3	143	24	393	7	70	6	49	37	512
Inflammation in the eyes	19	127	87	330	15	62	12	43	114	435
Water round the eyes	17	129	78	339	16	61	12	43	106	443

Table 5: Distribution of people attended to the survey for symptoms and sensation

Symptoms and Sensations	Non-Mobile Phone Users		Mobile Phone Users							
	Total		Durations						Total	
			1-10 min.		10-20 min.		20-60 min.			
	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Obscuration of vision	52,7	47,3	68,6	31,4	74,0	26,0	85,5	14,5	71,0	29,0
Redness on the eyes	14,4	85,6	20,9	79,1	15,6	84,4	21,8	78,2	20,2	79,8
Vision disorders	15,8	84,2	21,8	78,2	18,2	81,8	20,0	80,0	21,1	78,9
Crust round the eyes	2,1	97,9	5,8	94,2	9,1	90,9	10,9	89,1	6,7	93,3
Inflammation in the eyes	13,0	87,0	20,9	79,1	19,5	80,5	21,8	78,2	20,8	79,2
Water round the eyes	11,6	88,4	18,7	81,3	20,8	79,2	21,8	78,2	19,3	80,7

Table 6: Distribution of people attended to the survey for symptoms and sensations in percentages