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Original Article

Public Health Section

Impact of an Educational Intervention on Awareness, Knowledge, Preventive Practices, and Risk Perception Regarding Mobile Phone Radiation among Allied Health Sciences Students: A Quasi-experimental Study

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ABSTRACT

Introduction: Mobile phones are in widespread use among students and are therefore an exposure source of Radiofrequency Electromagnetic Radiation (RF-EMR) which has raised concerns about health effects and safety procedures. Although students use cell phones extensively, little or no knowledge exists about radiation exposure, Specific Absorption Rate (SAR), and preventive measures. Educational activities can be used to increase awareness, perceptions and safe mobile phone usage practices.

Aim: To assess the impact of an educational intervention on the levels of awareness, knowledge, and risk perception regarding mobile phone radiation among allied health sciences students.

Materials and Methods: The present Institutional-based quasi-experimental (pre-post) study design was adopted with a sample of 213 students from Dr. D. Y. Patil School of Allied Health Sciences, Pune, Maharashtra, India between June-July 2025. A validated, self-administered questionnaire of 64 items was used with the aim of assessing awareness, knowledge, perceptions of risk, and preventive practices regarding the hazards of mobile phone radiation. The questionnaire was given pre-intervention and post-intervention. The intervention included an awareness and educational session on mobile phone radiation, its potential health effects, myths and misconceptions, and safety practices. The data collected was analysed using the chi-square statistical test. A p-value of less than 0.05 was considered statistically significant.

Results: Improvements in various areas of radiation awareness and safety practices were statistically significant. These areas include an increase in awareness of preventive practices from 132 (62%) to 176 (82.6%), knowledge of methods to check SAR levels from 70 (32.9%) to 165 (77.5%), improvement in the practice of checking their phone's SAR levels among the students from 62 (29.1%) to 164 (77%), awareness of safe sleeping distance from 119 (55.9%) to 170 (79.8%), and awareness of radiation warning symbols from 91 (42.7%) to 144 (67.6%) (all $p<0.001$). Improvement in the perception of risks was observed, but belief in the impact of radiation on health did not change ($p=0.613$).

Conclusion: Results show improvements in knowledge, awareness of preventative measures and perception of risk concerning mobile phone radiation following educational intervention among students. While things have certainly gotten better in each area, health effects data appear stagnant for some audiences, reinforcing the need to maintain awareness and educational efforts.

Keywords: Electromagnetic fields, Health education, Preventive health behaviour, Radiofrequency radiation, Risk assessment

INTRODUCTION

The fast-emerging technology of mobile phones has significantly influenced the communication, the access to information and learning, especially on the side of the students. Mobile phones have become essential in academic activities and online learning. However, with the increasing use of mobile phones, students have been exposed to RF-EMR, and it has become essential to assess students' knowledge and safety measures regarding health hazards associated with mobile phones. Understanding students' knowledge and attitudes toward mobile phone radiation is therefore an important public health concern.

Research on the awareness of students regarding mobile phone radiation has also been conducted, in the case of students at the university level, it was determined that though the use of mobile phones was extremely high, the awareness of the radiation hazards was limited [1,2]. Additionally, awareness of the health hazards of mobile phone radiation exposure was also studied. The findings of the study on the awareness of the health hazards of exposure to mobile phone radiation among students at the University level were varied [3]. Furthermore, it was determined that educational exposure positively correlated with the awareness of the health hazards of exposure to cell phone radiation [4].

The scientific evidence regarding the biological and health effects of RF-EMR is an area that is still under scientific investigation. Mobile phone use and tumour risk is still subject of scientific debate. A systematic review reported inconclusive evidence regarding the biological effects of RF-EMR, with possible associations with brain and salivary gland tumours requiring cautious interpretation [5]. The International Agency for Research on Cancer (IARC) has classified RF-EMR as Group-2B, "possibly carcinogenic to humans," based on limited evidence of an association with certain types of brain tumours, including glioma, among long-term mobile phone users [6,7].

In research conducted on behavioural patterns among students, it has been found that there is a high prevalence of behaviour such as increased screen time, night use of mobile phones, and proximity of mobile phones to the body [8]. Studies conducted on the patterns of mobile phone use among students have also highlighted concerns about the potential health outcomes of such behaviour [8,9]. Cross-sectional study on the use of wireless phones among adolescents has also highlighted possible associations with behavioural and

psychosocial outcomes, emphasising the need for awareness [10]. Studies conducted on college and junior college students based on knowledge-based research on the use of mobile phones among students have found that there is a high level of misconception about the exposure of radiation and measures for protection, even among the high percentage of smartphone users [1,2,11]. Research conducted on medical students has found that there is an increasing level of dependence on smartphones for educational purposes, emphasising the need for awareness [12]. The increasing concerns about excessive use of mobile phones among medical students also highlight the need for awareness and responsible use [13].

However, despite the availability of scientific literature, there remains a lack of understanding of the level of awareness, misconceptions, and safety practices of students regarding mobile phone radiation in allied health science institutions. There is limited information available on the knowledge of radiation exposure and safety practices of students in academic institutions of allied health sciences. This knowledge gap needs to be bridged so as to develop more effective educational instruments to foster safe use of mobile phones.

The current research was carried out to assess the awareness of cell phone radiation, knowledge of possible adverse health effects, discovering the misconceptions and myths, and educating the students about the possible risks of cell phone radiation and to suggest viable measures to increase the awareness of the students and encourage them to use mobile phones safely.

The results of this research are expected to fill gaps in the current body of knowledge and safety behaviours associated with mobile phone radiation among students. These findings will guide the construction of more effective educational interventions to promote responsible use of mobile phones and enhance conscientious behaviour among the student population.

MATERIALS AND METHODS

The present Institutional-based quasi-experimental study was conducted among the undergraduate and postgraduate students of Dr. D. Y. Patil School of Allied Health Sciences, Dr. D. Y. Patil Vidyapeeth, Pune, Maharashtra, India. The data was collected in the period between June-July 2025. Ethical approval from the Institutional Ethics Sub-Committee (IESC) was obtained before initiation of the studies (Ref. No. DYPSAHS/296/2025; Date of approval: 26 April 2025).

Inclusion and Exclusion criteria: The inclusion criteria in this survey were students enrolled in academic programs at the time of data collection and reported to use cell phones at least once a day. Individuals who had any specialised telecommunications knowledge previously were excluded to reduce the possibility of response bias.

Sample size: The target sample size was 200, determined using WinPepi software version 11.65. Ultimately, 213 students participated.

Study Procedure

A 64-item structured, self-administered questionnaire, was developed by the investigators based on prior literature on mobile phone radiation awareness, risk perception, and preventive practices [1,2,11,14], and was distributed via Google Forms. This content was validated by a Radiation Safety Officer (RSO) for relevance and suitability of the items but no pilot testing was done. The sections comprised of demographics (age, gender, field of study, year of study), knowledge (knowledge of terms, sources, and applicability of SAR), awareness, perceived health risks, and preventive measures.

Pre-intervention responses were used to establish a baseline and a targeted educational session was given by an Assistant Professor and Physicist (RSO) in the Department of Radiodiagnosis, Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pune, Maharashtra, India. The session included scientifically sound and accurate information about cell phone radiation, health effects and safer use of cell phones. The same questionnaire was administered two weeks after the intervention to assess changes in awareness, knowledge, perception and practices. Ethical principles were maintained throughout the study, which included voluntary participation, confidentiality of the responses, and secure storage of the data with the removal of personal identifiers.

STATISTICAL ANALYSIS

All the data was entered into Microsoft Excel for analysis using Statistical Package for Social Sciences (SPSS) version 27. For data analysis, descriptive statistical methods such as count and percentage were employed for the analysis of the characteristics of the participants, as well as the results obtained from the questionnaire administration. Inferential statistical methods, such as the chi-square test, were also employed for the analysis of the association between qualitative data, with the results being considered statistically significant if the p-value <0.05. All the analysis was done under the supervision of experts for reliability and validity purposes. Although 64 items were included in the questionnaire, only those questions that were directly relevant to the objectives of the study were included and analysed in the Results section.

RESULTS

The findings of the study are presented below, based on the responses of the pre-intervention and post-intervention data collected from 213 students.

The majority of the students were in the age range of 17-20 years 101 (47.4%) and 21-24 years 100 (46.9%), whereas a few students were in the range of 25-28 years 8 (3.8%) and 29-32 years 4 (1.9%). The majority of the students were females 155 (72.8%) compared to males 58 (27.2%). The students were from different allied health sciences programs, and the majority were from B.Sc. Radiology and Imaging Technology 78 (36.6%), followed by B.Sc. Operation Theatre and Anaesthesia Technology 40 (18.8%). The majority of the students were in the first year 113 (53.1%), followed by second 63 (29.6%), third 31 (14.6%), and fourth year 6 (2.8%) as shown in [Table/Fig-1].

Variables	n (%)
Age (years)	
17-20 years	101 (47.4)
21-24 years	100 (46.9)
25-28 years	8 (3.8)
29-32 years	4 (1.9)
Total	213 (100)
Gender	
Female	155 (72.8)
Male	58 (27.2)
Total	213 (100)
Field of study	
B.Sc. Dialysis technology	18 (8.5)
B.Sc. Emergency and critical care technology	3 (1.4)
B.Sc. Medical laboratory technology	19 (8.9)
B. Sc. Operation theatre and anaesthesia technology	40 (18.8)
B.Sc. Radiology and imaging technology	78 (36.6)
B.Sc. Respiratory care technology	6 (2.8)
M.Sc. Clinical research	11 (5.2)
M.Sc. Emergency and critical care technology	2 (0.9)
M.Sc. Radiology and imaging technology	10 (4.7)
M.Sc. Clinical embryology	26 (12.2)
Total	213 (100)

Year of study	
I	113 (53.1)
II	63 (29.6)
III	31 (14.6)
IV	6 (2.8)
Total	213 (100)

[Table/Fig-1]: Demographic profile of participants (N=213).

Knowledge of cell phone radiation among students was found to be enhanced after the intervention as shown in [Table/Fig-2]. The knowledge of the term "cell phone radiation" was found to increase from 86.9 to 94.4%, (p=0.007), as was knowledge of cell phones emitting radiation, increasing from 87.3 to 92%, (p=0.260). Knowledge of SAR was found to increase from 58.2 to 86.4%, (p<0.001), as was knowledge of its significance, increasing from 44.6 to 83.1%, (p<0.001). Knowledge of how to check SAR was found to increase from 32.9 to 77.5%, as was knowledge of its practice, increasing from 29.1 to 77%, (p<0.001). Knowledge of symbols of radiation was found to increase from 42.7 to 67.6%, as was knowledge of international guidelines, increasing from 34.7 to 59.2%, (p<0.001).

Response	Pre n (%)	Post n (%)	p-value
Are you aware of the term 'cell phone radiation'?			
(a) Yes	185 (86.9)	201 (94.4)	0.007
(b) No	28 (13.1)	12 (5.6)	
Are you aware that cell phones emit radiation?			
(a) Yes	186 (87.3)	196 (92)	0.260
(b) No	27 (12.7)	17 (8)	
Are you aware of the Specific Absorption Rate (SAR)?			
(a) Yes	124 (58.2)	184 (86.4)	<0.001
(b) No	89 (41.8)	29 (13.6)	
Do you know the significance of SAR?			
(a) Yes	95 (44.6)	177 (83.1)	<0.001
(b) No	118 (55.4)	36 (16.9)	
Do you know how to check the SAR of your phone?			
(a) Yes	70 (32.9)	165 (77.5)	<0.001
(b) No	143 (67.1)	48 (22.5)	
Have you checked your phone's SAR?			
(a) Yes	62 (29.1)	164 (77)	<0.001
(b) No	151 (70.9)	49 (23)	
Are you aware of any radiation warning symbols or info on your phone/ packaging?			
(a) Yes	91 (42.7)	144 (67.6)	<0.001
(b) No	61 (28.6)	39 (18.3)	
(c) Never checked	61 (28.6)	30 (14.1)	
Have you noticed any differences in radiation guidelines across countries?			
(a) Yes	74 (34.7)	126 (59.2)	<0.001
(b) No	58 (27.2)	44 (20.7)	
(c) Never looked into it	81 (38)	43 (20.2)	

[Table/Fig-2]: Awareness of cell phone radiation among students.

Students had variable changes in scientific knowledge regarding cell phone radiation as depicted in [Table/Fig-3]. Correct knowledge that cell phones do not emit ionising radiation decreased from 56.3 to 33.3% (p<0.001). Knowledge regarding SAR improved from 81.2 to 86.4% (p<0.001). Knowledge that poor reception increases radiation slightly improved from 71.8 to 72.8% (p=0.427). Correct knowledge regarding airplane mode decreased from 47.9 to 35.7% (p=0.024). Knowledge regarding children's exposure decreased from 85.4 to 82.2% (p=0.151). A reduction in correct knowledge of the effects of Bluetooth radiation (56.3-42.3%, p=0.013) and Deoxyribonucleic

Response	Pre n (%)	Post n (%)	p-value
Cell phones emit ionising radiation similar to X-rays.			
(a)True	93 (43.7)	142 (66.7)	<0.001
(b)False	120 (56.3)	71 (33.3)	
SAR stands for Specific Absorption Rate.			
(a) True	173 (81.2)	184 (86.4)	<0.001
(b) False	5 (2.3)	11 (5.2)	
(c) Don't know	35 (16.4)	18 (8.5)	
Using a phone in areas with poor reception increases radiation emission.			
(a) True	153 (71.8)	155 (72.8)	0.427
(b) False	26 (12.2)	32 (15)	
(c) Don't know	34 (16)	26 (12.2)	
Airplane mode completely stops all radiation from a cell phone.			
(a) True	88 (41.3)	115 (54)	0.024
(b) False	102 (47.9)	76 (35.7)	
(c) Don't know	23 (10.8)	22 (10.3)	
Children absorb more radiation from cell phones than adults.			
(a) True	182 (85.4)	175 (82.2)	0.151
(b) False	14 (6.6)	25 (11.7)	
(c) Don't know	17 (8)	13 (6.1)	
Bluetooth devices emit the same level of radiation as cell phones.			
(a) True	65 (30.5)	89 (41.8)	0.013
(b) False	120 (56.3)	90 (42.3)	
(c) Don't know	28 (13.1)	34 (16)	
Cell phone radiation can damage DNA directly.			
(a) True	61 (28.6)	94 (44.1)	0.003
(b) False	124 (58.2)	94 (44.1)	
(c) Don't know	28 (13.1)	25 (11.7)	
Using a speaker phone reduces radiation exposure.			
(a) True	145 (68.1)	154 (72.3)	0.526
(b) False	39 (18.3)	37 (17.4)	
(c) Don't know	29 (13.6)	22 (10.3)	
The WHO has classified cell phone radiation as a "possible carcinogen."			
(a) True	155 (72.8)	157 (73.7)	0.631
(b) False	16 (7.5)	20 (9.4)	
(c) Don't know	42 (19.7)	36 (16.9)	

[Table/Fig-3]: Knowledge and scientific understanding of cell phone radiation.

Acid (DNA) damage (58.2-44.1%, p=0.003) occurred, whereas speakerphone use increased (68.1-72.3%, p=0.526), and WHO awareness slightly increased (72.8-73.7%, p=0.631).

A slight change was seen in the participants' perception of health risks associated with cell phone use. Overall concern increased from 84.0 to 87.4% (p=0.231). The perception that cell phone use could cause potential serious health consequences increased from 87.8 to 89.2% (p=0.241). The top three perceived health risks remained eye problems, headaches, and sleep disturbances, whereas the perceptions linking mobile phone use to infertility and memory problems decreased substantially (67.5 to 11.3% and 59.7 to 22.5%, respectively), indicating improved understanding among students. The proportion of participants who agreed that cell phone radiation has a health impact decreased from 93.9 to 92.0%, although this change was found to be non-significant (p=0.613). Long-term risk increased from 50.7 to 53.1%, short-term risk from 9.4 to 21.6%, and support for regulation from 68.5 to 77.9% (p=0.040) as shown in [Table/Fig-4].

The awareness of preventive practices increased from 62 to 82.6% (p<0.001), and the practice of preventive measures increased from 58.2 to 74.6% (p<0.001) [Table/Fig-5]. The adoption of safety behaviours such as the use of headset/speakerphone,

Response	Pre n (%)	Post n (%)	p-value
How concerned are you about health risks from cell phone use?			
(a) Very concerned	85 (39.9)	106 (49.8)	0.231
(b) Sometimes concerned	94 (44.1)	80 (37.6)	
(c) Not very concerned	23 (10.8)	19 (8.9)	
(d) Not at all concerned	11 (5.2)	8 (3.8)	
How likely do you think cell phone usage causes serious health problems?			
(a) Very likely	81 (38)	101 (47.4)	0.241
(b) Somewhat likely	106 (49.8)	89 (41.8)	
(c) Not very likely	21 (9.9)	17 (8)	
(d) Not at all likely	5 (2.3)	6 (2.8)	
Which health risks do you associate with cell phone usage? (Multiple responses allowed)			
(a) Cancer	56 (24.2)	72 (31.2)	<0.001
(b) Brain damage	75 (32.5)	88 (38.1)	
(c) Eye problems	174 (75.3)	158 (68.4)	
(d) Sleep disturbances	145 (62.8)	138 (59.7)	
(e) Headaches	158 (68.4)	140 (60.6)	
(f) Infertility	156 (67.5)	26 (11.3)	
(g) Memory problems	138 (59.7)	52 (22.5)	
(h) None of the above	26 (11.3)	16 (6.9)	
Do you believe cell phone radiation affects health?			
(a) I strongly agree	95 (44.6)	99 (46.5)	0.613
(b) I agree	105 (49.3)	97 (45.5)	
(c) I disagree	7 (3.3)	12 (5.6)	
(d) I strongly disagree	6 (2.8)	5 (2.3)	
Do you perceive differences between short-term and long-term radiation risks? (Multiple responses allowed)			
(a) Yes, long-term risks are more serious	108 (50.7)	113 (53.1)	0.0003
(b) Yes, short-term risks are more concerning	20 (9.4)	46 (21.6)	
(c) Both are equally concerning	71 (33.3)	38 (17.8)	
(d) No, I don't see any difference	9 (4.2)	11 (5.2)	
(e) I don't believe there are health risks	5 (2.3)	5 (2.3)	
Should the government regulate cell phone radiation levels?			
(a) Yes	146 (68.5)	166 (77.9)	0.040
(b) No	22 (10.3)	21 (9.9)	
(c) Undecided	45 (21.1)	26 (12.2)	

[Table/Fig-4]: Perceptions and beliefs regarding health effects of cell phone radiation.

texting instead of calling, and deactivation of phones was seen. The perception that hands-free equipment could reduce exposure increased from 53.5 to 70.9% (p<0.001). Knowledge of safe distance for sleeping increased from 55.9 to 79.8% (p<0.001). The choice of using a distance of 6 feet increased from 18.8 to 29.6%, and the choice of don't know decreased from 17.8 to 10.8%. Willingness (90.6 to 87.3%) and workshop interest (93.9 to 92.5%) were high. The participants suggested that the best way to enhance awareness was through the organisation of educational workshops/seminars and the use of information posters.

DISCUSSION

The present pre-post study conducted in the study Institute with undergraduate and postgraduate students revealed significant increase in knowledge about cell phone radiation when taught. Students were introduced to the term "cell phone radiation", SAR and how to find the SAR values, and they were taught some practical measures to reduce the risk of radiation (hands-free use, distance in bed). Preconceptions on airplane mode, DNA damage, Bluetooth and ionising radiation remained. There was little change in perceptions and perceived severity, which indicates that factual

Response	Pre n (%)	Post n (%)	p-value
Are you aware of any preventive practices related to phone radiation?			
(a) Yes	132 (62)	176 (82.6)	<0.001
(b) No	81 (38)	37 (17.4)	
Do you follow any preventive practices to reduce radiation?			
(a) Yes	124 (58.2)	159 (74.6)	<0.001
(b) No	89 (41.8)	54 (25.4)	
Which measures do you take to reduce exposure? (Multiple responses allowed)			
(a) Using a headset/speaker phone	95 (41.1)	110 (47.6)	0.749
(b) Texting instead of calling	84 (36.4)	100 (43.3)	
(c) Turning off phone when not in use	97 (42)	108 (46.8)	
(d) Using a radiation-blocking phone case	51 (22.1)	62 (26.8)	
(e) Limiting call duration	81 (35.1)	81 (35.1)	
(f) Keeping phone away from body when not in use	118 (51.1)	100 (43.3)	
(g) Using phone in areas with good reception	45 (19.5)	56 (24.2)	
(h) Using airplane mode when possible	69 (29.9)	73 (31.6)	
(i) None of the above	18 (7.8)	19 (8.2)	
Do you feel hands free devices are preventive?			
(a) Yes	114 (53.5)	151 (70.9)	<0.001
(b) No	47 (22.1)	31 (14.6)	
(c) Not sure	52 (24.4)	31 (14.6)	
Do you know the safe distance to place your phone while sleeping?			
(a) Yes	119 (55.9)	170 (79.8)	<0.001
(b) No	94 (44.1)	43 (20.2)	
What do you consider a safe sleeping distance for your phone? (Multiple responses allowed)			
(a) At least 1 foot	37 (17.4)	47 (22.1)	0.015
(b) At least 3 feet	76 (35.7)	65 (30.5)	
(c) At least 6 feet	40 (18.8)	63 (29.6)	
(d) Outside the room	22 (10.3)	15 (7)	
(e) Don't know	38 (17.8)	23 (10.8)	
If informed about health risks, how willing are you to adopt safer practices?			
(a) Very willing	121 (56.8)	110 (51.6)	0.302
(b) Somewhat willing	72 (33.8)	76 (35.7)	
(c) Not very willing	10 (4.7)	19 (8.9)	
(d) Not at all willing	10 (4.7)	8 (3.8)	
Would you attend a workshop on phone radiation safety?			
(a) Very interested	130 (61)	129 (60.6)	0.842
(b) Somewhat interested	70 (32.9)	68 (31.9)	
(c) Not interested	13 (6.1)	16 (7.5)	
What should your institution do to raise awareness? (Multiple responses allowed)			
(a) Organise educational workshops/seminars	169 (73.2)	145 (62.8)	0.716
(b) Display informational posters/banners	109 (47.2)	88 (38.1)	
(c) Send regular newsletters/alerts	59 (25.5)	56 (24.2)	
(d) Invite experts for talks	92 (39.8)	68 (29.4)	
(e) Conduct interactive exercises/discussions	77 (33.3)	56 (24.2)	
(f) Include topic in curriculum	66 (28.6)	40 (17.3)	
(g) Create a dedicated website/resource centre	45 (19.5)	37 (16)	

[Table/Fig-5]: Preventive practices and safety behaviours related to cell phone radiation.

knowledge and safety behaviours are more vulnerable to change than entrenched beliefs. The baseline awareness is comparable with the one of Chia MD et al., and Yadav JU et al., and the gains after the intervention are comparable to the previous studies [14,15]. One major finding was that there was a significant increase

in the knowledge of SAR. Students' technical knowledge was cited by Chia MD et al., such as SAR values which was a gap area that needed to be addressed; we focused on this specific gap in technical knowledge by implementing a focused intervention on SAR values and its implications [14].

Even with increased knowledge, there was still a lack of understanding of the relationship between ionising radiation and DNA damage. At the cellular level, experimental studies have indicated biological effects of RF exposure: genetic damages in mammalian cells following exposure [16] DNA damages following long-term RF exposure [17] and altered proliferation of human adipose-derived stem cells after GSM radiation [18]. These findings may have influenced students' perception that mobile phone radiation can directly damage DNA. The observed decline in correct responses following the intervention suggests that certain scientific concepts may not have been communicated with sufficient clarity, highlighting the need for clearer presentation of complex scientific evidence in future educational programs.

Concerns about carcinogenicity were common. Animal studies by Falcioni L et al., have correlated RF with brain and heart cancers in rats [19]; Melnick RL referenced the results of the National Toxicology Program's carcinogenicity studies [20]; and Carlberg M et al., have linked lower survival in long-term mobile phone users to the presence of glioma [21]. These reports raise concerns about the potential for cancer in long-term exposure.

The epidemiological evidence is inconclusive, however. In contrast, there were reports of low incidence trends for brain tumours in Australia with increasing phone use of all types (Karipidis K et al.,) and when exposure trends were taken into account (Nilsson J et al.,), and no clear differences in survival among glioma patients based on frequency of phone use (Olsson A et al.,) [22-24]. Biological effects and variable population-level epidemiology probably contribute to mixed perceptions [22-24].

Reported side effects of phone use were commonly headaches, sleep disturbances, memory problems and vision complaints, which were similar to those documented in previous literature. Meo SA et al., reported on the cognitive effects of base-station exposure [25]; Brzozek C et al., and Foerster M et al., reported on memory changes after RF exposure [26,27]; Deniz OG et al., reported changes in the hippocampus after exposure to RF [28]; and Pall ML reported on possible neuropsychiatric effects of microwave-frequency EMFs [29]. These investigations corroborate neurological and behavioural issues mentioned here.

Most students considered children to be particularly vulnerable to the potential effects of mobile phone radiation. Children were more susceptible to wireless radiation absorption in brain and eye tissues (Fernández C et al.,) [30] and child exposure to phone radiation was associated with behavioural problems [31,32].

Similar to the COVID-19 era studies, an increase in headaches, sleep problems, stress and behavioural changes were reported due to excessive phone usage, with Tyagi A et al., reporting these issues in India and Bhatnagar P et al., reporting on increasing usage and nomophobia among medical students during lockdown, and the need for awareness programs [33,34]. Srujana Aravinda VS et al., offered evidence of possible cytological changes brought on by the radiation from phones [35]. Karipidis K et al., highlighted that although technologies such as 5G are becoming increasingly widespread, there are only a few reported health effects with low-level exposures and misconceptions need to be corrected through scientific education [36].

Greater hands-free use, awareness of safe sleeping distance and SAR are improved preventive behaviours that reflect the results of Chia MD et al., [14]. Risk awareness leads to precautionary behaviours. Greater support for the government regulation is associated with precautionary attitudes related to the concern of carcinogenicity.

In general, the findings suggest that there is considerable potential for structured educational intervention to significantly enhance technical knowledge and practical safety behaviours and that deeper perceptions are less amenable to intervention. Risk perception is not only based on factual information, but also on habit, the influence of the media, and social beliefs. Incorporating radiation awareness into health science education may improve evidence-based practice, dispel myths and promote safer cell phone use by future health workers.

Limitation(s)

Limitations of the present study include sampling from a single Institution, which may limit the generalisability of the findings to other population and settings. Paired pre-post analyses were not possible because participant data was not identifiable. Multicentric and heterogeneous samples of participants with distinct identifiers should be used for paired analysis, and longer follow-up used to evaluate knowledge and behaviour changes in future studies.

CONCLUSION(S)

The present study found that cognizance, domain of knowledge, perception of risks, and adoption of specific preventive behaviours in students greatly improved after the educational intervention. Whereas some of the metrics achieved statistical significance, some were not altered. Specifically, there was an increase in the perceived risk among students with regard to health impacts of mobile phone radiations and the level of vigilance was heightened. Although the results of some of the variables are not significant, the general tendency was an increase in awareness and behavioural change after the intervention. Taken together, these findings point to the effectiveness of individualised pedagogical practices in dispelling misbelief and promoting an evidence-based attitude towards mobile phone radiation.

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