

Impact of Information Booklet on Knowledge of the Effects of Mobile Phone Use among Adolescents: A Pre-Experimental Study

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Abstract: Background: Mobile phone use among adolescents is widespread, but young users are seldom taught how heavy use may affect their health, schoolwork and relationships. Objectives: To evaluate the effect of a self-instructional information booklet on adolescents' knowledge of the effects of mobile phone use, and to examine whether baseline knowledge differed by personal and family characteristics. Methods: A one-group pre-test post-test pre-experimental study was conducted in a Kannada-medium school in Mangaluru, India (March–April 2022). Sixty-two students aged 12–14 years were selected at random. They completed a 27-item multiple-choice knowledge questionnaire (content-validated by 11 experts; split-half $r = 0.75$), read a Kannada information booklet, and were re-tested after seven days. Data were analysed using descriptive statistics, the paired t -test and the chi-square test. Results: Mean knowledge scores rose from 11.87 ± 2.43 (44.0%) to 18.69 ± 1.66 (69.2%), a mean gain of 6.82 points (95% CI 6.04–7.60; $t(61) = 17.50$, $p < 0.001$; Cohen's $d_z = 2.22$). At baseline no student had good knowledge and 17.7% had poor knowledge; at post-test 56.5% had good, 43.5% average and none poor knowledge. Although 82.3% reported that they already knew about the effects of mobile phone use, this was not associated with baseline scores. Baseline knowledge was higher among younger students ($p = 0.003$) and girls ($p = 0.006$); no association was found with religion, residence, parental education or occupation, family income, daily phone use or data use. Conclusion: A short, locally adapted booklet was followed by a large short-term gain in knowledge. Because the design had no control group and follow-up was seven days, the effect should be confirmed in controlled studies with longer follow-up and behavioural outcomes.

Keywords: adolescents; mobile phone use; health education; information booklet; knowledge; school health; community health nursing; India

1. Introduction

Mobile phones have become part of everyday life for young people in India. Studies of Indian adolescents indicate that a high proportion of them have smartphone addiction and they have been estimated to be in the range of 39-44% [1]. Research from population studies has shown that the more children and adolescents screen, the lower their psychological well-being is, and that the association is stronger between adolescents and younger children [2]. Mobile phone use has also been the subject of public concern due to radiation exposure. Radiofrequency electromagnetic fields were classified as possibly carcinogenic to humans in 2011 by the International Agency for Research on Cancer (Group 2B) in light of limited evidence. A large Danish cohort of more than 358,000 subscribers found no increased risk of glioma, meningioma or acoustic neuroma, especially in those who subscribed for 13 or more years [4]. The evidence of long-term risk is still lacking and health messages for young people need to be accurate and balanced, addressing behavioural and psychosocial effects as well as physical ones.

Adolescence is a period in which lasting habits are formed, and schools and communities are natural places to build awareness. Health education works best when information is understandable and usable by its audience, a principle captured by the concept of health literacy [5]. Community health nurses reach students in schools and neighbourhoods, and a printed booklet in the local language is an inexpensive,

reusable teaching aid that students can read at their own pace and share with their families. However, the extent to which such a booklet improves adolescents' knowledge about the effects of mobile phone use in the local setting has not been well documented.

This study therefore evaluated the effectiveness of an information booklet on knowledge of the effects of mobile phone use among adolescents in a school in Mangaluru. The objectives were (1) to determine adolescents' level of knowledge, (2) to evaluate the gain in mean post-test knowledge score after the booklet, and (3) to examine the association between pre-test knowledge and selected demographic variables. We hypothesised that mean post-test knowledge would be significantly higher than mean pre-test knowledge (H1), and that pre-test knowledge would be associated with selected demographic variables (H2), tested at $\alpha = 0.05$.

1.1 Need for the Study

Mobile phones reach young people at an early age, often as a shared family device, while education about their effects lags behind use [1,2]. Many adolescents are therefore left to form their views from peers and social media, where messages can be incomplete or exaggerated. Schools offer a practical point of contact, but they need teaching material that is accurate, age-appropriate and available in the language students speak at home.

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Local evidence is also limited. We found few evaluations of written health education on mobile phone use among students in Kannada-medium schools in coastal Karnataka, where many students come from families with modest income and parental education and may have less access to reliable information in their own language. Information booklets are inexpensive and reusable, but their value depends on whether they measurably improve what students know. Evidence from a real school setting, using a validated tool and a clear measure of knowledge gain, can help nurses, teachers and school health programmes decide whether such material is worth adopting more widely. This study was undertaken to provide that evidence.

2. Materials and Methods

2.1 Design, setting and participants

An evaluative approach with a pre-experimental one-group pre-test post-test design ($O1 - X - O2$) was used [6,7]. The study was conducted in a private Kannada-medium higher primary school in Mangaluru with about 240 students in classes 6–8. Students aged 12–14 years who were willing to participate, could read and write Kannada, and were present on the day of data collection were eligible. Students whose parents declined consent, or who had previously attended training on the effects of mobile phone use, were excluded. Sixty-two students were selected at random from the three classes (20, 21 and 21 from classes 6, 7 and 8, respectively).

Sample Size: Using pilot-study means and standard deviations (pre-test 14.16 ± 1.6 ; anticipated post-test 20.33 ± 2.3), a 5% significance level and 80% power [8], the required sample was approximately 56. Adding 10% for attrition gave a final sample of 62.

Inclusion criteria for sampling

- Adolescents who were willing to participate in this study.
- Those who were able to read and write Kannada.
- Those who were available at the time of data collection.

Exclusion Criteria for sampling

- Those whose parents were unwilling to give their consent.
- Who underwent training programme on effects of mobile use.

2.2 Instruments

Tool 1 was a 12-item demographic proforma (age, sex, religion, area of living, parents' education and occupation, monthly family income, daily mobile use, daily data use, and self-reported prior knowledge). Tool 2 was a 27-item multiple-choice knowledge questionnaire covering how mobile phones work, positive and negative effects, illnesses that may be linked to use, effects on students, and ways to control use. Each correct answer scored 1 and each wrong answer 0 (range 0–27). Scores were graded as poor (0–9; up to 33%), average (10–18; 34–66%) or good (19–27; 67% and above).

The questionnaire was developed from a blueprint (knowledge 40.7%, comprehension 18.5%, application

40.7%) and reviewed for content validity by 11 community health nursing experts; four items with low agreement were replaced. It was translated into Kannada by a language expert. Reliability was assessed in six adolescents using the split-half method ($r = 0.75$). The booklet covered the meaning of mobile phones, how they work, positive and negative effects, linked health problems, effects on students, and ways to limit use and prevent addiction. Its content was validated by the same 11 experts (100% agreement), translated into Kannada, back-translated into English, and pre-tested with six adolescents, who found it easy to understand.

2.3 Data collection

A pilot study (3–10 March 2022; six students from another school) confirmed feasibility. Main data collection took place from 27 March to 3 April 2022. Students completed the proforma and the pre-test, were given the booklet, and repeated the same questionnaire on day 7 (Figure 1).

Pre-test (O1)	Intervention (X)	Post-test (O2)	Analysis
Proforma and 27-item questionnaire	Information booklet	Same questionnaire on day 7	Descriptive statistics, paired t-test, chi-square test

Figure 1: Study design and sequence of data collection

2.4 Ethical considerations

The study was approved by the Institutional Ethics Committee [approval number and date to be added], and permission was obtained from the school principal. Written informed consent was obtained from parents, and assent/consent from the adolescents. Participation was voluntary and responses were kept confidential.

2.5 Statistical analysis

Data were analysed using SPSS. Demographic and outcome data were summarised using frequencies, percentages, means, medians and standard deviations. The pre–post difference in knowledge scores was tested with a paired *t*-test (two-tailed). Normality of the paired differences was assessed using the Shapiro–Wilk test [and was satisfied / the Wilcoxon signed-rank test was used where it was not, to be confirmed]. We report the 95% confidence interval of the mean difference and Cohen's *d_z* (mean difference divided by the standard deviation of the differences) [9]. For the association analysis, pre-test scores were dichotomised at the median (below versus at or above) and compared across demographic categories using the chi-square test, with degrees of freedom based on the number of categories. Statistical significance was set at $p < 0.05$.

3. Results

3.1 Characteristics of the participants

The 62 participants were evenly distributed across ages 12, 13 and 14 years, and 62.9% were girls. Most came from modest households: half of the fathers and 69.4% of the mothers had only primary education, 69.4% of fathers were labourers, 75.8% of mothers were homemakers, and 51.6%

of families earned less than ₹5,000 per month. Most students (87.1%) used a phone for less than one hour a day, yet 82.3% reported that they already knew about its effects (Table 1).

Table 1: Demographic characteristics of the adolescents ($n = 62$)

Variable	Category	n	%
Age (years)	12	21	33.9
	13	22	35.5
	14	19	30.6
Sex	Male	23	37.1
	Female	39	62.9
Religion	Hindu	38	61.3
	Muslim	18	29
	Christian	6	9.7
Area of living	Rural	24	38.7
	Urban	29	46.8
	Semi-urban	9	14.5
Father's education	No formal education	17	27.4
	Primary	31	50
	Higher secondary	13	21
	Graduate or above	1	1.6
Mother's education	No formal education	9	14.5
	Primary	43	69.4
	Higher secondary	9	14.5
	Graduate or above	1	1.6
Father's occupation	Labourer	43	69.4
	Private	12	19.4
	Government	5	8.1
	Self-employed	2	3.2
Mother's occupation	Homemaker	47	75.8
	Private	12	19.4
	Government	1	1.6
	Self-employed	2	3.2
Monthly family income (₹)	Less than 5,000	32	51.6
	5,001–10,000	29	46.8
	10,001–20,000	1	1.6
Mobile use per day	Less than 30 minutes	24	38.7
	30 minutes to 1 hour	30	48.4
	1–2 hours	6	9.7
	More than 2 hours	2	3.2
Internet data used per day	1 GB	30	48.4
	1.5 GB	18	29
	2 GB	12	19.4
	2.5 GB	2	3.2
Reported prior knowledge	Yes	51	82.3
	No	11	17.7

3.2 Knowledge before and after the booklet

At pre-test, 82.3% of students had average knowledge, 17.7% had poor knowledge and none had good knowledge. At post-test, 56.5% had good knowledge, 43.5% average knowledge and none had poor knowledge (Table 2, Figure 2).

Table 2: Level of knowledge before and after the information booklet ($n = 62$; maximum score 27)

Level	Score (range)	Pre-test n	Pre-test %	Post-test n	Post-test %
Poor	0–9 (up to 33%)	11	17.7	0	0
Average	10–18 (34–66%)	51	82.3	27	43.5
Good	19–27 (67% and above)	0	0	35	56.5

Figure 2: Percentage of students at each knowledge level before and after the booklet ($n = 62$). (Bar chart: see Word file.)

3.3 Change in knowledge score

Table 3: Knowledge scores before and after the booklet ($n = 62$; maximum score 27)

Test	Mean	SD	Mean %
Pre-test	11.87	2.43	43.97
Post-test	18.69	1.66	69.24

Table 4: Paired t -test of pre-test and post-test knowledge scores ($n = 62$)

Mean difference	SD of differences	95% CI	df	t	p	Cohen's dz
6.82	3.07	6.04–7.60	61	17.5	< 0.001	2.22

Students gained on average 6.82 correct answers out of 27, an increase of 25.3 percentage points, and the difference was statistically significant (H1 accepted). The spread of scores was also narrower after the booklet (SD 1.66 versus 2.43).

3.4 Baseline knowledge and demographic variables

Two characteristics were associated with baseline knowledge. Scores at or above the median were more frequent among 12-year-olds (71.4%) and 13-year-olds (63.6%) than among 14-year-olds (21.1%), and among girls (66.7%) than boys (30.4%). No association was found with the other demographic variables, including reported prior knowledge (Table 5). H2 was therefore partly supported.

Table 5: Association between pre-test knowledge (below vs. at or above median) and demographic variables ($n = 62$)

Variable	df	χ^2	p	Inference
Age	2	11.652	0.003	Significant
Sex	1	7.629	0.006	Significant
Religion	2	0.014	0.993	Not significant
Area of living	2	0.718	0.698	Not significant
Father's education	3	0.61	0.894	Not significant
Mother's education	3	4.076	0.253	Not significant
Father's occupation	3	0.429	0.934	Not significant
Mother's occupation	3	1.39	0.708	Not significant
Family income	3	0.276	0.964	Not significant
Mobile use per day	3	3.389	0.335	Not significant
Data used per day	3	2.317	0.509	Not significant
Reported prior knowledge	1	0.582	0.446	Not significant

4. Discussion

The results of the study are discussed under the following headings.

Section I: Demographic characteristics

Section II: Knowledge level of adolescents regarding effects of mobile use

Section III: Effectiveness of information booklet.

Section IV: Association between the pre-test knowledge score of adolescents and selected variables.

Section I: Demographic characteristics

- The study revealed that most of the adolescents (35.5%) were in the age group 13 years, (33.3%) were in the age

group of 12 years, and (30.6%) were in the age group of 14 years.

- The study revealed that most of the adolescents (62.9%) were females and (37.1%) males.
- The study revealed that majority of the adolescents (61.3%) were Hindu and (29%) of the sample were Muslim (9.7%) were Christian.
- The study revealed that majority of the adolescents (46.8%) were living in urban and (38.7%) of the sample were living in rural area and (14.5%) were living in semi urban
- The study revealed majority of the fathers (50%) of the sample have primary education and (27.4%) have no formal education and (21%) were having higher secondary education and (1.6%) were having graduation and above.
- Most of the mothers (69%) were having primary education and (14.5%) of the had no formal education and (14.5%) were having higher secondary education and (1.6) were having graduation and above.
- Most of the fathers (69.4%) of the sample were laborer and (19.4%) of the were private employees and (8.1%) were government and (3.2%) were self-employed.
- Most of the mothers (75.8%) of the sample were home maker and (19.4%) of the sample were private and (1.6%) were government and (3.2%) were self-employed.
- Majority (51.6%) of the family income was less than 5,000 and (46.8%) were 5,001-10,000 and (1.6%) were 10,001-20,000.
- Most of the adolescents (38.7%) were using the mobile for less than ½ an hour and (48.4%) of the sample were 1/2an hour to 1 hour and (9.7%) were c1 hour -2 hour and (3.2%) were more than 2 hours.
- The study revealed that majority (48.4%) of the sample were using 1G.B and (29%) of the sample 1.5G.B and (19.4%) were 2 G.B and (3.2%) were 2.5G.B.
- The study revealed that majority (82.3%) of the sample were having knowledge and (17.7%) of the sample were not having any knowledge.

Section II: Knowledge level of adolescents regarding effects of mobile use

The findings of the present study showed that in the pre-test 17.7% of the sample had poor knowledge and majority (82.3%) had average knowledge. The mean pre-test knowledge score was (11.87%). In the post-test (43.5%) of the sample had average knowledge and 56.5% had good knowledge the mean post-test knowledge was score (18.69%) which is much higher than the mean pre-test knowledge score (11.87).

Similar findings were observed by other researchers also. Where in it was found that the mean post-test knowledge is average (60%) regarding ill-effects of excessive usage of mobile phone on the health. (32%) adolescents have good knowledge and only (2%) have poor knowledge regarding ill-effects of excessive usage of mobile phones.[12]

Section III: Effectiveness of information booklet

The finding of the present study showed a significant increase in the post-test knowledge score the computed 't' value (17.50) was higher than the table value ($t_{59}=1.67$, $p<0.05$) at 0.05 level of significance. This shows that

information booklet was highly effective in improving the knowledge of adolescents regarding effects of mobile use. These findings are consistent with the finding of other studies.

The finding is consistent with the finding of other study conducted to evaluate the effectiveness of an information booklet on knowledge and practice on food safety among food handlers in restaurants. The overall mean post-test knowledge score (10.65) is apparently higher than overall mean pre-test (5.57), the paired "t" test value was 27.24 ($t_{137}= 1.656$, $p<0.001$). This suggested that the information booklet was effective to improve the knowledge and knowledge of practice on food safety among the food handlers. [13]

The finding is consistent with the findings of other study conducted to evaluate the effectiveness of Information Booklet on Emergency Contraception in Terms of Knowledge of Undergraduate College Girls and seek its Relationship with Selected Factors in a Selected College of Kashmir. The finding of the study revealed that mean post-test knowledge score (38.58%) of college girls were found to be significantly higher than their mean pre-test knowledge score (14.1%). The information booklet was found to be effective in enhancing the knowledge of college girls on emergency contraception. The information booklet had high acceptability and utility among college girls.[14]

Section IV: Association between the pre-test knowledge score of adolescents and selected variables

Finding of the present study showed that there was no significant association between Religion, Area of living, Education of the father, Education of the mother, Occupation of the father, Occupation of the mother, Income of the family per month, Duration of the mobile use per day, Internet facility used per day, Do you have knowledge regarding effects of mobile use. Significant association was found between Age and Sex regarding effects of mobile usage.

The finding is consistent with the findings of other study conducted to evaluate the effectiveness of information booklet on knowledge for Health Hazards of mobile phone Usage Among adolescents school going children in selected English Medium schools of Kolkata, West Bengal. A pre-experimental approach with one group pre-test post-test design was adopted for the study. The study findings showed the range of post-test knowledge score (27.4%) was higher than the pre-test knowledge score (16.9). The computed "t" (39) =19.34, $P<0.05$ level of significance. Indicating that the information booklet was effective in terms of gain in knowledge. Association of pre-test knowledge levels with selected variables were found to be not significant.[15]

4.4 Implications for practice

For community health nurses and school health programmes, a low-cost booklet may be a useful first step in building awareness, ideally combined with discussion with students and parents and practical guidance on setting limits. Knowledge, however, is not behaviour, and future evaluations should measure what students actually do.

4.5 Strengths and Limitations

Strengths include the use of a content-validated tool and booklet, translation and back-translation, a pilot study, a sample size calculation, and reporting of confidence intervals and effect size. The main limitation is the single-group design with no control group, so part of the gain may reflect repeated testing with the same questionnaire, the attention given by the study, or regression to the mean [6,11]. Follow-up was seven days, so retention is unknown. The study was conducted in one school with a small sample ($n = 62$). The questionnaire was developed for this study, and its reliability ($r = 0.75$) was estimated in only six adolescents, which gives limited precision. The chi-square analyses relied on a median split and small cell counts. Only knowledge, not attitudes or behaviour, was measured.

5. Conclusion

An information booklet in the students' own language was followed by a large and statistically significant short-term gain in adolescents' knowledge of the effects of mobile phone use. Given the single-group design and short follow-up, a controlled study with longer follow-up and behavioural outcomes is needed to confirm the effect. Meanwhile, simple, validated written material may be a practical addition to school and community health education. Based on the findings of the study the following conclusions were drawn: Most of the adolescents (82.3%) had average knowledge and none of them had good knowledge before the administration of the information booklet. But after administration of the information booklet there was increase in their knowledge as it is evident from the mean post-test knowledge score where most of them (56.5%) gained good score. The information booklet is an effective method in improving the knowledge on effects of mobile use.

Declarations

Ethics approval and consent: Approved by the Institutional Ethics Committee; written informed consent obtained from parents and participants.

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Conflicts of interest: None identified.

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