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Effect of an Information, Education and Communication (IEC) Strategy on Knowledge Quotient (KQ) Among School Students in Pune on Immunization

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Abstract : *Advertisements and awareness programmes have reached a saturation point in motivating parents to immunize their children, as lack of health awareness is set in their mind since young age. Alternatively, Information, Education and Communication (IEC) strategy given at school age might initiate health awareness owing to improved knowledge quotient (KQ), as they form future citizens. This experimental study assessed change in KQ on immunization among school students from rural and urban Pune. 1092 upper primary class students were enrolled into experimental and control groups, based on residence location as clusters, by randomized parallel group stratified sampling. A structured IEC on immunization of 30 minutes duration was given to experimental groups on day one and none to control groups. Pre-test scores improved during post test taken on day three in experimental groups of both rural and urban. However, change in KQ scores of rural students was significant than urban. Females scored better than males in rural while in urban no gender difference was observed. Among rural Ram mandir wasti, Mahadev nagar and from urban Shankerseth road, Dhobi ghat clusters scored high. Hence, Improving KQ of school students on immunization through IEC strategy has tangent benefits on health awareness.*

Keywords: *Information, Education and Communication (IEC) strategy, immunization, knowledge quotient (KQ), School students*

I. Introduction

Today, India is a leading producer and exporter of vaccines, still the country is home to one-third of world's unimmunized children. There are a number of reasons why India lags behind its many less developed neighbours in vaccination rates. [1] Approximately 27 million children are born in India each year – largest birth cohort in world, but less than 44 % receive a full schedule of vaccinations. [2] Achieving and maintaining high levels of immunization coverage must therefore be a priority for all health systems globally. Immunization coverage is a health output with a strong impact on child morbidity, child mortality and permanent disability.

Full immunization coverage of under five children still looms the world and India. No regulations, laws, legislations or fines exist in India to prevent parents, those who increase their non immunized children's vulnerability to preventable infectious diseases. Advertisements and awareness programs have reached a saturation point in motivating parents on immunization messages as lack of health awareness is set in their mind since young age. Alternatively, Information, Education and Communication (IEC) strategy given at school age might initiate health awareness owing to improved knowledge quotient (KQ), as they form future citizens.

Usually school students don't feature actively on this attempt by Government or other campaigns. They need to be included in campaigns to reach out to those vaccine hesitant parents as what might not have connected earlier through media, might appeal through their kids. Wakefield, Loken, and Hornik concluded that programs in which mass media is part of a multifaceted intervention strategy are more likely to be successful than mass media campaigns alone. [3] Hence, involving youth with innovative approach like IEC strategy should be given a chance to contribute to health awareness.

Many studies [4,5,6] recommend regular IEC activities in community to ensure that immunization will become a "felt need" of parents. This experimental study assessed effectiveness of IEC strategy on immunization through school students as stakeholders of knowledge (quotient) acquisition. Moreover, adolescents who take part in their own decision-making are likely to become empowered and informed to make good choices on health matters and likely to pass this messages to their parents and neighbors.

II. Objective

To assess effect of Information, Education and Communication (IEC) strategy on knowledge quotient (KQ) among school students in Pune on immunization.

III. Methodology

School students in urban and rural areas of India formed 'Study Universe'. Accessible population is from the setting set for research which is Pune city, cultural capital of Maharashtra. This research work was conducted in 2015 at Pune Camp of Pune city taluka and Loni Kalbhor village of Haveli taluka of Pune subdivision. Public education in Pune district is administered by Zilla Parishad. A list of entire Marathi medium schools having upper primary level and above in Pune Camp and Loni Kalbhor was prepared based on geographical contiguity, being the field practice area of Medical College served by investigator. Institutional Ethics Committee permission, written sanctions from concerned authority and written consent from parents and accent from school students were taken for the study.

These schools were arranged in cumulative frequency. A random numbers table was prepared till occurrence of highest number of cumulative frequency both for urban and rural. Then through lottery method two schools was selected each for urban and rural. The schools that were represented by the number were chosen. Students from Camp Education Society School, Babajan Chowk and Ambedkar Memorial Higher Secondary School, Wanowarie from Camp for urban and Prithviraj Kapoor Memorial Higher Secondary School, Kanya Paathshaala in Loni Kalbhor for rural were samples for study.

Randomized parallel group stratified sampling was used to select students. VI, VII standard students were chosen as first strata and students from same cluster of their household formed as second strata of samples. Based on location of household of school students, twenty two locations (mostly called as 'wasti' in Marati) (Fig 1) from urban and a similar number from rural formed the sampling frame. All locations were equally and randomly allocated to experimental and control groups. This was done using arbitrary allocation of numbers designated for each location through computer.

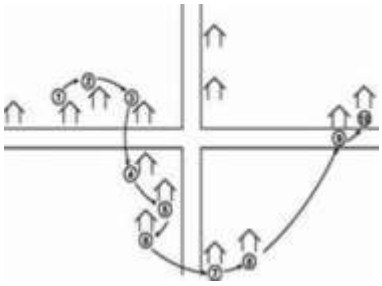

Fig 1 Sampling strata based on location

With limited studies available on health experimentation with school students in India, Coverage Evaluation Survey 2009 contributed as reference value for Maharashtra (78.6 %). Estimated sample size using formula suggested a minimum of 255 per arm and considering attrition at 5 % final sample size in both rural and urban was enrolled.

$$n = D * z^2_{1-\square} / 2 * P * (1- P)/d^2$$

Where,

- n = required sample size
- $Z_{1-ά/2}$ = Z - score corresponding to 'ά ' level of confidence, i.e., ± 1.96
- d = permissible margin of error in the estimate (5 %)
- P = assumed value of the indicator (78.6 %)
- D = Design Effect (1)

A total of 1,092 samples were randomly assigned to experimental and control group based on their residence location. 12 from rural and 14 from urban were excluded as they did not appear for post test. Tool was a predesigned questionnaire, tested and validated by experts with good reliability using appropriate methods. It was administered as pre-test and as well as post-test for samples before and after giving structured IEC on immunization by the researcher. Constructed on a single page it comprised brief profile of sample and 10 items on immunization in MCQ format. Each correct answer / option was given a score of one each. Maximum score achievable on questionnaire was 20. Scores were graded using cumulative grade point average (CGPA) based on the standard school board marking system of Maharashtra.

Content of IEC on immunization included - poster introduction on being immune to diseases; enumeration of vaccine preventable diseases; story reading from Meena Comic series by UNICEF (Fig 2); define immunization and its meaning; enlisting vaccines from birth to 5 years of age – routine / optional and

handing out of leaflet on routine immunization schedule with immunization card samples. Control groups had only informal discussions on health excluding immunization without any audio visual materials.

Language for the questionnaire and IEC was Marati and Hindi. The pre-test and post-test findings were analyzed using descriptive and inferential statistics with BMDP and RIDIT analysis to obtain crucial information on natural ordering of categories on scoring outcome. To analyze effectiveness of IEC strategy imparted to school students test scores were analyzed with statistical testing like mean, SD, Chi square, degrees of freedom, 'Z' test, RIDIT analysis, paired and unpaired 't' test with ''p value at 0.001 for statistical levels of significance.

Fig 2 : Meena comic series on immunization

IV. Results

There was a total of 1092 school students from 11 clusters each, with 555 of rural (Fig 3) and 537 of urban (Fig 4) Pune. Rural students' score in pre test was 2.66 ± 1.69 SD and post test was 14.31 ± 2.14 SD in experimental group (Fig 5). Control group had a pre test score of 2.52 ± 1.60 SD and post test score of 5.02 ± 2.01 SD (Fig 6). Urban students' scores in pre test was 1.99 ± 1.34 SD and post test was 9.81 ± 2.39 SD in experimental group (Fig 7) whereas control group scores were 1.96 ± 1.29 SD in pre test and 6.35 ± 2.06 SD in post test (Fig 8).

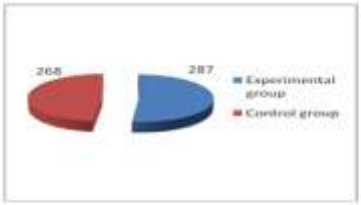

Fig 3 Distribution of school students in rural (n=555)

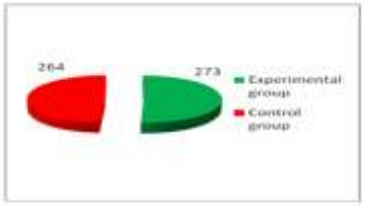

Fig 4 Distribution of school students in urban (n=537)

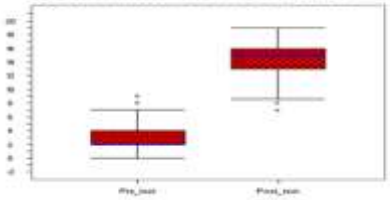

Fig 5 Comparison of pre and post test in rural experimental group

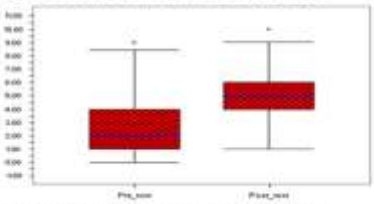

Fig 6 Comparison of pre and post test in rural control

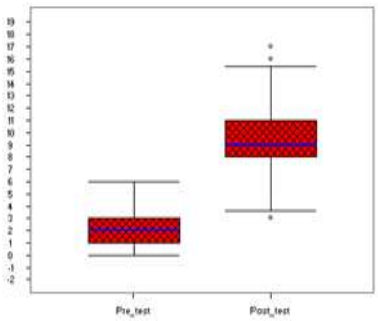

Fig 3 Distribution of school students in rural (n=555)

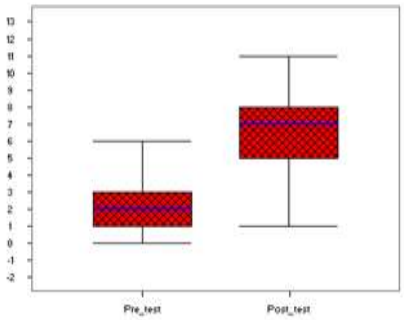

Fig 4 Distribution of school students in urban

Highly significant acquisition of KQ was observed in both rural (paired't' of 71.97 and 22.76 at P < 0.001 in experimental and control group respectively) and urban (paired't' of 49.75 and 32.71 at P < 0.001 in experimental and control group respectively. (Table 1)

Table 1 Results of knowledge quotient in rural and urban students

Sample characteristics	**'n'**	**Pre-test mean ± S.D.**	**Post-test mean ± S.D.**	**Statistical test results (by paired 't' test with df=n-1)**
Rural	555	1.59 ± 1.65	9.83 ± 5.09	't'=33.17, HS*
Experimental group	287	2.66 ± 1.69	14.31 ± 2.14	't'=71.97, HS
Control group	268	2.52 ± 1.60	5.02 ± 2.01	't'=22.76, HS
Urban	537	1.95 ± 1.31	8.11 ± 2.83	't'=48.52, HS
Experimental group	273	1.99 ± 1.34	9.81 ± 2.39	't'=49.75, HS
Control group	264	1.96 ± 1.29	6.35 ± 2.06	't'=32.71, HS

* HS = Highly Significant at P < 0.001

More and highly significant change in KQ was found in rural than urban students when compared by unpaired't' test 46.15 and 16.18 (p < 0.001) respectively, which is called as 'change score' (Table 2). Among rural clusters Ram mandir wasti, Mahadev nagar (Fig 9) and among urban Shankerseth road, Dhobi ghat, Ramtekdi cluster students, (Fig 10) scored high in post-test. Individual cluster scores when compared by paired't' test showed uniform gain in KQ with mean values ranging from 13.83 to 15 in rural and 9.23 to 10.8 in urban.

Table 2 Results of change score among school students in urban and rural

	Change Score = Post-test score – Pre-test score						**Comparison by Unpaired 't' test, df = n_1+n_2-2**	
	Experimental group			**Control group**			**'t' value**	**'P' value & Statistical Significance**
Area	**'n'**	**Mean**	**S.D.**	**'n'**	**Mean**	**S.D.**		
Urban	273	7.82	2.60	264	4.45	2.21	16.18	P < 0.001, Highly Significant
Rural	287	11.65	2.74	268	2.50	1.80	46.15	P < 0.001, Highly Significant

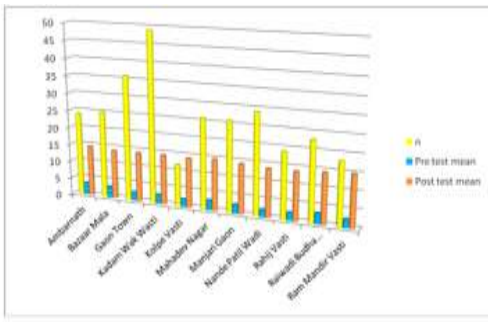

Fig 9 Distribution of cluster wise pre and post test mean in rural

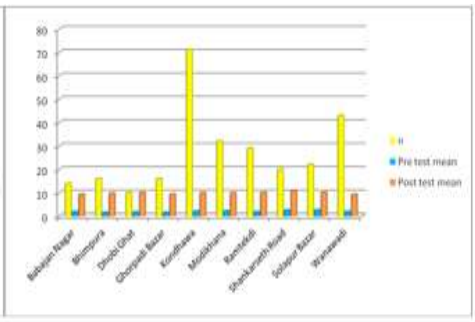

Fig 10 Distribution of cluster wise of pre and post test mean in urban

Considering post-test, females (10.60 ± 4.42) scored better than males (8.79 ± 5.73) in rural. However, females (8.12 ± 2.75) and males (8.08 ± 2.99) scored similar in urban. Both were statistically highly significant (P < 0.001). Upon CGPA grading of scores, 98 % of rural experimental group were found with poor and below KQ grading during pre-test and 92 % scored good and above in their post-test. (Table 3) 100 % of urban experimental students scored poor and below KQ grading during pre-test and 89 % scored good and above, in their post-test. (Table 4) Both table 3 and 4 summarize change in KQ grading that was highly significant at P < 0.001 with their matched Chi-square, Z values and RIDIT mean. 12 % of rural and 36 % of urban control group students scored to average grading from their baseline grading.

Table 3 Distribution of KQ grading during pre and post test of rural school students

Knowledge quotient grading	**Experimental group n = 287**				**Control group n = 268**			
	Pre test		**Post test**		**Pre test**		**Post test**	
	N	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Excellent (A grade : 80 % and above)	0	0	94	32.75	0	0	0	0

Good (B grade: 60 to 79 %)	0	0	172	59.93	0	0	0	0
Average (C grade: 40 – 59 %)	6	2.09	18	6.27	2	0.75	33	12.31
Poor (D grade: 20 – 39 %)	74	25.78	3	1.04	67	25.00	171	63.8
Fail (E grade: Below 20 %)	207	72.13	0	0	199	74.25	64	23.88

Mean RIDIT = 0.992, Z = 20.741, Chi-square = 496.55, Degrees of Freedom = 4, P < 0.001, Highly Significant
Mean RIDIT for data in table 3 is 0.992 that means if two subjects are randomly selected from the above type of two populations, then the subject from 'Exp' population will have a more extreme (i.e. higher/greater/larger) value and probability of this occurrence is 0.992 (i.e. 99.2%) and for the urban it is 81.2 % with crucial information on the natural ordering of the categories.

Table 4 Distribution of KQ grading during pre and post test of urban school students

Knowledge quotient grading	**Experimental group n = 273**				**Control group n = 264**			
	Pre test		**Post test**		**Pre test**		**Post test**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Excellent (A grade : 80 % and above)	0	0	4	1.46	0	0	0	0
Good (B grade: 60 to 79 %)	0	0	59	21.61	0	0	0	0
Average (C grade: 40 – 59 %)	0	0	180	65.93	0	0	95	35.98
Poor (D grade: 20 – 39 %)	45	16.48	29	10.62	32	12.12	139	52.65
Fail (E grade: Below 20 %)	228	83.52	1	0.36	232	87.88	30	11.36

Mean RIDIT = 0.812, Z = 13.689, Chi-square = 188.33, Degrees of Freedom=4, P < 0.001, Highly Significant

V. Discussions

This study aimed to assess effectiveness of IEC strategy on immunization through school students as stakeholders of knowledge acquisition (quotient). Generalization of study results depend upon background characteristics of population surveyed, which is discussed in a sequential manner.

Study results indicated that delivery of structured IEC strategy was in a standard manner with normal SD distribution. Control group students who did not undergo IEC on immunization also observed to have acquired knowledge once topic was introduced to them through pre test. Statistically significant gain in mean was observed in most of the clusters in both rural and urban control groups that was evident with their post test outcome in comparison to pre test means and't' values.

A study [3] covered range of child survival health topics in a systematic examination of reviews. Notable studies published after 1998 and retrieved from Medline, PsycINFO, Embase, Soclit, ERIC, Communication and Mass Media Complete found moderate evidence for effectiveness of mass media campaigns on family planning, immunization, diarrheal diseases and weak evidence for mass media breastfeeding interventions. In agreement with this study, current research results showed effective IEC strategy on immunization with school students.

Results showed more and highly significant change in KQ was observed in rural than urban students which contradict few of the previous studies [7] and are in sync with other studies on performance of students. [8,9] They contradict the results of the present study and they showed that urban students perform well in problem solving ability than rural students. The notion that urban schools are better than rural schools is ill-founded quoted a report by the NGO 'Save the Children' in 2015 [9]. This is supported by National Achievement Survey (2012) of NCERT which reveals that Class 8 rural students outshone urban counterparts in Science and Mathematics. Class 5 students in urban areas showcase what one may refer to as stagnancy (little change in learning levels) when their achievements are compared in Mathematics, Language and Environmental Studies. Times of India (2014) published that rural students score better in another education survey. [10]

This may be contributable to a more motivated, as evidenced by rural students seeking out a somewhat discreet opportunity by virtue of their intrinsic value for such things, might just be an indicator that they are more competent to undertake such rigorous studies. One review found four of six childhood vaccination programmes which used mass media achieved substantial improvements in vaccine use and the effects were incremental with increasing exposure to the campaign. [4] One cost-effectiveness analysis in Bangladesh attributed increasing use of immunisation services to national campaign exposure. [11]

Another review of vaccination interventions found no additional benefits of mass media campaigns alone. [3] Rather, mass media was a strategy widely used in multi-component vaccination campaigns worldwide and substantial improvements in childhood vaccination were repeatedly recorded. [3,12,13] Studies have found that mass media campaigns can directly and indirectly produce positive changes or prevent negative changes in

health-related behaviours across large populations. [12,13,14] Improving students' awareness in the community is one such strategy that can significantly contribute to reaching large populations as the study results show positive changes on knowledge component among students.

The likelihood of success is substantially increased by application of multiple interventions and when target behaviour is one-off or episodic (eg, screening, vaccination, children's aspirin use) rather than habitual or ongoing (eg, food choices, sun exposure, physical activity). Greater and longer-term investment will be required to extend effects. The increasingly fractured and cluttered media environment poses challenges to achieving adequate exposure to planned media messages, rather than making wide exposure easier.

Careful planning and testing of campaign content and format with target audiences is, therefore, crucial (panel). [3] This evidence based campaign contributes to long term investments as today's students are going to be future parents and imparting health messages at an young age will greatly ease the health behavior positively, which is substantiated by their positive gain in knowledge quotient.

In this study school students were inquired to spontaneously mention the name of the vaccines a newborn and a child under the age of 5 years should be taking. Overall, it appears that they were not sufficiently aware of those facts initially. It was measured that 98 % had poor levels of KQ on immunization in baseline survey but their awareness was improved among 92 % in the post- intervention testing; similar findings have been documented by other researchers. [15] [16]

In order to address all the barriers to achieve high routine immunization (RI) rates, induction of innovative method [1,17,18,19] has been recommended and this IEC approach to school students is one such method. Such an IEC approach through school students was found effective in increasing the KQ on immunization which is likely to be transferred to the care givers of children in the community.

The basic tenet of an IEC approach is that there is a common truth behind all conceptually similar efforts, but which has been measured with certain definite outcome like acquisition of KQ. A study concluded that health education approach for schools is feasible and effective in improving knowledge and behavioral practices of non-communicable diseases (NCD) risk factors in adolescents in rural India which is concurrent to the findings of this study which showed KQ improvement. [20] Another research from Pakistan concluded that IEC based interventions were understood by women and can be incorporated in different tiers of health system. [12] Generally over 90 % of women understood messages with help of sketches and found similar way of message delivery useful. In this study too females acquired better KQ than males.

On a wider application of immunization knowledge, studies [4,5,6] have highlighted that lack of awareness is one great barrier to achieve cent percent immunization coverage. This study concur that lack of awareness existed with pre test scores in both experimental and control groups among school students in rural areas. Similar findings were observed in urban groups. It may reflect that parental behavioral barrier for complete immunization coverage in selected setting in spite of presence of health teams throughout and campaigns regularly in the setting. A study among 225 villages of Uttar Pradesh corroborated this fact. [4]

VI. Recommendations

IEC strategy on topics of health may be conducted for degree of effectiveness among school students in improving knowledge quotient which in long term would contribute for a healthy society. More so significant with females students as acquisition in KQ on essential woman health topics would collectively mean and contribute towards better maternal child health indicators on consistent implementation.

VII. Conclusion

School students have shown interest in health education messages delivered through IEC strategy on immunization. Impact of this approach is evidenced with the resultant change in KQ substantiate understanding and their readiness for further dissemination. It would be a way of empowering youth with KQ to build their family and friends' health by helping them tap their potential to the fullest by active participation and would be an ode to the youth in country.

VIII. Acknowledgements

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