Original Research Article

An interventional study to assess the effectiveness of 'WhatsApp' as a teaching learning tool in community medicine

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ABSTRACT

Background: Undergraduate medical students, perceive the subject of Community Medicine as irrelevant to their role as physician and majority of the students dislike the subject and consider it as dull and boring. The present research study aims to study the effectiveness of 'WhatsApp' as medium of teaching complementing the traditional teaching to enhance the knowledge and skills of the undergraduate medical students using case based learning.

Methods: Before and after comparison Interventional study design amongst 49 sixth semenster students conducted over a period of six months in a private medical college. Implementation of the study divided into three phases – preparatory, intervention and evaluation phase.

Results: The improvement in average marks scored for epidemiology module was 1.97 and that for diabetes module was 5.38 which were statistically significant. The participation rate for the various modules ranged from as low as 10.2% to 73.5%. About 90% students perceived 'WhatsApp' as an effective tool for teaching-learning; a tool that stimulates and encourages learning.

Conclusions: There was a significant improvement in knowledge amongst the students. Though perceived as an effective tool for learning by the students, participation rate in online discussion was poor over the course of implementation.

Keywords: Interventional study, Teaching-learning tool, Community medicine, WhatsApp

INTRODUCTION

Medical Council of India's document on graduate medical education states that the goal of the teaching of undergraduate students in community medicine is to prepare them to function as community and first level physicians.[1] However undergraduate medical students, perceive the subject as irrelevant to their role as physician. Majority of the students dislike the subject and consider it as dull and boring.

Community medicine is taught right from 1st semester in MBBS curriculum, but students do not study the subject till they are in 6th semester. A study by Dongre et al revealed that students found it difficult to comprehend the core of subject from the scattered lecture series over a long teaching period, especially using lengthy overhead projector/liquid crystal display presentations.[2] The major problems encountered in studying the subject of Community Medicine were confusions due to apparently similar text in National Health Programs and difficulty to

recall disease statistics due to vast syllabus.[2] An overwhelmingly vast and ever increasing size of the standard textbook adds to their negative perspective. Teaching in Community Medicine apart from lectures includes several teaching methods like family case study, field visits, case presentation, practical demonstrations etc., however it does not appear to be sufficient to generate interest in learning. A study by Thakur et al found that 62% participants felt that the lectures weren't stimulating enough.[3]

Case study based teaching is a method which allows students to apply what they learned in the classroom to real world situations. Cases come in many formats, from a simple "What would you do in this situation?" question to a detailed description of a situation with accompanying data to analyze.[4] Case studies are ideal to develop higher order reasoning skills.[5] They increase students motivation to learn. Though the subject of community medicine, utilises several modalities of teaching, case based learning, has not been so extensively used due to time constraint.

Medical sciences involve teaching lot of scientific facts and concepts. This leaves very little time for discussion using interactive teaching method. With advancing technology and availability of internet, information is now available with one click. There is an increasing trend of using 'WhatsApp' as a channel of instant communication amongst students. It is a natural tendency for all to check their 'WhatsApp' messages frequently throughout the day or at the buzz of incoming message.

A comparative study found that there was significant difference in the achievement and attitudes of the group exposed to learning through 'WhatsApp' as compared to the group exposed to face-to-face learning in the classroom.[6] Another experimental study showed that when 'WhatsApp' is used as a tool for mobile learning in a blended strategy the outcome was better as compared to only traditional face to face learning.[7] An indepth interview with 12 high school teachers who were using 'WhatsApp' revealed its advantages as a tool for communication.[8]

The present research study aims to study the effectiveness of 'WhatsApp' as medium of teaching complementing the traditional teaching to enhance the knowledge and skills of the undergraduate medical students using case based learning.

METHODS

The study is a before and after comparison interventional study conducted in a private medical college in the city of Mumbai. The students being from affluent class of society were all using android phones with Internet facility. The students were already accustomed to using 'WhatsApp' for social conversation and therefore it was easy to implement this modality of teaching learning. All the students who were enrolled for the sixth semester of MBBS were eligible for participation. Though the subject of Community Medicine is taught right from the first semester, students from the sixth semester were chosen for the study, as this is the time period when their focus is on Community Medicine.

All the sixth semester students were approached, explained about the study and a written consent was obtained from the students. All the 49 students of the class consented to participate in the study. The study was implemented over a period of six months from March 2016 to August 2016. Institutional Ethics Committee approval was obtained for implementation of the study.

Table 1: Study framework.

Preparatory phase	1.	Sensitization of the students regarding the research study
	2.	Consent of students
	3.	Development and validation of modules, case studies, pre-post-test questionnaire, feedback form and in-depth interview tool
	4.	Formation of 'WhatsApp group'
Implementation phase	1.	Posting of case studies on 'WhatsApp'
	2.	Online discussion
	3.	Posting of case studies on 'WhatsApp
Evaluation phase	1.	Pre-test and Post-test scores
	2.	Record of participation in online discussion
	3.	Feedback form
	4.	In-depth interview

This study being interventional was divided into three phases (Refer to Table 1).

1. Preparatory phase
2. Intervention phase
3. Evaluation phase

1. Preparatory phase

The students were sensitized about the project and their willingness to participate in the project was obtained through a written consent. The student's contact number for forming the 'WhatsApp' group was obtained and students were asked to choose a topic for discussion from the list of topics provided to them.

After reviewing the student's forms, four topics were selected; epidemiological study designs, epidemiology of tuberculosis, epidemiology of diabetes and sampling methodology.

Modules were developed on the selected topics. The topic was subdivided into several sub-modules. For each module relevant material in the form of power point presentations, videos, images were developed. These modules were shared with the students on 'WhatsApp'. For the online discussion case studies were developed for each of the topic to stimulate interest in the subject and at the same time assess the student's level of knowledge and its application. Three faculty members of the department of Community Medicine validated all the modules, case studies and pre-post-test questionnaire.

A feedback form to assess the student's opinion on the administered modules and an indepth interview tool was prepared and validated by the faculty members.

2. Intervention phase

Four modules were administered over a period of three-four months with each module requiring 2-3 weeks. The four topics were epidemiological study designs; epidemiology of tuberculosis; epidemiology of diabetes and sampling methodology.

Implementation of module on epidemiological study designs

A pre-test questionnaire in the form of three case studies was sent on 'WhatsApp' group after they were exposed to the traditional lecture. The students were asked to respond within a defined time period. A classroom discussion was also held to discuss answers and clarify student's queries. Again after the classroom discussion, similar case studies as post-test were sent to students asking them to submit their response. The answers to the case studies with an explanation were posted on the group subsequently.

Implementation of module on epidemiology of diabetes

A pre-test questionnaire was administered to the students in the classroom. The modules prepared on diabetes were posted on 'WhatsApp' group. Six case studies were sent on the group. The students had to discuss the answers amongst themselves in their smaller group of 5-6 students, post their answers on 'WhatsApp' and present their case study in the classroom. So through the medium of the case studies the entire diabetes modules was discussed. A post-test questionnaire was administered in the classroom subsequently.

Implementation of the module on sampling methodology

Six case studies covering various sampling designs were posted on 'WhatsApp' group for students to identify the sampling methodology after the traditional lecture. The students were asked to submit their responses within a defined time period. There was no classroom discussion for this module. The answers to the case studies with an explanation were posted subsequently. Again a second round of six case studies was sent to students to assess their knowledge after the online discussion.

Implementation of the module on epidemiology of tuberculosis

Ten case studies covering various clinical aspects were designed and posted on 'WhatsApp' group for students to answer. The students were asked to submit their responses within a defined time period. There was no classroom discussion for this module. The answers to the case studies with an explanation were posted subsequently. Pre and Post-test questionnaire was not used for this module. Only participation rate was assessed.

3. Evaluation phase

The outcome measured was change in knowledge before and after implementation of the intervention. This outcome was measured through the response on 'WhatsApp' to the case studies (epidemiological study designs, sampling methodology) and through a questionnaire administered in the classroom (epidemiology of diabetes). The individual and cumulative score for each student for each of the modules was calculated before and after the intervention.

The second outcome measured was the participation rate in online discussion. The participation rate in the online discussion on 'WhatsApp' was assessed by counting the number of students submitting their responses on 'WhatsApp'. Frequency and percentages of participation was calculated for all the modules.

Feedback from students regarding the intervention was obtained through a semi-structured feedback form administered at the end of all the modules and an indepth interview tool administered to few students. Suggestions were sought from the students to improve the intervention.

The intervention would be considered as effective if

1. The pre-test and post test score showed a statistically significant difference at 95% confidence interval.
2. At least 30% of the students participate in the case study discussion on 'WhatsApp'.
3. Atleast 50% students report 'WhatsApp' as satisfactory modality of teaching learning.

Statistical tests employed for detecting the change in the knowledge levels was the unpaired t-test. The participation rate was assessed by calculating the proportion of students responding to the case studies posted on WhatsApp. The feedback from the students was analysed using percentages for closed ended questions and thematic coding was followed for open ended questions in feedback form and the indepth interview tool.

RESULTS

Knowledge levels of the students

Of the 49 students enrolled in the 6th semester, the knowledge level of the students before and after the intervention varied considerably across the module and showed significant improvement.

Module on epidemiological study designs

The number of students responding to the pre-test and post-test on 'WhatsApp' group was 36 and 25 respectively. The maximum obtainable score was three. In the post-test all the students answered all the questions correctly whereas in the pre-test 34 students could answer only one question correctly and two students could not answer even a single question correctly. Of the 25 students in the post-test, 24 of them had also given the pre-test and they answered all the three case studies correctly. The unpaired t-test showed statistical significant difference in the pre-test and post-test score (Table 2).

Table 2: Pre-test and post-test results of module on Epidemiological study designs.

Module on epidemiology	Pre-test (n =36)	Post-test (n =25)
Mean score	0.94	3
SD	0.232	0

T =-44.28, df =59, p<0.001, SEDM =2.06 (1.97–2.15).

Module on epidemiology of diabetes

A questionnaire comprising of 20 questions in the form of MCQs, one line answer, fill in the blanks was administered in the classroom. The module contained several subsections which were sent over 'WhatsApp' to the student. Case-studies pertaining to each of the section was posted on the 'WhatsApp' group. The students were asked to discuss the answer amongst their groups and post their answers on 'WhatsApp'. The cases studies were discussed in the classroom following which all the correct answers were posted on the group. A post-test questionnaire was again administered at the end of the module. The number of students present for post-test was only 31 as compared to 36 in the pre-test. Applying the unpaired t-test, it was found that the results were statistically significant with p<0.001 (Table 3).

Table 3: Pre-test and post-test results of module on epidemiology of diabetes.

Module on diabetes	Pre-test (n=36)	Post-test (n=31)
Mean score	9.3	14.68
SD	3.6	3.15

T =-6.46, df =65, p<0.001, SEDM =5.38 (3.71–7.04).

Module on sampling methodology

Six case studies were sent on 'WhatsApp' (pre-test), for which 25 students had responded and the average score was 0.17. After the classroom discussion, six more case studies were sent on 'WhatsApp' (post-test). Only five students responded and the average score was 0.57. As the number of students responding was poor in the post-test, the evaluation of the module for change in knowledge levels was not done.

Module on epidemiology of tuberculosis

In this module, the number of students responding to the case studies pertaining to BCG vaccination; and other preventive measures for control of TB was 10 and 5 students respectively. Level of knowledge as reflected in the response to case studies is not presented due to low participation rate.

Participation rate in online discussion

The participation rate for the various modules ranged from as low as 10.2% to 73.5%. The initial participation for the first module was encouraging, but over the period of four months, the participation rate declined (Table 4). Several reminders were given to the students everytime reminding them about the deadlines for submission of the response.

Table 4: Participation of the 6th semester MBBS students in different modules.

Name of module	1st round of online discussion	2nd round of online discussion
Epidemiological study designs	36/49 =73.5%	25/49 =51%
Epidemiology of tuberculosis	10/49 =20.4%	
	5/49 =10.2%	
Sampling methodology	25/49 =51%	5/49 =10.2%

The feedback forms revealed some of the reasons for non-participation. Some of the reasons cited were lack of time; questions were difficult or too simple; had not studied the topic; answers were already given by others; lack of access to internet and did not remember to send the answers. Two common answers emerging were that the students were busy preparing for other subjects and they did not want others to see their answers.

Feedback about the 'WhatsApp' project

Thirty five students were administered anonymous questionnaire in the class. A large majority of the students (88.6%) felt that 'WhatsApp' can be used as a teaching learning tool. All students felt that the discussion via case studies was informative, and helped

them to gain new knowledge and or expanded their learning. The students (91.4%) said that the case studies stimulated their learning and recommended such discussions to be continued for important topics. Students felt the option for answering on an individual basis should be available rather than answering on the group.

All students felt that the questions were relevant. There was a mixed opinion about the difficulty level of the case study. Around 49% felt the questions were difficult while 46% felt the questions were simple. The number of case studies sent at a time and timing were considered appropriate by 83% and 85% students respectively. The time frame given to answer the questions was said to be appropriate by 80% of the students.

Table 5: Quotes from in-depth interview.

'No improvement needed. It is a great initiative to stimulate learning and make it more interesting'
'Even though I have not responded to the post, I did check out the questions and the answers posted by the teacher just before the exams'
'It helped me for my exams, especially for viva and case presentations'
'Since the answer was already posted, I did not want to answer'
'It should be made compulsory'
'Case studies should be sent just before exams'

Five in-depth interviews were conduct to get a better perspective about the intervention and explore student's perspective about its benefits and seek suggestions for improvement. All the students who were interviewed felt that the entire concept was good, and felt it was useful. They felt that the case studies and the discussion following them helped them tremendously (Table 5).

Suggestions by students for improvement

Students felt that questions should be sent daily pertaining to the topic that is being taught in class. Some said that that only one question or a case study per week should be sent so that they are not burdened. The case studies should additionally be discussed during the class. They felt that a list of important questions should be sent to the students. A few felt that more time should be given to answer questions. Some said that case studies should be sent just before exams. Students also seemed uncomfortable answering on the group and felt the option of answering on an individual basis should be available.

DISCUSSION

In present study the there is significant improvement in the average marks scored by students after 'WhatsApp' intervention, in modules assessed by pre and post-test questionnaire. The improvement in average marks scored for epidemiology module was 1.97 and that for diabetes

module was 5.38 which were statistically significant. Similar significant improvement in the mean scores of experimental ('WhatsApp') group were observed in a study by Barhoumi[7] In another study by Amry, there was an average improvement of 4.8 in average score in 'WhatsApp' intervention group.[6]

However a study by Gon et al revealed that there was no significant improvement in the marks after using 'WhatsApp' as a medium for teaching learning modality.[9] In their study the learners with WhatsApp as a learning tool scored in the range of 5-20 marks while those with didactic lecture scored in the range of 3-17.5 marks and had an average of 11.6 and 11.9 score respectively.[9]

The participation rate for the various modules ranged from as low as 10.2% to 73.5%. Though the first module had a good response, the participation rate could not be sustained. Also several reminders had to be given to the students to send in their response. The case studies on Tuberculosis were reported to be difficult, and that could be the reasons for poor participation in online discussion. For the two modules on epidemiological study designs and sampling methodology, the participation dropped drastically in the second round of case studies. It is probable that the students were overwhelmed with the number of case studies that they had to respond. It is therefore important to have an optimum number of case studies for each module, sent over a period of time.

In present study the students expressed the usefulness and relevance of 'WhatsApp' as a study tool overall and few even emphasized on its utility especially for exam preparation by referring the model answer on their devices. Few students felt concerned about answering in group, and felt comfortable in individual discussion on 'WhatsApp'.

Gon et al in their study state that technical, educational and instructional advantages of teaching learning activity via 'WhatsApp' far outweigh its disadvantages.[9] Facilitator's availability (86.72%)and learning anytime anywhere (86.55%) were top two advantages of learning through 'WhatsApp' as quoted by these students.[9] Message flooding (63.23%), time consuming (75.28%) and eye strain (68.53%) were the other technical disadvantages observed in the study by Gon.[9] The results of the study by Amry showed that 'WhatsApp' is a good tool for mobile learning when it is used in a blended course strategy and was preferred over face-to-face, in-class discussion in regard to completing course activities.[6]

In the present study, the biggest challenge was the time factor. It is a time consuming and challenging task to design the case studies. The student's participation rate could not be sustained and decreased over time. Also the student's required to be given several reminders to send in their responses. It was difficult to respond to each and every individual student's response and give them individualized feedback.

The limitations of the study are the small sample size, since total number of students in the sixth semester available for the study was itself small. It was difficult to ensure 100% participation of the students not only for implementation, but also for evaluation of the project. The views of the students who did not participate in any of the discussions could not be obtained which could have given more insight to the reasons for poor participation.

Though the students feel that this sort of discussion was helpful and enriching, the participation of the students in terms of response rate to the questions decreased over the course of the implementation. In terms of knowledge there definitely has been an improvement amongst the students who participated in the discussion. On a more objective note, using the criteria set for effectiveness, the present study meets all the three criteria i.e. the pre-test and post test score showed a statistically significant difference at 95% confidence interval in both the modules that were assessed for change in knowledge levels ; average participation rate was 36% as against the criteria of at least 30% of the students participate in the online discussion; and 88% reported the intervention to be effective as against the set criteria of at least 50% students report 'WhatsApp' as a satisfactory tool for teaching-learning.

Classroom discussions should form an integral part of this modality. An initially post on the topic to stimulate their interest; followed by a classroom discussion on the topic could be the first step. This could be followed by online discussion through case studies to assess their understanding of the subject followed again by a classroom discussion to discuss the answers. However time is the biggest challenge for implementing this, because of the vast syllabus.

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