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| Quick Response Code: |
|  |
| Website: www.jehp.net |
| DOI: 10.4103/jehp.jehp_30_18 |

Feasibility, effectiveness, and students' attitude toward using WhatsApp in histology teaching and learning

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Abstract:

OBJECTIVE: The present study assessed the feasibility, effectiveness, and students' attitude toward histology teaching using WhatsApp.

MATERIALS AND METHODS: We conducted 6 months of histology teaching session on a "Histology learning WhatsApp group" consisting of 250 1st-year medical graduate students at Dr. S.N. Medical College, Jodhpur. A teacher posted a digital image of histology slides created using a mobile camera; a slide diagram sketched using hematoxylin and eosin pencil, identification points, and detail description of slide followed by discussion of queries. The feasibility was measured by adequate enrollment of students in the WhatsApp group, drop-out rate during the teaching period, acceptability of the by students based on their feedback, and perception of the teacher. To study the effectiveness, we conducted an online test pre- and posttests after every 2 months. The Student's attitude WhatsApp learning was assessed using the prevalidated feedback questionnaire.

RESULTS: All the 1st-year medical graduate students admitted in the year 2016 enrolled and most of them were actively participated in the discussion conducted on WhatsApp group with zero dropout rate. Students' feedback indicated that students enjoyed learning using WhatsApp with better participation than traditional teaching method. Students liked anytime, anywhere learning using WhatsApp and it helped them to clear doubts. The statistical difference between average pre- and posttest scores (6.54 ± 2.33 and 16.37 ± 3.32 , respectively) were statistically significant.

CONCLUSIONS: We conclude that histology teaching using WhatsApp learning group is feasible, effective, and student-friendly method. It should be used more frequently to complement traditional teaching.

Keywords:

Histology, medical education, WhatsApp

Introduction

Histology is a branch of anatomy which deals with the study of microscopic structure of the cells and tissues in the human body. Conventionally, in medical schools, histology is taught using didactic lectures and practical demonstrations of slides under the microscope. The specific learning objective of histology teaching is that the students should be able to recognize

and label the microscopic characteristics of the cell or tissue. In general, the teacher begins histology teaching by briefing the students about the microanatomy slide and its structure, then drawing the structure on board followed by demonstration of the slide under microscope. Students in small groups then study the slide under microscope and discuss the doubts with the teacher. However, this method has few limitations such as less student interaction and more time-consuming and it is a difficult method for slow learners. Thus, it is

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How to cite this article: Maske SS, Kamble PH, Kataria SK, Raichandani L, Dhankar R. Feasibility, effectiveness, and students' attitude toward using WhatsApp in histology teaching and learning. J Edu Health Promot 2018;7:158.

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Received: 04-02-2018

Accepted: 13-10-2018

the need of today's teachers to move on to new teaching methods. Lately, virtual microscopy has been used as an alternative method to teach histology.^[1,2] In virtual microscopy, digital images of microscopic structures are created and displayed using sophisticated electronic devices and image processing software.^[3] Although virtual microscopy has better time-effectiveness than traditional teaching, it requires substantial financial investment which may not be possible in every set up of medical colleges in India. Moreover, student's participation is also limited. Therefore, there is a need for cost-effective and more interactive teaching method with the use of digital histology slides.

Smartphones have reshaped our lives today. WhatsApp is a widely used social networking smartphone application. In India, WhatsApp has >200 million users; mostly belonging to the young population.^[4] Indian youth spends almost 2 h/day on mobile applications.^[5] Therefore, WhatsApp mobile application can be used as an effective teaching method for Indian students. Previously, WhatsApp application has proven to be effective for teaching geography,^[6] language and writing skills,^[7] and mathematics.^[8] In the previous studies done on medical education, WhatsApp has been demonstrated to be effective in facilitating and improving communication between medical students and teachers.^[9,10] Therefore, the WhatsApp can be a better supplementary method for histology teaching. The digital microanatomy images can be captured using smartphone devices from optical microscope and these images can be easily shared with large number of students using WhatsApp application.

As social media is a part of student's everyday lives, this informal ways of communication would be better accepted by students with better participation. It would be cost-effective as it does not require sophisticated hardware and software as virtual microscopy teaching. With this background, we started our study with objective to find out feasibility, effectiveness, and students' attitude toward WhatsApp as a histology teaching method for 1st-year medical graduate students.

Materials and Methods

The present interventional study was carried out on 1st-year medical graduate students from September 2016 to March 2017 at Dr. S.N. Government Medical College, Jodhpur. We created digital images of histology slides focused under optical microscope ($\times 4$, $\times 10$, and $\times 40$ power) using smartphone mobile camera (iPhone-7 Plus). Multiple photographs of the same microscopic field were taken and the best photograph among them was chosen. Then, for each slide, hematoxylin and eosin (H and E) labeled diagram

was drawn on paper and detail characteristic and identification features were written.

We created a WhatsApp group named as "Histology learning group." We informed and encouraged the 1st-year medical graduate students to participate in this group. All the 250 students joined this group. To manage this large group, five students and one teacher were assigned as group administrators. The teacher involved in this group is an assistant professor in the Department of Anatomy, Dr. S.N. Medical College, Jodhpur. Teacher/instructor possessed >5 years of experience in teaching human anatomy including histology. The participating students were instructed not to post anything apart from academic discussion related to histology on this group. One histology slide image, H and E labeled diagram and microanatomy description of that slide were posted on the WhatsApp group every day. Students were asked to study this material and were given a chance to ask the query on the WhatsApp group [Figure 1]. Then, discussion regarding histology slide was carried out every day. This type of teaching was conducted regularly for 6 months.

This 6 months of histology teaching was divided into three sessions each consisting of 2 months. Session I-General histology; Session II-Systemic part 1 histology topics: Cardiovascular system, respiratory system, and gastrointestinal system; and Session III consisted of systemic part 2 histology topics such as the genitourinary system and central nervous system were covered. Before and after each session online tests, that is, pre- and post-online tests were carried out to assess the teaching and learning effectiveness [Figure 1]. This online assessment tests were carried out using www.Profprofs.com website; each test consisted of 20 questions. Question type were multiple choice questions (MCQs), identify the structure and true or false [Figure 2]. These MCQs were prevalidated with known difficulty and discrimination index. Pretest and posttest online questions were different but having similar structure, almost same difficulty and discrimination index. Each correct answer weighted 1 mark. The online test result was displayed on completion of each of the test immediately and explanation for the correct answer was given at the end of the test. Those securing >50% score were given the completion certificate online as a part of reward [Figure 3]. The pretest and posttest scores for all the three sessions were tabulated in mean \pm standard deviation. The pretest and posttest data were tested for the normal distribution by statistical test: Shapiro-Wilk test using IBM SPSS statistics software (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). All the pretest and posttest data showed, $P < 0.0001$, which accepts the alternative hypothesis and conclude that the data has skewed distribution. Hence, to study the statistical difference between pre- and posttest scores, the

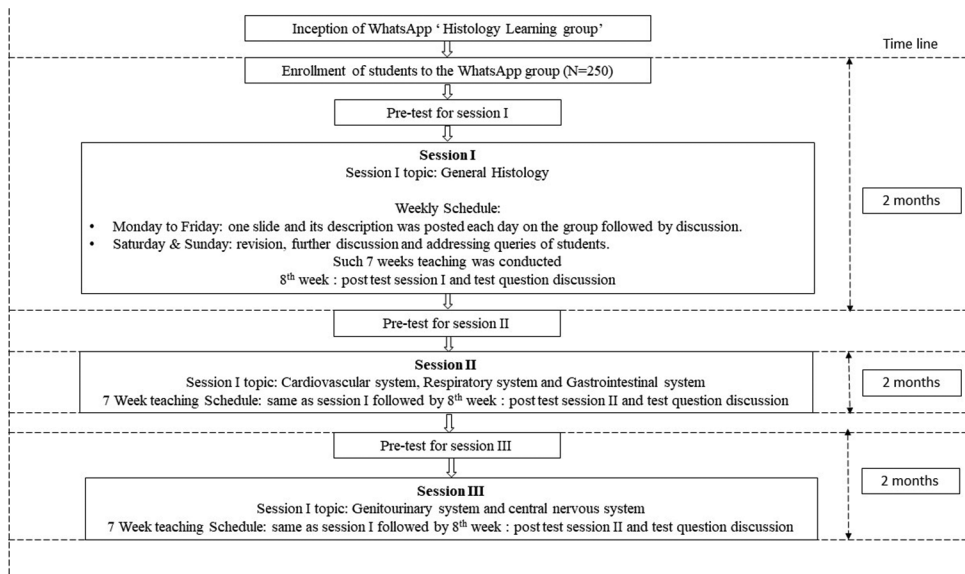


Figure 1: The details of WhatsApp teaching sessions

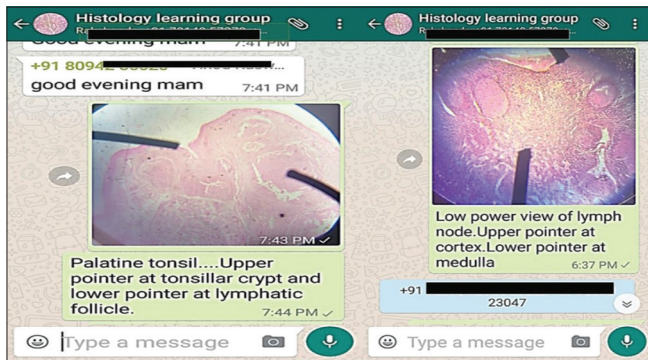


Figure 2: The screenshot of WhatsApp group showing histology slide posted and the description of the slide below it

nonparametric-related sample Wilcoxon signed-rank test was applied used SPSS software.

At the end of completion all the three sessions, that is, after 6 months; the online feedback questionnaire using the SurveyMonkey website was given to all the students to assess student's attitude toward WhatsApp learning. The feedback questionnaire was researcher made and prevalidated using peer teacher review as well as using a pilot study carried out in 1st-year medical graduate students to assess the comprehension regarding the questions. This questionnaire consisted of 10 closed-ended questions to be answered in Likert type scale. Each question was to be rated in the scale of 1–5 (1-strongly disagree, 2-disagree, 3-neutral, 4-agree, and 5-strongly agree). The students were well informed beforehand about the questionnaire to clear their doubts.

Results

At the inception of this study, all the students of the 1st-year graduate batch ($n = 250$) joined the WhatsApp

group. Over the 6 months of implementation of this teaching method, none of the students left the group. Most of the students were actively participated in the discussion carried out on this group.

During three online tests, the number of students participated was 250. The average test results were as follows [Table 1].

The feedback questionnaire results are depicted in Table 2, it showed that students enjoyed WhatsApp learning which helped them to learn and understand subject in a better way. Students liked the anytime and anywhere learning flexibility which was offered by this teaching method. Most of the students reported that they would prefer to learning histology by WhatsApp module [Table 2].

The average score of three pretests was 6.54 ± 2.33 (32.70%). The average score of three posttests was 16.37 ± 3.32 (81.85%). The pretest and posttest scores were compared for each session as well as average of all three sessions using the nonparametric Wilcoxon test. The difference in pretest and posttest for all the sessions was found to statistically significant ($P < 0.0001$).

Discussion

Social media is a new way of communication, very popular among students as well as teachers. Today, students are addicted to social media websites and mobile apps, and it is blamed that these social media sites are wasting valuable time of students. However, this media can be used in more constructive ways for learning as the newer generation is techno-friendly. In the present study, we examined feasibility, effectiveness,

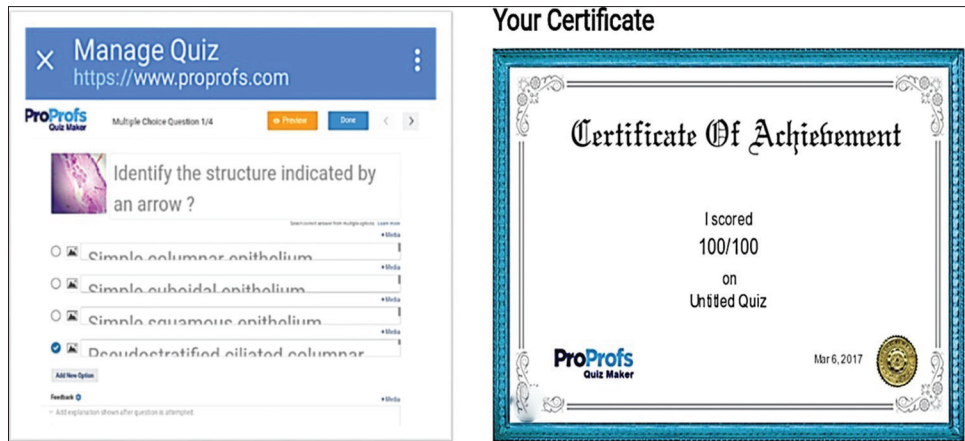


Figure 3: The screenshot of quiz and the certificate of achievement given to the students online

Table 1: The results of pretest and posttest scores

| Test number | Pretest score | Posttest score | P | Z |
|---------------|---------------|----------------|----------|---------|
| Session I | 5.56±2.18 | 15.29±2.78 | <0.0001* | -8.709 |
| Session II | 7.08±2.33 | 16.59±3.36 | <0.0001* | -8.699 |
| Session III | 6.98±2.19 | 17.24±2.48 | <0.0001* | -8.699 |
| Average score | 6.54±2.33 | 16.37±3.32 | <0.0001* | -15.045 |

*P<0.05 statistically significant

Table 2: The average Likert-scale score of feedback questionnaire

| Question | Average score (mean±SD) |
|--|-------------------------|
| I enjoyed learning histology using this method | 3.97±0.52 |
| This method provided enough learning resource for histology (slide description, slide image, and discussion) | 4.03±0.27 |
| It has improved level of participation in learning as compared to histology lecture cum demonstrations | 4.95±0.26 |
| It helped me to improve communication with teachers and colleagues | 4.99±0.08 |
| I liked anytime anywhere learning by this method | 4.96±0.24 |
| I would prefer this method for learning histology | 3.88±0.33 |
| It boosted my confidence in histology practical | 3.86±0.46 |
| This method helped to clear subject doubts | 4.96±0.18 |
| It helped me to study the histology slides without the need of visiting the laboratory/even if I'm absent for that practical | 4.96±0.26 |
| It is a cost-effective method of learning | 3.89±0.47 |

SD=Standard deviation

and students' attitude toward WhatsApp mobile application as histology teaching method.

Feasibility of teaching method is objectively and rationally study the practicality of implementation of the proposed method, to identify the resources required for implementation, and ultimately evaluates the strengths, weaknesses, and the method's potential for success.^[11] Therefore, for the present study, we measured feasibility by adequate enrollment of students in the WhatsApp group, drop-out rate during the teaching period, acceptability of the students based

on their feedback, and our perception as a teacher or coordinator. All 250 students enrolled in the WhatsApp group and none of them left the group during 6 months of teaching. Most of the students actively participated in the discussion. The student's feedback as discussed later also showed WhatsApp teaching as acceptable way for teaching histology. As a teacher, we perceived that the implementation of this method as teaching was easy and workable. The resources required, that is, smartphones were already available with students and teachers. Taking good-quality photographs from focused slide under optical microscope with mobile camera needs practice, but it is doable. Therefore, the WhatsApp teaching for histology is a feasible method.

Effectiveness is the evaluation of decided, decisive, or desired effect after an intervention. In the present study, to assess effectiveness, we used pretest-posttest design. The results of pretest and posttest examination showed that there was a significant improvement in the test scores after the intervention. Therefore, we conclude that WhatsApp was effective teaching method for histology teaching. Gon and Rawekar in 2017^[12] conducted an interventional study for testing effectiveness of WhatsApp as pathology teaching aid found that WhatsApp better but not superior than the didactic lectures.^[13] Dyavarishetty and Patil in 2017^[14] conducted an interventional study to test the effectiveness of WhatsApp as community medicine teaching, and the results depicted that there was significant improvement in student's knowledge as assessed by pretest-posttest pattern. Similarly, studies conducted by Mohanakrishnan K *et al.* in 2017 on medical graduates,^[15] So S in 2016 at teacher training institute,^[16] and Alsaleem in 2004 on journalism students^[17] showed effectiveness of WhatsApp as a teaching method.

The third objective of the present study was to assess students' perception regarding the WhatsApp as teaching method, for this questionnaire was given to

the students. It suggested that students enjoyed learning using WhatsApp, they have better level of participation as compared to traditional method to clear their queries regarding the histology. WhatsApp teaching method boosted their confidence in histology as they received the slide photographs and the discussion readily available in their mobile which they can retrieve any time and learn histology anytime. Moreover, students preferred this method for learning histology. Thus, the questionnaire-based results of the present study show that students had positive attitude toward WhatsApp learning than the traditional teaching-learning method. A questionnaire-based study conducted by Mohesh and Meerasa^[18] to study the perception of learning physiology by mobile learning method showed similar results with immediate acceptability among students. Similar results were depicted by Aburezeq and Ishtaiwa in 2013^[19] and Ranjan *et al.* 2017^[20] in a questionnaire-based study.

During this study, we as a teacher perceived some advantages and disadvantages of WhatsApp teaching method. First of all, WhatsApp is already being used by teachers and students, so both were acquainted with its use; so it created positive atmosphere among 1st-year medical graduates. WhatsApp group increased sharing of educational material between students which helped students to work as a team. Even if the student is absent for the practical classes, WhatsApp discussion helped them to keep away from worries regarding that specific practical. Easy accessibility to learning materials, readily approachability and availability teachers, learning anytime anywhere, and possibility to correct mistakes immediately provide a secure environment. These were some of the advantages of WhatsApp learning.

We also experienced few disadvantages of WhatsApp learning. Teacher needs to give extra time and attention. Sometimes, the teacher has to witness irrelevant messages such as student's posts regarding wishing birthday, festival wishes, message flooding, and coarse behavior which may cause discomfort. As it was a large group, the proper monitoring of individual student's participation in the discussion is not possible. In accordance with our experience, Heinze and Procter (2006) underlined similar disadvantages with online learning like too much communication, off-topic communication, and zero communication.^[21] Lohitashwa *et al.*^[22] narrated the similar advantages and disadvantages.

There were few limitations of the present study. One of the major limitations of the study was to test effectiveness of control group who did not receive WhatsApp teaching should have been added, but when we instructed students regarding WhatsApp group all the students from 1st-year medical graduate class participated. It would have been unethical to deprive

some students from learning through WhatsApp for this study. Therefore, we could not add a comparison group. The second limitation was a large group. It was a very preliminary type of study and need more time and continuous efforts to see long-term effects. However, overall activity was very much interactive during project work. Students requested us to continue further using WhatsApp for teaching. In the present study, to access feasibility, we used perception of teacher or coordinator as one of the criteria, but the standard approved evaluation tool would have been a better option.

One of the challenges faced by us during this study was the absence of Wi-Fi connection within the college campus and students had to use mobile data to upload the learning material. Hence, some students could not get the material immediately.

Conclusion

Hence, we conclude that histology teaching using WhatsApp is a feasible, effective, and highly acceptable teaching method for 1st-year medical graduate students. WhatsApp teaching can be positively used in progressively expanding the tissue knowledge and also in other disciplines of medicine. The study also highlights the potential advantages and disadvantages of WhatsApp teaching. It is a very preliminary type of study and needs more time and continuous efforts to see long-term effects.

Acknowledgment

I would like to express my special thanks of gratitude to all the participants in the study, that is, 1st-year medical graduate students for their active and enthusiastic participation in this study. Second, I would also like to thank the all the senior residents, junior residents, and nonteaching staff of Department of Anatomy, Dr. S.N. Medical College, Jodhpur, for their constant support.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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