Perception towards Problem Based Learning among Medical Students of a Private Medical College in South India

Nitin Joseph1*, Sharada Rai2, Animesh Jain1, Maria Nelliyanil3 and Shashidhar M. Kotian1

1Department of Community Medicine, Kasturba Medical College, Light House Hill Road, Manipal University, Mangalore, India.
2Department of Pathology, Kasturba Medical College, Light House Hill Road, Manipal University, Mangalore, India.
3Department of Community Medicine, A.J. Institute of Medical Sciences, Mangalore, India.

Authors’ contributions

This work was carried out in collaboration between all authors. Author NJ designed the study, wrote the protocol and wrote the first draft of the manuscript. Author SR revised the article on technical aspects and did manuscript review. Author AJ helped in manuscript editing and review. Author MN managed the literature searches and author SMK performed data analyses of the study. All authors read and approved the final manuscript.

ABSTRACT

Introduction: Meeting the changing demands in medical education requires implementation of innovative teaching methods. Problem based learning (PBL) was introduced for the first time for teaching Community Medicine at Kasturba Medical College, Mangalore. The objective of this study was to obtain students’ perception towards this learning experience so as to evaluate its potential benefits.

Study Design: Cross sectional study.

Place and Duration of Study: This study was done in a private medical college between June to November 2014.

*Corresponding author: Email: drnitinjoseph@gmail.com
Methods: It was conducted among final year medical students. PBL was introduced to a randomly chosen group of students and their perception towards this learning experience was obtained. The assessment was done using a standardized questionnaire containing responses in a five point Likert scale ranging from strongly agree to strongly disagree.

Results: Mean age of the 54 participants was 21.4±1.0 years. Majority were females 33(61.1%) and were Indians 45(83.3%). Majority of students strongly agreed to most parameters under application of knowledge base, clinical reasoning, decision making skills, self-directed learning and collaborative work experience in PBL tutorials. Similarly feedback regarding standard of PBL exercise, self/peer performance and facilitator performance in the PBL tutorials was strongly agreed to be satisfactory by majority of participants. However 24(44.4%) of them found PBL to be time consuming. Greater proportion of males felt that their contribution was not satisfactory during sessions (p=0.049).

Conclusion: Students feedback towards PBL was found to be satisfactory in all aspects. Few barriers like demotivation on the part of male participants needs to be resolved by facilitators so as to improve output in PBL sessions.

Keywords: Problem based learning; perception; medical students.

1. INTRODUCTION

Traditionally training of under graduates in Community Medicine has been by means of didactic lectures. Students taught in this system have been found lacking in appropriate problem solving or clinical decision making skills that are essential to be primary care physicians [1,2]. The present teacher centered education model would not provide medical students optimal opportunities to learn processes needed to identify common health problems in the community and to frame effective interventional strategies. Also the current traditional lecture based learning has been criticized as lacking the ability to connect basic sciences with clinical sciences [3]. Therefore to meet the changing demands in medical education implementation of different training methodologies followed by feedback becomes important. Hence an effort to bridge the gaps in student learning in Community Medicine and attempt to introduce PBL into the curriculum was done.

PBL which was first introduced in 1960s at McMaster University Medical School in Canada, involves a student centered learning approach where students take active responsibility for their learning [4-6]. It is based on four modern insights namely constructive, collaborative, self-directed and contextual aspects in learning. PBL uses ill structured case scenarios. Learning occurs in a collaborative environment augmented by discussion, arguments, presentation and listening to each other’s viewpoints during sessions. Explanation of material to others brings about cognitive elaboration in learning among participants [7]. Thus PBL stimulates learning at higher level and is found to complement other teaching methodologies like case based learning (CBL) very well. PBL provides for CBL a vehicle for putting its philosophy into practice [8]. PBL aims for students to be able to successfully use knowledge and generic skills acquired during problem solving in a variety of circumstances including solution to medical problems which makes PBL unique in itself [9]. The objective of this study was to obtain students’ perception towards this new learning experience so as to evaluate the potential benefits of PBL.

2. METHODS

This study was done among 7th semester final year MBBS students of Kasturba Medical College, Mangalore. This study was approved by the institutional ethics committee. The study was conducted between June to November 2014. It is during this period that students of 7th semester have clinical postings in Community Medicine in batches of 50 students each every month. Each batch is further divided into five subgroups of 10 students each. Each subgroup have to present a medico social case, bed side every day followed by lectures by the tutors in the hospital wards. A sub group of students chosen simple randomly formed the study group in PBL intervention and were given an exercise on malaria. Similarly another sub group was chosen to participate in a PBL exercise on tuberculosis. The remaining 40 students in each round of PBL session constituted the control group. The study group were briefed about the objective of the study and written informed consent were taken for their participation. These students were given a 30 minutes orientation on PBL methodology using
power point slides by the tutor. This was followed by a 10 minutes question answer session and discussion in rounds among participants on PBL methodology using validated MCQs shown on power point slides. Each PBL session consisted of a brainstorming session followed by a presentation session. The entire PBL session was modelled as per the Maastricht “seven jump” process using validated PBL exercises [10].

After the presentation session students were administered a validated modified version of standardized feedback form [11] so as to share their PBL tutorial experience. It contained 49 statements to assess perception under areas like application of knowledge base, clinical reasoning and decision making, self-directed learning and collaborative work in PBL session. It also included statements on perception towards peer performance, tutor’s performance and on PBL exercise given in the session.

The students recorded their responses on a 5 point Likert scale; 5 point for strongly agree and 1 for strongly disagree. Demographic information on age, gender, nationality and previous experience in PBL of the participants were also collected.

Data entry and analysis was done using Statistical Package for Social Sciences software package (SPSS Inc., Chicago, IL) version 16. Chi square test was used test association. $p \leq 0.05$ was taken as statistically significant association. The overall response rate was 100% represented by 54 students. The results of Cronbach’s alpha coefficient ($\alpha = 0.91$) indicated that the items had high reliability.

3. RESULTS

The number of participants in the brainstorming session was 77. Of them 54 took part in the presentation session. The 23 drop outs were excluded from this study and the perception towards PBL was obtained from the remaining 54 participants. The mean age of these participants was $21.4 \pm 1.0$ years. Majority were females 33(61.1%) and were Indians 45(83.3%). None of them had previous exposure to PBL. However 20(37%) students were previously exposed to CBL.

Maximum agreement regarding application of knowledge base in PBL tutorials was for role of PBL in elaboration of prior knowledge through cooperative discussions (Table 1).

Most participants felt that PBL paves way for active involvement in the class (Table 2).

Most participants felt that PBL helps in better retention of knowledge (Table 3). Of the total participants, 24(44.4%) reported that PBL methodology was a time consuming method.

The quality of exercises provided in the sessions was appropriate to the level of final year medical students was agreed by 51(94.5%) participants. The rest 3(5.5%) were neutral in their opinion. Majority 53(98.1%) agreed that exercises had sufficient amount of trigger materials to stimulate discussion. Only one participant remained neutral. The exercises resulted in framing of all learning objectives was agreed by all participants. Discussion of topic was adequate between participants was agreed by 47(87%) while 6(11.1) participants were neutral and was disagreed by one participant. Forty two (77.8%) students agreed that group members were considerate and helped peers who lagged behind. However 9(16.7%) were undecided and 3(5.5%) felt that they received no help from their peers.

Overall group productivity in the session was considered excellent by 50(92.6%) while 3(5.5%) were undecided and one disagreed. Only about one third of the students strongly agreed to adequate student participation in asking critical questions and preparation for presentation sessions and only one fourth towards framing of learning objectives. All the participants felt that feedback by the facilitator was constructive and done in a friendly manner. They also noted that the facilitator constantly monitored the work of leader and scribe (Table 4).

Students aged 22 years and above felt that PBL exercises were appropriate to their level of proficiency ($p=0.015$). Greater proportion of males felt that their contribution was not satisfactory during sessions ($p=0.049$). Even though greater proportion of foreign students strongly agreed that the tutor ensured equal team participation ($p=0.025$), the ability to work productively as a team was strongly agreed by a greater proportion of Indian students ($p=0.006$). Various attributes of PBL were appreciated better by significantly greater proportion of students not exposed to CBL before compared to those who were (Table 5). No other variables were associated with any other parameters assessing perception of PBL among participants.
### Table 1. Perception of participants regarding application of knowledge base in PBL tutorials (n=54)

| Characteristics                                                                 | Strongly agree no. (%) | Agree no. (%) | Neutral no. (%) | Disagree no. (%) | Strongly disagree no. (%) |
|---------------------------------------------------------------------------------|------------------------|---------------|-----------------|------------------|--------------------------|
| PBL exercises helps in development of critical thinking skills.                 | 41 (75.9)              | 13 (24.1)     | 0               | 0                | 0                        |
| PBL enhances my problem solving abilities.                                      | 38 (70.4)              | 16 (29.6)     | 0               | 0                | 0                        |
| PBL elaborates my prior knowledge through cooperative discussions.              | 42 (77.8)              | 12 (22.2)     | 0               | 0                | 0                        |
| The self-directed learning period in PBL helps me in acquiring new information. | 37 (68.5)              | 16 (29.6)     | 1 (1.9)         | 0                | 0                        |
| PBL session are more interesting than traditional teaching methods.              | 39 (72.2)              | 10 (18.5)     | 5 (9.3)         | 0                | 0                        |
| PBL helps in enhancing my clinical approach.                                    | 27 (50)                | 18 (33.3)     | 9 (16.7)        | 0                | 0                        |
| PBL provides insight on clinical correlation and integration of knowledge with basic sciences. | 34 (63)                | 18 (33.3)     | 2 (3.7)         | 0                | 0                        |
| I could make connections between related subjects while studying.               | 32 (59.3)              | 19 (35.2)     | 3 (5.5)         | 0                | 0                        |
| PBL relates concepts to everyday activities and improve their understanding.    | 23 (42.6)              | 21 (38.9)     | 10 (18.5)       | 0                | 0                        |
| I would like to have more of PBL tutorials than traditional teaching methods in learning the subject. | 34 (63)                | 12 (22.2)     | 7 (13)          | 1 (1.8)          | 0                        |

### 4. DISCUSSION

The various benefits of PBL such as to improve ability to apply concepts of basic sciences to clinical situations, more interesting than didactic lectures, increased class participation, improvement in self-learning and enhancement of clinical reasoning abilities, improvement in communication skills, obtaining new information and hence need for replacement of didactic classes by PBL, suggested by most participants in this study was similar to that reported by medical students in other studies [1,12-15]. This supports the fact that PBL leads to self-directed learners an important skill required to be successful.

Prior studies [16-18] have also found that students in a PBL curriculum borrowed more books from the library than students in
conventional curriculum schools which suggest that PBL students take more personal responsibility for their learning and are hence more independent learners [19].

PBL sessions like any other teaching methodologies may have few drawbacks. For instance, 24(44.4%) participants in this study felt that it consumed a lot of time which was supported by views of majority of students in other studies too [1,12-15,20]. Moreover PBL may not be ideal to be introduced early in medical curriculum when students are in a process of adjusting to professional school. They may therefore lack confidence and maturity needed to excel in PBL based course. Anxiety and insecurity while learning has been reported by Brazilian medical students learning in the context of PBL [21]. Exposing students to simulations in PBL tutorial sessions could be beneficial to reduce anxiety [21].

| Characteristics                                                                 | Strongly agree no. (%) | Agree no. (%) | Neural no. (%) | Disagree no. (%) | Strongly disagree no. (%) |
|--------------------------------------------------------------------------------|------------------------|---------------|----------------|------------------|--------------------------|
| PBL exercises are so framed to discriminate important information of the topic discussed from that which is not. | 22 (40.7)              | 23 (42.6)     | 7 (13)         | 2 (3.7)          | 0                        |
| The trigger in PBL exercises helps to stimulate discussions                    | 30 (55.6)              | 24 (44.4)     | 0              | 0                | 0                        |
| PBL exercises helps to formulate strategies to analyze the data and generate possible solutions. | 35 (64.8)              | 17 (31.5)     | 2 (3.7)        | 0                | 0                        |
| PBL exercises helps to prioritize the patient's problems.                     | 23 (42.6)              | 22 (40.7)     | 7 (13)         | 2 (3.7)          | 0                        |
| PBL tutorials help to generate alternative diagnostic hypothesis.             | 20 (37)                | 28 (51.9)     | 6 (11.1)       | 0                | 0                        |
| PBL tutorials helps in following a sequential management of patient's problems. | 18 (33.3)              | 32 (59.3)     | 4 (7.4)        | 0                | 0                        |
| PBL tutorials helps to make decisions in unfamiliar situations.               | 13 (24.1)              | 26 (48.1)     | 15 (27.8)      | 0                | 0                        |
| PBL is an effective strategy to enhance communication skills.                 | 37 (68.5)              | 12 (22.2)     | 5 (9.3)        | 0                | 0                        |
| PBL paves way for active involvement in the class.                            | 40 (74.1)              | 12 (22.2)     | 2 (3.7)        | 0                | 0                        |
| PBL tutorials helps to develop skills in group learning.                      | 34 (63)                | 18 (33.3)     | 2 (3.7)        | 0                | 0                        |
| PBL sessions can help students in building a high professional competency.    | 27 (50)                | 13 (24.1)     | 14 (25.9)      | 0                | 0                        |
| PBL exercises helps to establish learning goals.                              | 30 (55.6)              | 21 (38.9)     | 3 (5.5)        | 0                | 0                        |
Facilitators' performance is another aspect which determines success of PBL sessions. In a Nigerian study, 55% participants reported that PBL sessions could have been better organized and training of facilitators should have been better [15]. As teachers are accustomed to delivering lectures rather than facilitating PBL sessions as reported in Brazil [21], their development using methods like fishbowl techniques could be very effective [22].

To further improve student output in PBL, the session should be facilitated by subject matter experts [23]. This was shown to result in framing of more learning objectives, improvement in time spent on self-directed study and achievement of better academic performance among PBL participants than students guided by non-expert tutors [23,24]. This is attributed to better knowledge and deeper understanding of the objectives to be mastered by the students on the part of subject experts. The non-expert tutors on the other hand would evaluate the group functioning more often [23]. Framing of integrated exercises based on concepts from pre, para and clinical subjects and involving content experts from different fields to facilitate discussions would broaden the scope of PBL discussions and depth of student learning [21].

In a Nigerian study, 92% students felt that heavy workload and time consumed on the part of the learner were the main drawbacks of the PBL pedagogy [15]. These issues can be resolved by training students in time management skill and the faculty in facilitation skills.

Poor student motivation and evaluation problems were other problems encountered by tutors in a study done in the Nanded, India [1]. In the present study too, the number of students from brainstorming session of 77 dropped to 54 in presentation session probably due to poor motivation. The unequal group participation was another issue raised in the study done in Malaysia which was also seen in this study especially among male participants [12].

Studies on the motivational effects has proved that superficial and irrelevant discussions, probably caused by students who were less motivated, inhibits student learning [25]. These problems can be resolved by training the staff for becoming better facilitators and counsellors for PBL sessions. They should also master the skill to recognize cognitive attitudes and motivational problems among participants and offer solutions.

Table 3. Perception of participants regarding self-directed learning and collaborative work experience in PBL tutorials (n=54)

| Characteristics                                      | Strongly agree no. (%) | Agree no. (%) | Neural no. (%) | Disagree no. (%) | Strongly disagree no. (%) |
|------------------------------------------------------|------------------------|---------------|---------------|------------------|--------------------------|
| Self-directed learning                                |                        |               |               |                  |                          |
| These exercises paved way to read diverse and recent bibliographic sources. | 29 (53.7)              | 18 (33.3)     | 7 (13)        | 0                | 0                        |
| PBL tutorials helps in better retention of knowledge. | 36 (66.7)              | 14 (25.9)     | 4 (7.4)       | 0                | 0                        |
| Self-reliance in learning gets improved by PBL.      | 31 (57.4)              | 22 (40.7)     | 1 (1.9)       | 0                | 0                        |
| Collaborative work                                   |                        |               |               |                  |                          |
| PBL tutorial enhances my ability to work productively as a team member. | 28 (51.9)              | 17 (31.5)     | 7 (12.9)      | 2 (3.7)          | 0                        |
| Such teaching methodology will benefit classmates who lag behind in academics. | 26 (48.1)              | 17 (31.5)     | 9 (16.7)      | 0                | 2 (3.7)                  |
| PBL tutorials helps me to improve my time management skills. | 15 (27.8)              | 15 (27.8)     | 18 (33.3)     | 4 (7.4)          | 2 (3.7)                  |
| The criticisms led to improvement in my attitude.    | 19 (35.2)              | 19 (35.2)     | 14 (25.9)     | 2 (3.7)          | 0                        |
Table 4. Feedback of participants regarding PBL exercise, self/peer performance, facilitator performance in the PBL tutorials (n=54)

| Characteristics | Strongly agree no. (%) | Agree no. (%) | Neutral no. (%) | Disagree no. (%) | Strongly disagree no. (%) |
|-----------------|------------------------|--------------|----------------|------------------|--------------------------|
| Feedback on PBL exercise on malaria/ tuberculosis | 31 (57.4) | 17 (31.5) | 6 (11.1) | 0 | 0 |
| Feedback on peer performance during PBL tutorial | 28 (51.9) | 20 (37) | 5 (9.3) | 1 (1.8) | 0 |
| Group members were patient listeners to each other’s views. | 29 (53.7) | 21 (38.9) | 4 (7.4) | 0 | 0 |
| Each participant respected other’s opinions. | 32 (59.3) | 19 (35.2) | 3 (5.5) | 0 | 0 |
| Active involvement of team members was seen in brainstorming and presentation sessions. | 20 (37) | 21 (38.9) | 9 (16.7) | 4 (7.4) | 0 |
| Preparation for the presentation sessions were adequate by fellow participants. | 8 (14.8) | 22 (40.7) | 16 (29.6) | 7 (13) | 1 (1.9) |
| My contribution was not satisfactory to the group discussion. | 18 (33.3) | 23 (42.6) | 9 (16.7) | 4 (7.4) | 0 |
| Students asked critical questions to check the explanations of content given by other students. | 13 (24.1) | 29 (53.7) | 9 (16.7) | 3 (5.5) | 0 |
| All were serious in their commitment towards framing the learning objectives in the given time framework. | 26 (48.2) | 25 (46.3) | 3 (5.5) | 0 | 0 |
| Participants were open to criticisms and accepted feedback sportively. | 42 (77.8) | 11 (20.3) | 0 | 1 (1.9) | 0 |
| Feedback on facilitator performance | 44 (81.5) | 10 (18.5) | 0 | 0 | 0 |

The other reasons like content knowledge, English proficiency and social relationships between group members which affects students participation needs to be addressed by facilitators so as to bring out better output from PBL sessions [26].

A study done in Saudi Arabia reported that students in PBL have been observed to improve their perception towards it especially with regards to areas like developing communication skills and motivation to study over a period of time [13]. Therefore tutors need to be patient with students and persevere with the newly introduced methods to get better students’ performance after a period of time.

The student feedback was considered as an important exercise for improvement of tutor skills in this study. Most students reported positive perception of tutors’ performance in PBL similar to a study done in South Korea among medical
However in few other studies tutor’s role was not found to be satisfactory [28,29]. Tutor's even though play a role of facilitation in PBL sessions, can stimulate the students’ performance by giving individual feedback after sessions and by their ability to guide students’ learning can enhance their information gathering skills (e.g., simulating students to search for resources). Hence their training is vital for success of PBL sessions.

Table 5. Association between socio demographic variables and prior exposure to CBL with current perception towards PBL among participants (n=54)

| Characteristics | PBL exercises were well framed and was appropriate to level of final year students |   |   |   | Total |
|-----------------|---------------------------------------------------------------------------------|---|---|---|-------|
| Age (years)     |                                                                                  | Neutral | Agree | Strongly agree |       |
| 20              |                                                                                  | 0 (0)    | 4 (50) | 4 (50)         | 8     |
| 21              |                                                                                  | 1 (3.6)  | 16 (57.1) | 11 (39.3) | 28    |
| 22              |                                                                                  | 0 (0)    | 1 (11.1) | 8 (88.9) | 9     |
| 23              |                                                                                  | 1 (14.3) | 1 (14.3) | 5 (71.4) | 7     |
| 24              |                                                                                  | 1 (50)   | 1 (50)   | 0 (0)    | 2     |
| Gender          | During the sessions my contribution was not satisfactory to group discussions | Strongly disagree/ Disagree | Neutral | Agree/ Strongly agree | Total |
| Males           |                                                                                  | 0 (0)    | 7 (33.3) | 14 (66.7) | 21    |
| Females         |                                                                                  | 8 (24.2) | 9 (27.3) | 16 (48.5) | 33    |
| Nationality     | Tutor ensured adequate class participation                                        | Disagree | Agree   | Strongly agree | Total |
| Indian          |                                                                                  | 0 (0)    | 11 (24.4) | 34 (75.6) | 45    |
| Foreigner       |                                                                                  | 1 (11.1) | 0 (0)    | 8 (88.9) | 9     |
|                | Enhanced my ability to work productively as a team member                           | Disagree | Neutral | Agree/ Strongly agree | Total |
| Indian          |                                                                                  | 0 (0)    | 6 (13.3) | 39 (86.7) | 45    |
| Foreigner       |                                                                                  | 2 (22.2) | 1 (11.1) | 6 (66.7) | 9     |
| PBL enhances communication skills |                                                                                  | Neutral | Agree   | Strongly agree | Total |
| Previous exposure to CBL |                                                                                  | 0 (0)    | 8 (40)   | 12 (60)  | 20    |
| Not exposed     |                                                                                  | 5 (14.7) | 4 (11.8) | 25 (73.5) | 34    |
| PBL enhances active involvement in class |                                                                                  | Neutral | Agree   | Strongly agree | Total |
| Previous exposure to CBL |                                                                                  | 1 (5)    | 8 (40)   | 11 (55)  | 20    |
| Not exposed     |                                                                                  | 1 (2.9)  | 4 (11.8) | 29 (85.3) | 34    |
| PBL enhances skills in group learning |                                                                                  | Neutral | Agree   | Strongly agree | Total |
| Previous exposure to CBL |                                                                                  | 2 (10)   | 10 (50)  | 8 (40)   | 20    |
| Not exposed     |                                                                                  | 0 (0)    | 8 (23.5) | 26 (76.5) | 34    |
5. CONCLUSION

The findings of this study prove that students are satisfied with PBL methodology. The great majority of students believed that PBL enhanced their critical thinking, team work, interest to learning and leadership skill. This study revealed that students perceive PBL as an effective tool that enhances their responsibility for self-learning, professionalism and effective communication skills.

The favourable responses to PBL supports its usage as a useful learning methodology in medical schools and that too for learning Community Medicine. The few challenges and barriers raised needs close monitoring and resolution. This is in line with the promotion of evidence based educational practices in medical schools. This would make PBL widely applicable for its use so as to bring out better quality doctors.

6. LIMITATION

The limitations of our study was that problem based learning was only implemented among few students of final year in a medical college. We therefore recommend more such studies done with larger representation of students from first to final year to get a complete perception towards PBL among medical students. Perception of participants in the control group could not be obtained. This aspect will be researched upon in future studies.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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