

Effect of Introduction of 'Research Orientation Module' in Ayurveda Undergraduates

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ABSTRACT

Introduction: Health research is necessary to address community health issues and needs even in enhancing health care. Anyone involved in medical science must understand research. A long-term approach for the promotion of health research is to target undergraduates.

Aim: The present study is an effort to develop a time bound 'Research orientation module' with the aim to orient Ayurveda undergraduates about the basics of research and providing them hands-on training to develop primary proposal writing skills.

Materials and Methods: It was an educational interventional study. It was conducted in two phases. In phase I and II, 160 and 56 students of II, III, and IV years Bachelor of Ayurvedic Medicine and Surgery (BAMS) respectively were enrolled. The students were exposed to research orientation module. The pretest, posttest, and feedback was taken and students were asked to prepare a research proposal on their topic of interest. The data is represented in mean and standard deviation. As the

data followed normal distribution, parametric tests were used to analyse the data. Intergroup comparison was done with one-way ANOVA test. The paired t-test was used to check mean differences between groups.

Result: In all batches, the mean posttest score (15.02±2.63) was significantly higher than pretest score (1.44±0.65) which showed improvement in knowledge. The mean proposal evaluation score was increased in all batches after students participated in workshops, but the IV year students score (12.83) was significantly increased in comparison with II year (9.92) and III year (10.53) students' score. With the aid of the students' feedback, the workshop evaluation was completed. Positive feedback and an interest in learning about the fundamentals of research were apparent.

Conclusion: It can be concluded that 'Research orientation module' is effective in educating Ayurveda undergraduates about the basics of research and it is helpful in developing proposal writing skills in Ayurveda undergraduates.

Keywords: Medical undergraduates, Orientation, Proposal writing, Research module

INTRODUCTION

Health research is necessary to address community health issues and needs even in enhancing health care. We have moved into an era of Evidence-Based Medicine (EBM), which has an objective to change current medical practice by applying evidence obtained through scientific methods [1]. Anyone involved in medical science must understand research. For the purpose of promoting health research, undergraduate students must be the objective [2,3].

Research is given the lowest priority in India [4]. The key factor for the decreasing number of medical researchers all over the globe is a lack of research skills training [5]. A thorough understanding of research methodology not only improves students' problem-solving abilities but also encourages them to pursue research as a career [6]. Indian Council of Medical Research (ICMR) has opened the doors through initiation of Short-Term Studentship (STS) projects for undergraduates, even so it is only restricted to medical and dental students with no opportunity to foster research skills for undergraduates of other health fraternity [7].

With the goal of introducing research at the undergraduate level, the 'Central Council of Indian Medicine (CCIM)' a statutory body to monitor higher education in Ayurveda initiated a subject of 'Research Methodology and Biostatistics' for final BAMS in 2016 [8], although, it is limited to rote learning without any 'hands-on outcome'. According to a study by Shilpashree YD et al., lack of inspiration and knowledge about the research are key factors of non involvement of undergraduates in research [9].

In our institute, students are motivated to STS projects by providing intramural grant, but they are not oriented about the basic knowledge of project preparation. There is a huge scope of research in Ayurveda but the enormous potential group of

undergraduates are deprived of research. To the best of our knowledge, no any study has been conducted in Ayurveda institutions regarding effect of introduction of basic health research orientation to undergraduates.

The present study is an effort to develop a time bound 'Research orientation module' with the aim to orient Ayurveda undergraduates about the basics of research and providing them hands-on training to develop primary proposal writing skills. The research protocol for this study has already been published [10].

MATERIALS AND METHODS

This interventional study was conducted at School of Health professions education and Research. DMIMS (DU) and Mahatma Gandhi Ayurved College from Sept 2019 to Oct 2021. The study was commenced on obtaining the Institutional Ethics Committee approval (Ref no: DMIMS(DU)/IEC/Aug-2019/8189).

The study was conducted in two phases. In phase I, the Google form was sent to all students (180 students of II to IV year) to assess their basic knowledge and attitude about research through structured questionnaire. Out of that, 160 students were responded.

In phase II, sample size was calculated with following formula (Comparing two proportion Paired- before after). We carried out a pilot study with 12 students (4 from each year) to determine the sample size. According to the findings, basic knowledge was estimated to be 5%, and an intervention was expected to result in a 60% improvement.

$$D = \frac{\mu_A(1-\mu_B)}{\mu_B(1-\mu_A)}$$

$$\pi \text{Discordant} = \mu_A(1-\mu_B) + \mu_B(1-\mu_A)$$

$$N_{\text{pair}} = \frac{\left(Z_{1-\frac{\alpha}{2}}(1-\phi) + Z_{1-\beta}\sqrt{(\phi+1)^2 - (\phi-1)^2\pi_{\text{Discordant}}} \right)^2}{(\phi-1)^2\pi_{\text{Discordant}}}$$

μ_A =Expected proportion of outcome before the study=0.05% (Assumed before)

μ_B =Expected proportion of outcome after the study=0.65% (Assumed after)

Z (table value at $\alpha=0.01$)=2.326 (one tail)

Z (table value at $1-\beta=0.90$)=1.282

$$\phi = \frac{0.05 \times (1-0.65)}{0.65 \times (1-0.65)} = 0.0271$$

$$\begin{aligned} \pi_{\text{Discordant}} &= 0.05 \times (1-0.65) + 0.65 \times (1-0.05) = 0.644 \\ &= \frac{(2.326 \times (1-0.0271) + 1.282 \times ((0.0271+1)^2 - ((0.0271-1)^2 \times 0.644))^2}{0.0271 - 1^2 \times 0.644} \end{aligned}$$

$N_{\text{pair}}=12$ each

$N_{\text{pair}}=14$ each (considering 10% dropout)

Total 56 students (17 from II BAMS, 21 from III BAMS and 18 from IV BAMS) were selected on the basis of inclusion criteria and they were exposed to 'Research Orientation Module'

Inclusion criteria:

In phase I, all students of II, III, and final BAMS were included

In phase II, following three criteria were applied.

Students having $\geq 60\%$ marks in MCQs of the questionnaire

Students agree or strongly agree on 60% of attitude assessment items.

Students who scored $\geq 60\%$ in the previous year's university examination. To preserve uniformity in sample variability and to prevent bias, the 60% criterion was used.

Exclusion criteria:

I BAMS students as they are novice in this field

The students who were involved in UG STS projects

Those who were not present for all three days of the workshop

Those who did not submit pre or postworkshop research proposal

The following material was prepared before initiating the study.

Questionnaire to assess student's knowledge and attitude of research:

The researcher worked with the education unit's expert team to develop the well-structured questionnaire that was then validated. Five questions were designed for knowledge assessment and attitude was assessed with the help of nine items on Five Points Likert scale [Annexure-1]. The reliability of the questionnaire was calculated with Cronbach alpha which was 0.73 showing acceptable reliability. It was piloted on 10 students.

Research orientation module: It was six hours teaching module (2 hours/day for consecutive 3 days) comprising of interactive lecture and group activity and assignments. It was prepared by the researcher, considering the basic knowledge needed for proposal writing. It was validated by the experts of our University education unit. The contents of the module for three days were as follows:

Day 1- Introduction of Research and its rationale, Steps in Research, 'FINER' criteria, Key points of literature search, PICO

Day 2- Study types, study design, designing different studies

Day 3- Importance of biostatistics in research and concept of data, basics of sample size and sampling methods Steps of proposal writing

Pre-posttest questionnaire to assess students' knowledge [Annexure-2]:

It was prepared by a researcher and approved by education unit professionals. Cronbach's alpha was used to calculate reliability, and the result of 0.83 indicated adequate reliability. Twelve students participated in the piloting. Questionnaires for the pre- and

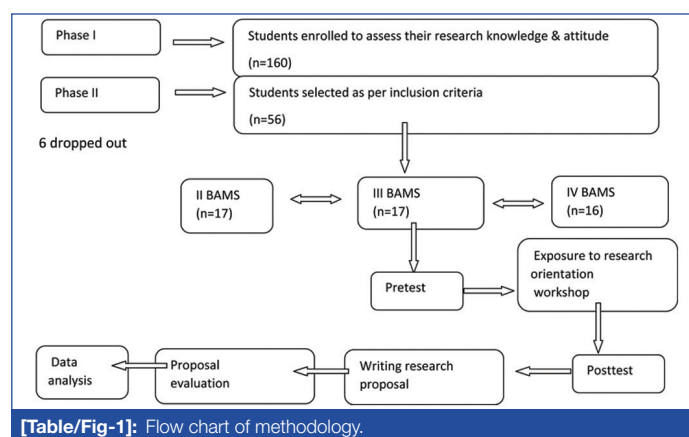
posttest were identical. On the basis of the material of the research module, 12 questions totalling 20 marks were created.

Evaluation committee of six experts was formed to evaluate research proposal on the basis of provided checklist. Total 15 marks were allotted in research proposal checklist.

Participant's feedback form to take their responses on 4 point Likert scale and open-ended questions [Annexure-3] for workshop and outcome evaluation. It was devised by researcher and validated by the expert team of education unit.

Methodology [Table/Fig-1]:

All students (180 students) of II, III and IV year of BAMS were included for I phase to assess their research knowledge and attitude. Participation was voluntary. The Google form was prepared to assess their baseline knowledge and attitude about research. It was mailed to all students. Out of 180 students, 160 forms were received. For phase II, total 56 students (17 from II BAMS, 21 from III BAMS and 18 from IV BAMS) were selected on the basis of inclusion criteria. The consent was obtained prior to the study participants being enrolled.



[Table/Fig-1]: Flow chart of methodology.

The students were exposed to pretest to assess their baseline research knowledge before initiation of a workshop. The pretest questionnaire was different from the questionnaire designed for assessment of research knowledge and attitude. Each batch was exposed separately to research orientation workshop. Students were taught by interactive lectures, group activity, assignments and mock projects during the sessions. On the day of completion of workshop, the posttest and feedback was taken and students were asked to prepare a research proposal on their topic of interest within one month. The proposals were evaluated using a prevalidated checklist of total 15 marks. The marks allotted for each component is mentioned in Annexure [Annexure-4].

STATISTICAL ANALYSIS

The software SPSS, version 27 was used for statistical analysis. The data is represented in mean and standard deviation. As the data followed normal distribution, parametric tests were used to analyse the data. Intergroup comparison was done with one-way ANOVA test. The paired t-test was used to check mean differences between groups. The level of significance was kept at $p < 0.05$.

RESULTS

For orientation of the research, total of 56 students were selected. Six students were dropped out due to being unable to attend all sessions. A total of 17 (34%) were from second year, 17 (34%) from third year, and 16 (32%) from final year were completed the study.

The mean pretest and posttest values were compared of II year BAMS students. The paired t-test showed significant differences ($p < 0.001$) in mean pretest and posttest values. The mean posttest scores (15.02 ± 2.63) was significantly higher than pretest score (1.44 ± 0.65). In comparison of mean pretest and posttest values of III year BAMS students, significant difference was found. The

mean posttest I scores (15.31±3.44) was significantly more than mean pretest score (1.02±0.85). There was significant difference (p<0.001) in mean pretest and posttest values in final year also. The mean posttest score (15.08±2.79) was significantly more than pretest score (2.77±1.74). The final year students had the highest mean pretest score of 2.77±1.74 followed by II year (1.44±0.65) and III year students (1.02±0.85) [Table/Fig-2].

Year of students	Pretest (mean±SD)	Posttest (mean±SD)	p-value
II BAMS students (n=17)	1.44/0.65	15.02/2.63	<0.001†
III BAMS students (n=17)	1.02/0.85	15.31/3.44	<0.001†
IV BAMS students (n=16)	2.77/1.74	15.08/2.79	<0.001†
p-value#	<0.001†	0.988	

[Table/Fig-2]: Comparison of mean pretest and posttest of II, III & IV BAMS students.
#One-way ANOVA test was applied to compare the mean pretest score among BAMS students

The post-hoc pair wise comparative analysis was done. When II-year score was compared with III year, a mean difference of 0.41 (95% CI: -1.37-0.54) was seen which was not statistically significant (p=0.551). When II-year score was compared with IV year, a mean difference of 1.33 (95% CI: -0.36-2.30) was seen which was statistically significant (p=0.005). When III-year score was compared with IV year, a mean difference of 1.75 (95% CI: 0.80-2.69) was seen which was also statistically significant (p<0.001) [Table/Fig-3].

Year	MD	95% CI	p-value*
II Year v/s III Year	0.41	1.37-0.54	0.551
II Year v/s IV Year	1.33	0.36-2.30	0.005
III Year v/s IV Year	1.75	0.80-2.69	<0.001†

[Table/Fig-3]: Post-hoc pair wise comparison of mean pretest score among BAMS students.

The mean posttest score was compared among the BAMS students. The analysis done by one-way ANOVA showed no significant difference (p=0.988) in mean posttest score [Table/Fig-4].

Year	MD	95% CI	p-value*
II Year v/s III year	0.3	1.82-2.49	0.7426
II Year v/s IV year	0.07	1.46-2.48	0.9475
III Year v/s IV year	0.23	1.99-2.18	0.8264

[Table/Fig-4]: Post-hoc pair wise comparison of mean posttest score among BAMS students.

The post-hoc pair wise comparative analysis was done. When II-year score was compared with III year, a mean difference was 0.3 (95% CI: 1.82-2.49) which was statistically insignificant (p=0.7426). When II-year score was compared with IV year, a mean difference was 0.07 (95% CI: 1.46-2.48) which was also statistically insignificant (p=0.9475). When III-year score was compared with IV year, a mean difference of 0.23 (95% CI: -1.99-2.18) was not significant (p=0.8264). It indicates near about equal improvement in knowledge.

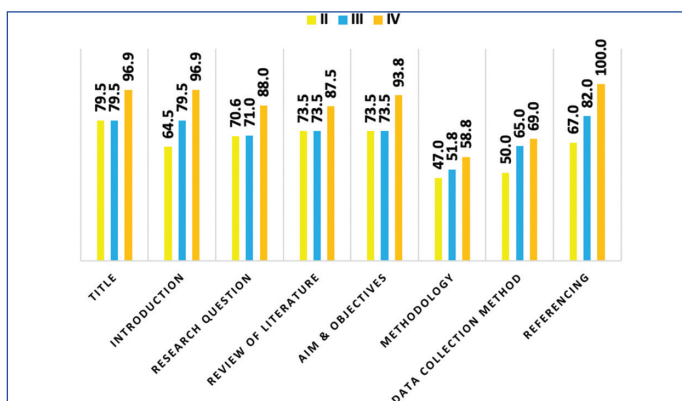
The mean proposal evaluation score after intervention was compared among the BAMS students. The analysis done by one-way ANOVA showed statistically significant differences (p<0.001) in the mean proposal evaluation score. The IV year students had the highest mean proposal evaluation score of 12.83±1.42 followed by III year (10.53±2.13) and II year students (9.92±1.68).

The post-hoc pair wise comparative analysis was done. When II-year score was compared with III year, a mean difference was 0.61 (95% CI: -0.82-2.04) which was not statistically significant (p=0.561). When II-year score was compared with IV year, a mean difference of 2.90 (95% CI: 1.45-4.36) was statistically significant (p<0.001). When III-year score was compared with IV year, a mean difference of 2.29 (95% CI: -0.88-3.70) was also statistically significant (p<0.001) [Table/Fig-5].

Year	MD	95% CI	p-value*
II Year v/s III year	0.61	0.82-2.04	0.561
II Year v/s IV year	2.90	1.45-4.36	<0.001†
III Year v/s IV year	2.29	0.88-3.70	<0.001†

[Table/Fig-5]: Post-hoc pair wise comparison of proposal evaluation score after intervention among BAMS students.

In the analysis of percentage of score in the various components of proposal writing. All the students scored the percentage in the range of 64.5% to 100% in all the components except methodology and data collection method. The score was 47% to 58% and 50-69% in methodology and data collection method, respectively. The score of IV BAMS was higher than II and III BAMS students [Table/Fig-6].



[Table/Fig-6]: Comparison of percentage of score in the components of proposal writing after intervention among BAMS students.

All of the participants agreed that the workshop content was sufficient for basic knowledge of research and easy to understand. All the participants also agreed that the provided learning resource material was beneficial in writing proposal and group activity was helpful in boosting the confidence to write proposal. Only 2 (4%) participants disagreed that time allotted for orientation was sufficient while rest of them felt that time allotted was sufficient [Table/Fig-7].

Questions		Strongly Disagree	Disagree	Agree	Strongly Agree
The workshop content was sufficient for basic knowledge of research	n (%)	0 (0.0)	0 (0.0)	1 (2%)	49 (98%)
The workshop content was easy to understand	n (%)	0 (0.0)	0 (0.0)	3 (6%)	47 (94%)
The provided learning resource material was beneficial in writing proposal	n (%)	0 (0.0)	0 (0.0)	8 (16%)	42 (84%)
The group activity was helpful in boosting the confidence to write proposal	n (%)	0 (0.0)	0 (0.0)	4 (8%)	46 (92%)
The time allotted for orientation was sufficient	n (%)	1 (2%)	1 (2%)	1 (2%)	47 (94%)

[Table/Fig-7]: Responses of participants to questions on workshop evaluation.

Before intervention 27 (50%) participants rated their knowledge about research as poor, 18 (33.3%) as fair and 5 (16.7%) as good. There was good improvement in self-perception of participants about their knowledge of research. After intervention 30 (54.6%) participants rated their knowledge about research as good and 20 (44.4%) as excellent. Before intervention 39 (72.2%) participants rated their knowledge about research protocol designing as poor and 11 as fair (27.8%). There was good improvement in self-perception of participants about their knowledge of research protocol designing. After intervention 30 (55.6%) participants rated their knowledge about research protocol designing as good and 20 (44.4%) as excellent [Table/Fig-8].

For the open-ended items, the responses were coded and categorized. The data has been summarised in [Table/Fig-9].

Your knowledge about research	Poor	Fair	Good	Excellent
Before {n (%)}	27 (50.0)	18 (33.3)	5 (16.7)	0 (0.0)
After {n (%)}	0 (0.0)	0 (0.0)	30 (55.6)	20 (44.4)
Knowledge about research protocol designing	Poor	Fair	Good	Excellent
Before {n (%)}	39 (72.2)	11 (27.8)	0 (0.0)	0 (0.0)
After {n (%)}	0 (0.0)	0 (0.0)	30 (55.6)	20 (44.4)
Confidence to make STS project	Poor	Fair	Good	Excellent
Before {n (%)}	26 (48.1)	15 (27.8)	9 (24.1)	0 (0.0)
After {n (%)}	0 (0.0)	3 (5.6)	23 (42.6)	24 (51.8)

[Table/Fig-8]: Self-assessment of participants about research before and after the intervention.

What did you like about this workshop? (Response 83.17%)	
Components	Verbatim Responses
Content	All the basic things necessary for proposal writing were covered All steps of proposal writing are cleared The workshop's main feature was the practical implications of each component. Good Explanation of each and every topic and concept with an example
Duration	All needed for proposal writing was completed in a short duration.
Teaching style	Interactive session and explanation with examples were key features of the workshop. The way the topic was explained by giving examples was easy to understand. Small group activities were interesting. I liked the interactive portion of the presentation. Delivery of the topic was very good and easy to understand.
Write your opinion to start the workshop for I to Final BAMS (Response 85.58%)	
Yes, it should be conducted for all batches; it will improve knowledge about research. Yes, of course, it must be good having such type of workshop which is so helpful for us in future also. Yes, it will help us to conduct our research work properly and with clarity. It is very necessary to give orientation before making proposal because many students don't know about the research terms that are used. Yes, the workshop should start from I BAMS, because it gives different insights to explore new things It will be quite useful to a few students who are willing to do something different than just completing graduation	
Any suggestion about content and conduction of workshop (45.43%)	
No suggestion, only request to conduct in future No suggestions, it was an overall good experience It should be conducted on a regular basis Time duration of the workshop should be more	

[Table/Fig-9]: Qualitative analysis of student's feedback.

DISCUSSION

This study comprised of both quantitative and qualitative analysis to assess the effectiveness of the intervention. The quantitative design was used to determine mean scores, differences, and relationships among variables. Through the qualitative approach, the open-ended questions in the feedback provided an opportunity for the students to give opinions and reflect on the intervention.

The purpose of assessment was to evaluate the achievement of learning. It helps to develop a prospective plan for improvement in the workshop depending on the results of the assessment. We assessed two domains in our study, the assessment of the cognitive domain done through a pre-post test questionnaire and the skill component was assessed through the evaluation of the research proposal prepared by students.

The mean posttest I scores (15.12 ± 0.3) was significantly increased in all years in comparison with the pretest score (1.74 ± 1.38), which confirms that the research orientation helped all students improve their research knowledge.

This research's conclusions are consistent with the findings of a study by Deo M in which three days workshop was conducted for medical undergraduates that showed a higher gain in knowledge [11]. The study conducted by Nakanekar A et al., for final year BAMS students showed significant improvement in knowledge [12].

The postworkshop proposal evaluation mean score was 65.70%, 73.97%, and 86.35% in II, III & IV BAMS, respectively. The score of final BAMS students was higher than that of II and III BAMS students. It could be due to the subject of research methodology in the final year. Our findings are supported by the study of Mostafa S et al., however in their study, a facilitator was provided to students for proposal writing [13]. In the study, conducted by Mathur M et al., it showed improvement in proposal writing [14].

It is also observed that the students of all batches scored good percentage in all components of proposal but had a low score in methodology and data collection method. It reflects the degree of difficulty of it and hence might be required repeated orientation. This short duration 'Research orientation module might be insufficient for writing of methodology and data collection methods.

Feedback from all the students was taken to evaluate the workshop for its content quality, duration, and teaching method. For outcome evaluation, students had to respond to an improvement in research knowledge, proposal writing skills.

A 100% of participants agreed that the workshop content was sufficient for basic knowledge of research and easy to understand. All the participants also agreed that the provided learning resource material was beneficial in writing proposals and group activity was helpful in boosting their confidence to write a proposal. Only 2 (3.8%) participants disagreed that the time allotted for orientation was sufficient while the rest of them felt that time allotted was sufficient. For all years, 94.4% of students were in favour of good module quality and workshop feasibility. Similar findings were observed in a study by Nusrath A et al., wherein 98.75% of students perceived the importance of research in the medical field and 91.25% of undergraduates were willing to involve in research [15].

In this study, 85.58% students gave positive response to start the workshop for I to Final BAMS. The study of Achi D et al., observed a positive perception of the majority of students for three items-enhancing knowledge, research promoting critical thinking, and enhancing career prospect [16]. The study of Mostafa S et al., observed that students had high levels of satisfaction and gain from the workshop, and the great majority regarded it as an enjoyable experience. It enhanced their research skills and motivates them for future medical practice [13]. A study conducted by Imafuku R in a Japanese setting where they studied the perception of students regarding research and concluded that research enhanced a deeper approach to learning [17].

In the analysis of students' feedback, it was observed that students were satisfied with the contents of workshop. They appreciated the interactive presentation, small group activities and explanation with examples. They told that the workshop helped them to think critically. They suggested conducting it from first year and on regular basis.

It is also widely accepted that creative physician-scientists can be created with the help of developing critical thinking in medical aspirants. History exemplifies how the practice of medicine progressed with the growth of science [18]. It is well known that health undergraduates should learn the research methodology and its practical implications [19].

Limitation(s)

This study only addressed the fundamentals of proposal writing for Ayurveda undergraduates. Long-term effect of research orientation was not determined in the form of number of research proposal submission by the participants.

A study with progressive Research modules (in a hierarchical manner) i.e., initiation and inculcation in I BAMS, consolidation in II BAMS and certification in final BAMS can be conducted, thus spreading the Research skill module pan undergraduate course.

CONCLUSION(S)

From the study, it can be concluded that six hours 'Research orientation module' is feasible to implement in Ayurveda undergraduates. It was effective in educating Ayurveda undergraduates about the basics of research and in developing proposal writing skills in Ayurveda undergraduates.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Sep 02, 2022
- Manual Googling: Nov 17, 2022
- iThenticate Software: Dec 22, 2022 (3%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Aug 28, 2022**

Date of Peer Review: **Oct 31, 2022**

Date of Acceptance: **Dec 23, 2022**

Date of Publishing: **Apr 01, 2023**