

## ORIGINAL ARTICLE

## Scientific attitudes, knowledge and barriers among medical students of a university in Sergipe: a longitudinal study

### *Atitudes, conhecimento e barreiras científicas entre estudantes de medicina de uma universidade em Sergipe: estudo longitudinal*

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**ABSTRACT:** Introduction: Extracurricular activities participation such as research and extension allow students to develop skills. However, the literature reports the existence of barriers to the development of scientific practice in undergraduate courses. Previous studies were able to assess the target population only in a single moment. Objectives: To evaluate longitudinally the levels of knowledge, attitudes and scientific barriers of medical students. Casuistics and Methods: Longitudinal observational study carried out with medical students from Campus Prof. Antônio Garcia Filho of the Federal University of Sergipe. A questionnaire was applied to 23 students at two different times, 2015 and 2017, with 4 sections: Demographic, Scientific Knowledge, Favorable Attitudes to Scientific Practice and Barriers to Scientific experience. Results: In the analyzed period, there was an increase of more than 300% ( $p < 0.0001$ ) in the participation of students in Academic Leagues, as well as with regard to their scientific attitudes (increase of 21.80%;  $p < 0, 01$ ). When assessing knowledge scores and scientific barriers, no difference was observed between the two periods. Although, in the analysis of barriers alone, there was a significant increase ( $p < 0.05$ ) in dedication to curricular activities, lack of familiarity with statistics, and there was also an increase in the percentage of students who did not see the application of research in their future profession. Conclusion: Despite the improvement in attitudes, there was an increase in scientific barriers. Thus, there is a need to reduce the difficulties encountered by students and further encourage scientific practice.

**Keywords:** Health education; Science; Problem-based learning; Medical students.

**RESUMO:** Introdução: A participação em atividades extracurriculares como a pesquisa e extensão permitem o desenvolvimento de habilidades nos estudantes. Entretanto, a literatura relata a existência de barreiras para o desenvolvimento da prática científica na graduação. Estudos anteriores conseguiram avaliar a população alvo apenas em um único momento. Objetivos: Avaliar longitudinalmente os níveis de conhecimento, atitudes e barreiras científicas de estudantes de medicina. Casuística e Métodos: Estudo observacional longitudinal realizado com acadêmicos de medicina do Campus Prof. Antônio Garcia Filho da Universidade Federal de Sergipe. Aplicou-se um questionário a 23 discentes em dois momentos diferentes, 2015 e 2017, possuindo 4 seções: Demográfica, Conhecimento Científico, Atitudes Favoráveis a Prática Científica e Barreiras para vivência Científica. Resultados: No período analisado, ocorreu crescimento de mais de 300% ( $p < 0,0001$ ) na participação de estudantes em Ligas Acadêmicas, bem como no que diz respeito às suas atitudes científicas (aumento de 21,80%;  $p < 0,01$ ). Ao avaliar os escores de conhecimento e barreiras científicas não foi observado diferença entre os dois períodos avaliados. Na análise das barreiras isoladamente, no entanto, constatou-se aumento significativo ( $p < 0,05$ ) da dedicação nas atividades curriculares e falta de familiaridade com estatística, também houve aumento da porcentagem de alunos que não viam aplicação da pesquisa em sua futura profissão. Conclusão: Apesar da melhora das atitudes, houve aumento das barreiras científicas. Sendo assim, percebe-se a necessidade de reduzir as dificuldades encontradas pelos estudantes e estimular ainda mais a prática científica.

**Palavras-chave:** Educação em saúde; Ciência; Aprendizagem baseada em problemas; Estudantes de medicina.

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## INTRODUCTION

Scientific Knowledge aims to understand the organization and functioning of facts and phenomena, constituting itself as a systematic method in seeking to order laws and principles. It is rational and seeks constant review of pre-existing knowledge<sup>1</sup>. In view of the growing production of knowledge, it is necessary for medical professionals to be able to select reliable sources, critically assess and apply them appropriately in their practice, thereby resulting in improved care<sup>2</sup>. These attributes can be acquired through scientific practices<sup>3</sup>.

The very important ability to think scientifically and be able to continuously acquire new knowledge is related to Scientific Attitude, a subjective attribute of researchers who seek serious solutions, with appropriate methods for the confronted problem<sup>4</sup>. In this sense, an early introduction of programs focused on research in medical schools, as well as the perception of research as something useful for professional life can develop favorable Scientific Attitudes in students<sup>4,5</sup>.

Despite the relevance of scientific practice, several barriers are pointed out in the literature for their practice which distance students from developing them in the scientific area. According to students in the health field, the main barriers are a lack of financial support, dedication to academic activities, limited time and lack of guidance<sup>6</sup>. However, not only Scientific Barriers, but also the analysis of Scientific Knowledge and Attitudes must be taken into account when tracing students' profiles with regard to scientific practice.

Many universities have adopted an active methodology in their curricula in order to promote the best development of students in the Health field through scientific practice. In doing so, the student takes a leading role in their knowledge acquisition through an active search for information, developing correlations between them and even as a knowledge producer<sup>7</sup>. In this context, the Prof. Antônio Garcia Filho Campus of the Federal University of Sergipe stands out as one of the pioneers in adopting this teaching method in all of its eight courses in the health field<sup>8</sup>.

Some studies have already managed to analyze the Scientific Knowledge and Attitude levels in undergraduate and graduate students in the medical field<sup>3,9,10,11</sup>. However, all of these studies only evaluated the target population at a single time. Thus, the literature lacks studies which analyze the longitudinal impact of active methodologies in the scientific practice of medical students. Therefore, this study aimed to evaluate the Scientific Knowledge, Attitudes and Barriers of medical students from the Prof. Antônio Garcia Filho Campus of the Federal University of Sergipe, which incorporates active methodologies as a teaching method.

## CASUISTICS AND METHODS

This work is a longitudinal and observational study, composing part of the research project on the impact of extracurricular activities on the training of health students in a curriculum based on active methodologies and problem-based learning (PBL).

All participants were medical students from the Federal University of Sergipe (UFS), Prof. Antônio Garcia Filho Campus, located in Lagarto-SE, Brazil, who independently answered the questionnaire applied at two moments at the end of the school year in 2015 and 2017 (two-year interval), without any intervention by the researchers in the evaluated sample. The present questionnaire was formulated through an adaptation of the instruments used by Figueiredo et al.<sup>9</sup> and Memarpour et al.<sup>6</sup>, having 4 sections: Demographic, Scientific Knowledge, Attitudes Favorable to Scientific Practice and Barriers to Scientific experience.

All students of the second year of the medical course of the referred campus were randomly recruited through a random draw to participate in the study. Those who were regularly enrolled in the period in which the questionnaires were applied and who signed the Free and Informed Consent Form were eligible, while those who answered the questionnaire in only one of the collection moments were excluded. All second year students (45) were considered to determine the sample size, with a sample error of 10% and a 95% confidence interval, totaling 31 subjects. Thus, 31 students were selected. After applying the questionnaire in the second stage of the study, 8 students were excluded due to follow-up loss. Thus, a final sample consisting of 23 undergraduate students was obtained.

The information for demographic data is expressed in absolute values and percentages, except for age, presented as mean  $\pm$  standard deviation (SD). The score of the groups in the sections on Scientific Knowledge and Attitudes was calculated according to the methodology used by Figueiredo et al.<sup>9</sup>.

Scientific Barriers and their 12 components were evaluated according to the work by Figueiredo et al.<sup>10</sup>. In addition to each component of the Barriers, the students should respond by checking one of the options with their respective score: Totally Agree (4 points), Partially Agree (3 points), No Definite Opinion (2 points), Partially Disagree (1 point), I completely disagree (0 points). The score of each participant was given as a percentage of the maximum possible score for each component based on their answers, and then the mean score  $\pm$  standard error (SE) was calculated for each year evaluated.

Finally, the participation of students in extracurricular activities in Research, Extension and Academic Leagues was also evaluated, with the data being presented as a percentage of the total sample in both evaluated periods.

The GraphPad Prism 7.0 program was used for statistical analysis. The Wilcoxon test for non-parametric paired data was used to compare the two moments regarding the data for Scientific Knowledge, Attitudes and Barriers. Fisher's exact test was used to compare the two moments regarding the factors about Scientific Barriers and participation in Research, Extension and Academic Leagues. A p-value<0.05 was considered statistically significant. This study was approved by the Research Ethics Committee of the University Hospital of the Federal University of Sergipe (CAAE no. 36830014.3.0000.5546).

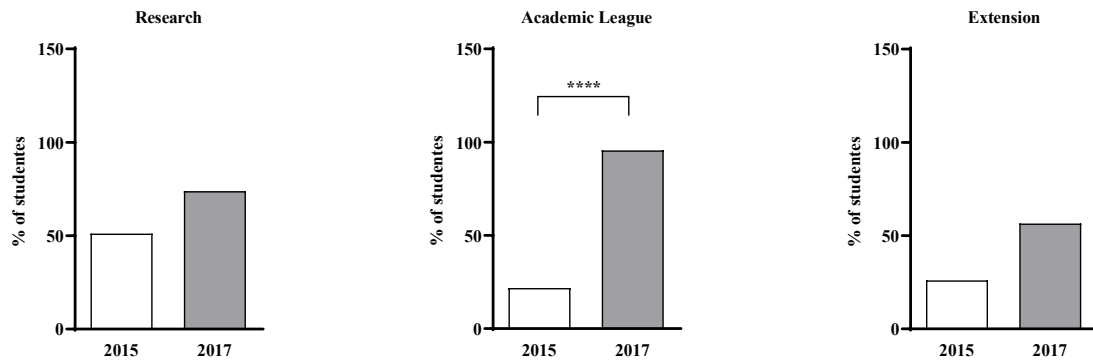
**RESULTS**

The proportion of men in the studied sample was higher than that of women (56.52 and 43.47, respectively). The mean age was 21.43 (± 2.57) in the first collection (Table 1).

The scientific practice with the largest number of students involved in 2015 was Research with 52.17%, followed by Extension (26.09%) and Academic Leagues (21.74%) (Table 1). However, Academic Leagues reached 95.65% in 2017, surpassing the other modalities and presenting 340% growth (p<0.0001). Growth was also observed in the other two practices, as Research increased by 41.66% and reached 73.91%, while the Extension increased even more by 100%, reaching 52.17% of the students, although it was not statistically significant (Table 1 and Figure 1).

**Table 1.** Demographic data and scientific practice of medical students. Lagarto/SE, Brazil, 2015 to 2017

Variables	n (%)
<b>Gender</b>	
Men	13 (56.52)
Women	10 (43.47)
<b>Age (years) at collection 1 (2015)</b>	
Total mean ± SD	21.43 ± 2.57
Mean men ± SD	21.64 ± 3.12
Mean women ± SD	21.11 ± 1.45
<b>Scientific practice in collection 1 (2015)</b>	
Extension	6 (26.09)
Academic league	5 (21.74)
Research	12 (52.17)
<b>Scientific practice in collection 2 (2017)</b>	
Extension	12 (52.17)
Academic league	22 (95.65)
Research	17 (73.91)

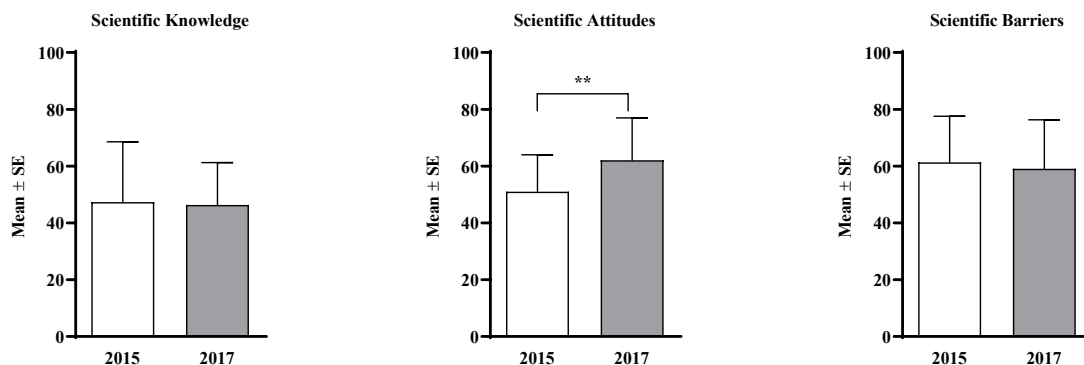


**Figure 1.** Evaluation of the evolution of the participation of medical students in Research, Academic League and Extension activities in Lagarto/SE, Brazil, 2015 to 2017. The values were presented as a percentage of the total number of participating students. Fisher's exact test was used to assess statistical differences at both times. \*\*\*\**p* < 0.0001

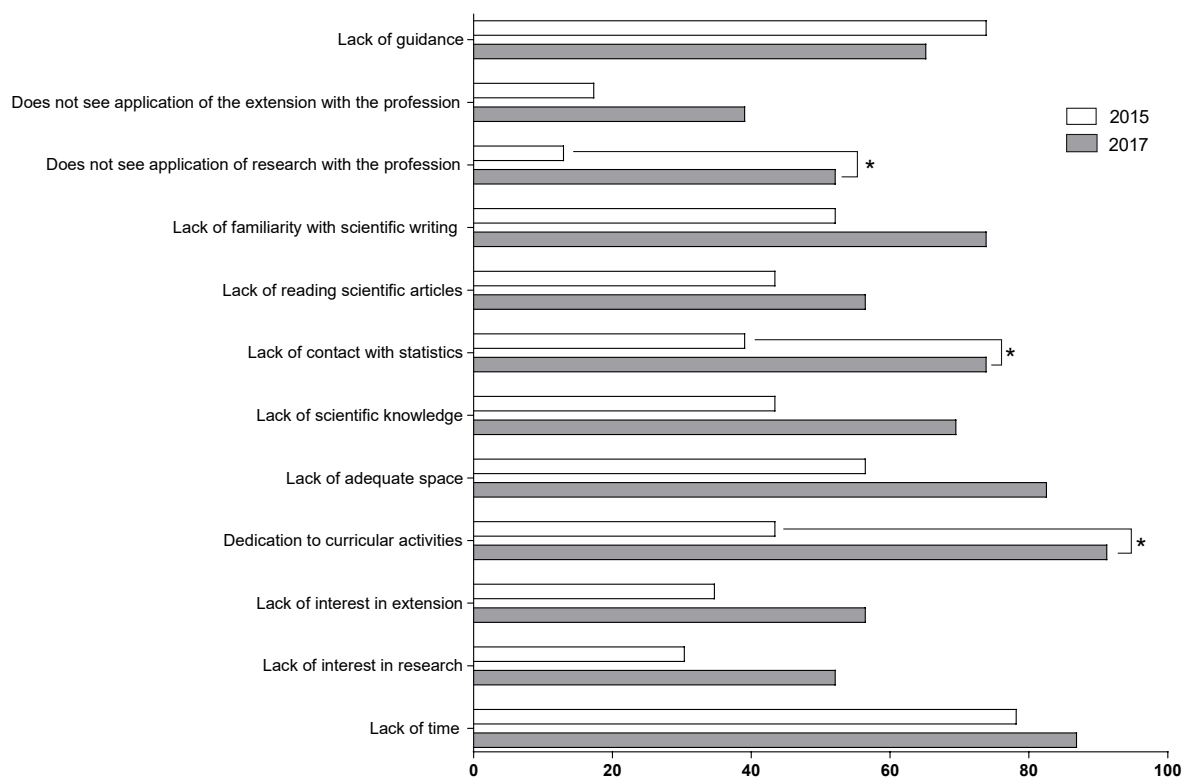
No statistical difference was found regarding the scores on Scientific Knowledge and Barriers in the period between applying the questionnaires. In turn, a higher score was observed in the second evaluated moment for Scientific Attitudes, corresponding to a 21.8% increase in the average score (p<0.01) (Figure 2).

Although the average score for Scientific Barriers

did not change between the evaluated periods, it was observed that 11 of the 12 points assessed as barriers increased in the second moment of the research when analyzing them in isolation, and three of these had significant increases (p<0.05) - Dedication to Curricular Activities; Application of Research with the Profession; and lack of Contact with Statistics (Figure 3).



**Figure 2.** Evaluation of the medical students' evolution on Scientific Knowledge, Attitudes and Barriers in Lagarto/SE, Brazil, 2015 to 2017. The values are presented as mean ± SE of the evaluated aspects. The Wilcoxon test was used to assess statistical differences at both times. \*\*  $p < 0.01$



**Figure 3.** Evaluation of the evolution of medical students regarding the components of Scientific Barriers in Lagarto/SE, Brazil, 2015 to 2017. The values are presented as a percentage of the total number of students questioned. Fisher's exact test was used to assess statistically significant differences at both times. \*  $p < 0.05$

## DISCUSSION

The Professor Antônio Garcia Filho Campus is located in the interior of the Northeast and managed to gather eight courses in the health area adopting an innovative pedagogical proposal. Teaching is structured based on Problem Based Learning (PBL) and other Active Teaching Methodologies. The concern/focus in

these methods is to teach how to learn, enabling to train a professional who practices continuing education, knows how to work in groups and has autonomy. In PBL, the use of different problem situations related to the reality in which the student is inserted brings them closer to their community and enables knowledge of the reality in which they will act as a doctor<sup>8</sup>. To our knowledge, this is the first longitudinal study which has evaluated the Scientific

Knowledge, Attitudes and Barriers of medical students using active methodologies.

There was an increase in the participation of students in all extracurricular activities presented in the study, which may be related to the opportunities offered by teachers and to greater interest by students in complementing the curriculum as they approach the end of graduation. This growth in participation brings advantages to students such as greater clarification in the choice of a medical specialization, forming criticality, developing social skills and scientific learning<sup>12,13</sup>. The work also highlights the growth of participation in Academic Leagues which reached 95.5% of students in 2017, surpassing data related to Research and Extension. Medical Academic Leagues are student organizations which offer opportunities to learn and practice a specific medical field, in addition to mandatory undergraduate activities. In this sense, it is possible that the 340% expansion in the league participation is probably related to more dynamic forms of learning, since many activities are developed by the students themselves; their approximation to medical practice; and also to its growth observed throughout Brazil<sup>14</sup>. In recent years, this development has been such that it has given rise to state, regional and even national organizations such as the Brazilian Association of Academic Medicine Leagues<sup>15</sup>. In addition, Peres et al.<sup>16</sup> perceived in 2007 that participation in leagues was an activity most frequently reported by students from the first to the third year of the medical course.

The trend of an increase of 100% in participation in Extension programs and 41.66% in Research may be important in recruiting candidates for academic careers, although it did not present a significant variation. It is possible to attribute this absence of significant statistics to the limited population evaluated in our study. A longitudinal study carried out with Dutch medical students showed that students who were successfully encouraged to participate in the scientific publication process or to present their respective production in international meetings obtained a higher percentage of doctorates in relation to Dutch doctors in general<sup>12,13</sup>. The development of scientific knowledge is also related to participation in extension projects. One of the pillars of university extension is the articulation between teaching and research anchored in the interaction of students with society<sup>9,17</sup>.

Given the importance of Academic Leagues regarding the complementary training of medical students, there is an increase in the amount of research which evaluates their importance in recent years. In this context, an integrative review published in 2011 shows that Academic Leagues are important activities capable of providing students with greater integration with society, as well as greater Scientific Knowledge<sup>18</sup>. Thus, it is possible to expect that the greater the student's contact with such activities, the more profitable their relationship between Scientific Knowledge, Barriers and Attitudes. However,

a different reality from that expected was observed in the present study, in which the increase in participation in Academic Leagues observed between the evaluated periods does not reflect changes with regard to Scientific Knowledge and Barriers. On the other hand, this greater participation in Leagues may be associated with the increase observed in the Scientific Attitudes of students.

Despite the fact that there was no change in relation to Scientific Knowledge, it should be noted that it was shown to be high in the first evaluation, and was maintained in the second evaluation. In turn, this fact is justified by the curriculum based on active methodologies which stimulates the student to seek the most updated Scientific Knowledge in different ways. In addition, students learn about database research, produce a research project, and acquire other basic knowledge about scientific methods in the first year of the course, thus justifying the high score on Scientific Knowledge observed starting from the first years of the Medicine course<sup>7</sup>.

It is known that greater contact with Scientific Practice is capable of enabling better integration of this knowledge with clinical practice<sup>3,11</sup>. A study published in 2012 in which the impact of the Course Completion Work activity as the final activity of an axis of initiation to research by Medicine students in the State of Bahia was evaluated, showed that Scientific Practice contact enabled a better evaluation of scientific texts in the students' perception. This in turn would enable these students to improve their clinical practice, as well as to improve their professional skills and abilities<sup>19</sup>. However, the present study showed an increase in the number of students who did not see application of Research with Profession, despite the students being inserted in the active learning methodology which seeks to stimulate the search for updated Scientific Knowledge for academic and clinical application early.

Better understanding of scientific works by medical students engaged in Scientific Practice is justified (among other factors) by their better understanding of the methodological part components<sup>19,20</sup>. The present study also evaluated a lack of Familiarity with Statistics among the components analyzed in the Scientific Barrier item, which showed a very significant growth between the two periods studied. Therefore, it is possible to suggest that this Barrier presents itself as a limiting factor for understanding scientific texts, being in line with the increase in the lower Applicability of Research in the Profession also observed in the present study.

In addition, another limiting factor related to the student's insertion in Scientific Practice corresponds to the workload demanded by it. It is known that the medical course is one of the graduations which demands a higher weekly workload when compared to other higher education courses. This reality can be easily observed by the large number of students who reported a lack of time as an important scientific barrier<sup>10</sup>. In addition, although the

lack of time did not show statistical difference in the two moments, it was reported as a barrier by more than 78% of students since the first assessment. Another important barrier which increased was the greater dedication of students to Curricular Activities. Such a condition is possibly a reflection of the higher requirement of the student in more advanced periods, which would limit their dedication to Scientific Practice.

Nevertheless, the present study has limitations, especially regarding the number of students evaluated, with only 23 in a universe of 45 students. This limitation was due to the follow-up loss in our study. In addition, annual application of questionnaires in all academic periods of the institution would enable better characterizing the evolution in the perception of medical students regarding scientific practice.

**Authors' participation:** *Figueiredo WPS* - collection, tabulation, study design, discussion of findings and manuscript preparation; *Nunes TS e Faro LL* - Statistical analysis, discussion of the findings and manuscript preparation; *Lima RSA and Tanajura DM* - project guidance, study design, discussion of findings and manuscript preparation.

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## CONCLUSION

The increase in Scientific Attitudes by students is not accompanied by changes in Scientific Knowledge and Barriers, although these remained high in both assessments. The increase in the lack of Applicability of Research in the Profession and less Familiarity with Statistics stand out when analyzing the components of the Barriers in isolation, although many still remained expressive. Thus, the present study gains importance for being one of the pioneers to longitudinally assess the perception of medical students regarding Scientific Practice throughout the course. In turn, the evaluation of these data can enable the coordinators of the courses to promote strategies to stimulate Scientific Practice by their students, reinforcing the main existing deficit points.

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