

HEALTH SCIENCE STUDENTS' OPINIONS TOWARD SCIENTIFIC RESEARCH AND WOMEN IN SCIENCE

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ABSTRACT

Objective: The objective of the present study was to determine the health sciences students' attitudes toward women in science and scientific research.

Material and Method: This cross-sectional study was carried out in 2014-2015 academic calendar in Ege University. The study group was composed of 1038 first year students attending the Medical School, Faculty of Pharmacy, Faculty of Dentistry, and Faculty of Nursing. A 6-item questionnaire was used to evaluate socio-demographic characteristics, academic career plan, pursuing scientific publications, and attendance to scientific meetings. The Likert-type scales comprised of 20 statements were used to obtain views of the students in line with the objectives of the study. Higher scores in this scale indicate a positive attitude.

Results: Most of the students (63.9%) were females. Most of the participants intended to pursue an academic career. Approximately half of the students are eager to conduct a scientific research. Although there was no

difference between female and male students in terms of their responses about scientific studies, there were some differences in their responses to the statements about the place of women in science. The study found that students pursuing scientific publications and attending scientific meetings and medical school students had more favorable attitude toward scientific studies. Female students, students pursuing scientific publications, and medical school students had more favorable attitude toward the place of women in science. There were statistical differences between male and female student' perceptions about women in science.

Conclusion: Students of Health Sciences were eager to conduct a research and some sentimental differences in male and female students were detected. In the subject of women in science, female students were more supportive and positive than male students. These findings lay a responsibility on the instructors to eliminate different views between females and males and unfavorable attitudes.

Keywords: Women, science, students, scientific research, attitudes. Nobel Med 2018; 14(2): 22-30

SAĞLIK BİLİMLERİ ÖĞRENCİLERİNİN BİLİMSEL ARAŞTIRMA VE BİLİMDE KADIN KONUSUNDA GÖRÜŞLERİNİN DEĞERLENDİRİLMESİ

ÖZET

Amaç: Araştırmanın amacı, sağlık bilimleri öğrencilerinin bilimde kadın ve bilimsel araştırma konusunda tutumlarının belirlenmesidir.

Materyal ve Metot: Bu kesitsel çalışma Ege Üniversitesinde 2014-2015 eğitim yılında yürütülmüştür. Tıp, hemşirelik, diş hekimliği ve eczacılık fakültesinden 1038 öğrenci çalışmaya katılmıştır. Sosyodemografik bilgiler, akademik kariyer planı, bilimsel çalışma yürütülmesi ve bilimsel toplantılara katılımı ile ilgili altı soruluk bir anket kullanılmıştır. Öğrencilerin bilimde kadın ve bilimsel araştırma konusunda görüşlerini belirlemek için Likert-tipi 13 ve 7 maddelik iki ölçek ile tutumları belirlenmiştir. Ölçekten elde edilen yüksek puan olumlu görüş olarak değerlendirilmektedir.

Bulgular: Katılımcıların % 63,9'u kız öğrenci idi. Çoğunluğu akademik kariyer planlamaktaydı.

Öğrencilerin yaklaşık yarısı bilimsel çalışma yürütmek isteğini belirtmiştir. Kız ve erkek öğrenciler arasında bilimsel araştırmalara ilişkin tutum konusunda fark bulunmamışken, kadının bilimdeki yeri konusunda bazı görüşlerinde farklılıklar saptanmıştır. Bilimsel çalışma yürütenler, bilimsel toplantıya katılanlar ve tıp fakültesinde öğrenci olanlar bilimsel araştırmalar konusunda daha fazla olumlu tutuma sahiptirler. Kız öğrenciler ve tıp öğrencileri bilimde kadın konusunda daha olumlu tutuma sahiptir.

Sonuç: Sağlık bilimleri öğrencileri araştırma yürütmeye istekli olmakla birlikte kız ve erkek öğrencilerin görüş farklılıkları saptanmıştır. Kadınların bilim içinde daha fazla yer alması konusunda kız öğrencilerin daha olumlu görüşlere sahip olduğu belirlenmiştir. Bu bulgular eğitmenlere kızlar ve erkekler arasındaki farklı görüşleri ve olumsuz tutumları ortadan kaldırmak açısından sorumluluk getirmektedir.

Anahtar kelimeler: Kadın, bilim, öğrenciler, bilimsel çalışma, tutum. *Nobel Med* 2018; 14(2): 22-30

INTRODUCTION

Higher education institutions are based on three major components as education, research, and public services. The research component is the most important component for academic advancement.¹ The objective of higher education is to ensure that students attain critical thinking, self-directed learning, and problem solving skills. Having the students attain competence in scientific research can be a tool by which the students might reach these targets.² It was reported that students getting involved in scientific research in pre-graduate education are more eager to continue post-graduate education and they have better use of their cognitive and personal skills.³ The education in the field of medicine, dentistry, pharmacy, and nursing aims at having students attain necessary scientific attitudes and skills in reaching knowledge and solving problems they might encounter in their professional life, and conducting scientific research makes significant contribution to accomplishing these objectives. In the practice of health care services by physicians, dentists, pharmacists, and nurses, scientific research has been reported to enhance evidence-based and positive approaches and have a beneficial role in innovation and improvement of professional practices.^{1,2,4-9} The students motivated to

conduct projects in pre-graduate education promote themselves as potential scientists. In particular, motivation of female students and presence of female instructors serving as a role model for female students would contribute to higher number of females getting involved in scientific studies in the future.

Nowadays the traditionally patriarchal role of scientists, the labs that have male dominance and scientific communities are controversial issues among science society. The women less often continue their academic careers due to academic system prioritizing males in providing research support and acceptance of publications, not allowing women to interrupt ongoing projects due to reasons such as maternity leave, and academic system not being organized according to females.¹⁰⁻¹² Gender-biased sociocultural behaviors determine the status of a woman in a family and workplace. Motivational differences related to career between genders are suggested to originate from different social roles of males and females.¹³

The women are represented in the fields such as law and medicine but they have slow advancement in their career. The women are underrepresented in the fields of science and interested women are not encouraged to advance in their career.^{14,15} One study

Table 1. Sociodemographic characteristics of the students.	
Characteristics	%
School	
Faculty of Medicine	38.5
Faculty of Pharmacy	9.8
Faculty of Nursing	38.8
Faculty of Dentistry	12.8
Gender	
Female	63.9
Male	36.1
Educational Status of Mother	
Uneducated	5.9
Primary School	35.2
Secondary School	9.3
High School	22.5
University	26.8
Educational Status of Father	
Uneducated	1.9
Primary School	21.4
Secondary School	13.7
High School	23.5
University	39.3

conducted in 50 countries in 2006 has evaluated career choices of adolescent students. In all countries, female students mostly preferred agriculture, biology and health in the field of life sciences.¹⁶ There are obstacles to academic advancement of women in the fields of health sciences and medicine, which are most commonly preferred by women. The women continue their academic career if family friendly policies are set in place and if there is a flexibility in working hours, part-time working opportunity, wages equality, and there are other women in the faculty with an opportunity to make progress.¹⁷

Small number of women in higher education also causes lack of role model for female students, which in turn negatively affects career choices of the students.¹⁸ If females can be encouraged to be involved in scientific research, they would have higher chances to choose a scientific career. The studies indicated that encouraging and supporting female students to be involved in scientific research at school where they could find an opportunity to participate scientific studies have affected students in their future career choices.¹⁹ In Turkey, although academy is one of the fields that women are highly represented, the women are required to make more efforts to hold on in academic positions due to gender

inequality.²⁰ In our country, students proficient in the field and math and science and those achieving higher score in countrywide university selection exams are placed in the faculties of medicine, dentistry, pharmacy and nursing. It is known that a significant proportion of these students has ever conducted and is enthusiastic about conducting a scientific study before attending higher education program. The objective of the present study was to determine the views of medical school, dentistry, pharmacy, and nursing students in Ege University on scientific research and place of women in science.

MATERIAL AND METHOD

Research Design

This cross-sectional study was carried out in the fall season of 2014-2015 academic calendar in Ege University. The research questionnaires were administered based on voluntariness in all faculties at the beginning of academic year and at the end of the lectures in amphitheaters where the students can be found as a whole group, and all questionnaires were anonymized. The students were provided verbal and written explanation before administering the questionnaires. The students were provided verbal and written explanation before administering the questionnaires. Ethical approval of the research was obtained from the Ethics Committee of the Faculty of Medicine of Ege University.

Research Sample

The study enrolled a total of 1300 first grade students attending the Medical School, Faculty of Pharmacy, Faculty of Dentistry, and Faculty of Nursing. The study included a total of 1038 students. This represents a response rate of 83%, and includes 93% of first-year medical students, 84% of first year nursing students, 53% of first year dentistry students and 73% of first year pharmacy students.

Data Collection and Data Analysis

A 6-item questionnaire was administered to evaluate socio-demographic characteristics, academic career plan, pursuing scientific publications, and attendance to scientific meetings. A 13 and 7-item two scales was used to evaluate the attitudes of students toward scientific research and the place of women in science that was prepared by the investigators in line with the literature. All items were rated on a Likert-type scale from 1 to 3 points and the items were responded as "I do not agree", "Neutral", and "I agree". Negative attitude sentences were rated as the opposite of

Table 2. The Distribution of the responses for statements in attitude towards science scale.									
Items	I agree			Neutral			I do not agree		
	F	M	Total	F	M	Total	F	M	Total
I believe I can conduct a scientific research *	66.1	75.0	69.0	30.4	22.3	27.4	3.5	2.7	3.2
Conducting scientific research is prestigious *	92.6	88.4	91.1	5.6	6.7	6.0	1.8	4.9	2.9
I would love to and I am eager to conduct scientific research	54.7	56.6	55.4	32.7	29.9	31.7	12.6	13.5	12.9
I do not think my knowledge on conducting research is sufficient	23.8	21.6	23.0	31.8	34.1	32.6	44.4	44.3	44.4
I think conducting scientific research is boring	15.2	14.9	15.1	26.9	25.3	26.3	57.8	59.8	58.5
Scientific research improves health care services	95.5	93.2	94.7	3.5	4.6	3.9	1.1	2.2	1.5
Scientific research is necessary for my professional development *	92.8	86.2	90.4	4.9	9.2	6.4	2.3	4.6	3.1
Training is required to conduct scientific research, it must be included in training program	82.4	78.1	80.9	12.9	14.6	13.5	4.7	7.3	5.6
Conducting scientific research is looming due to its difficulties	39.5	31.2	36.5	25.1	30.1	26.9	35.4	38.7	36.6
Knowledge of foreign language must be sufficient to conduct scientific research	75.8	74.0	75.1	13.3	13.1	13.3	10.9	12.9	11.6
Scientific research can be conducted only after graduating from school	12.6	12.9	12.7	26.8	25.5	26.4	60.6	61.6	60.9
Conducting scientific research gives self-confidence *	95.0	88.2	92.5	4.1	8.8	5.8	0.9	2.9	1.6
Conducting scientific research is a pleasurable process	68.3	69.0	68.6	25.4	21.7	24.1	6.3	9.2	7.3

*: $p < 0.05$. F: female, M: male

positive attitudes. Higher scores in this scale indicate a positive attitude.

The data were analyzed using SPSS 18.0 software package. At the beginning of the analysis, all variables were tested for their conformity to parametric test criteria using normal distribution conformity tests. A p value less than 0.05 was considered statistically significant in the analysis of data. The relationship between responses given to the statements and sociodemographic characteristics of the participants was evaluated using chi-square test. The mean values were expressed as mean \pm standard deviation. The relationship between the scores achieved in the scales and sociodemographic characteristics of the participants was evaluated using chi square, independent samples t-test and ANOVA.

Psychometric Assessment

Expert opinions were obtained regarding the items in the scale in order to evaluate the validity of this tool. A preliminary study was performed on five students. It was realized that the questionnaire was completed within an average 3-5 minutes. The scale has overall a good response quality. No systematic rejection was observed in any of the items. The rate of items not responded ranges from 0.5% to 2.0%. There was no participant that provided completely positive (cap) and completely negative (base) answers. Internal consistency coefficient of the attitude toward

scientific research domain of the questionnaire (Cronbach's alpha value) was 0.93 and coefficient of the women in science domain was 0.91, and these values were sufficient. Each of the items of the both scales was submitted to a principal components analysis with varimax rotation. All items loaded >0.48 on a domain. The number of factors extracted in the science attitude scale was 2, accounting for 49.47% of the variance. The first factor, labelled "barriers to conducting scientific research" and the second, labelled "the enthusiasm for conducting scientific research". These procedures resulted in second instrument that accounted for 64.25 % of the variance in "women in science scale scores and 2 factors with eigenvalue above 1 were obtained. These two factors were named "women in science should be able to participate" and "obstacles in front of women." According to the results of the reliability and validity analyses, it has been established that these scale were reliable and valid.

RESULTS

Of these students, 63.9% were females and the mean age was 19.03 ± 1.28 years. Socio-demographic characteristics of the students are presented in Table 1. Of students, 81% were graduated from high schools requiring high scores in entrance exams. More than half of the students had parents with education level of high school or university. Although the rate of students pursuing scientific activities (78.9%)

Table 3. The distribution of the responses for statements in women in science scale.

Items	I agree			Neutral			I do not agree		
	F	M	Total	F	M	Total	F	M	Total
Views on Women in Academy and Science									
Women can continue scientific life and career shorter than males*	43.7	12.0	12.5	16.3	28.1	20.6	4.0	59.9	66.9
Family responsibilities are important obstacles for women in scientific life*	39.2	37.1	38.4	21.7	28.9	24.3	39.2	34.1	37.3
Women can be successful in scientific research*	96.3	87.8	93.3	2.6	9.1	5.0	1.1	3.0	1.8
Women are not supported technically and scientifically as much as males and do not have same opportunities*	57.5	34.6	49.2	27.0	30.8	28.4	15.5	34.6	22.4
Women are more enthusiastic than men in engaging scientific research*	36.7	16.9	29.6	51.4	51.6	51.5	11.9	31.4	18.9
A successful career is important for women as much as for men*	96.2	88.3	93.4	3.1	7.9	4.8	0.8	3.8	1.9
Women must have work opportunities as much as men do in science and technology*	95.9	87.4	92.9	2.1	8.2	4.3	2.0	4.4	2.8

*: $p < 0.05$. **F:** female. **M:** male

was higher, only 17.1% had conducted a scientific study. Almost half of the students reported that they participated in a scientific or academic event. Most of the students intended to pursue an academic career (73.9%). Of participants, 89% reported that they received support from their families to do an academic career. When the students were asked for their expectations related to scientific studies, they

reported encouragement to get involved in scientific studies, enhancement of infrastructure, guidance, and active counseling as their expectations from their schools.

Approximately half of the students are eager to conduct a scientific research. According to chi square analysis, male students had significantly higher self-confidence than females in this regard. Female students provided significantly higher number of positive responses to the statements of “scientific research is required in my professional advancement” and “conducting a scientific research is prestigious”. Most of the participants agree that scientific research improves health care services. There are a very small percentage of students reporting that conducting a research is boring and difficult and even overestimated. The majority of students stated that this subject must be included in the education program (Table 2). According to chi square analysis, there were statistical differences between male and female students in their perceptions on all items (Table 3). The majority of students stated that females must have working opportunity in the fields of science and technology as much as males, and that, females would be successful in scientific career. More females than males felt that females did not have equal opportunities with males (Table 3).

Correlation between the scores resulting from “women in science” and “attitude towards science” scales was found meaningful in positive moderate level (Pearson’s Correlation: 0.31, $p < 0.001$).

The comparative data for some sociodemographic features of the study participants and their scale points are given in Table 4 and Table 5. There was no difference between males and females in terms of the

Table 4. Comparison of demographic features of students and attitude towards science scale.

	n	Mean±SD	p
Gender			
Female	620	31.73±3.03	$p > 0.05$
Male	346	31.69±2.04	
Pursuing Scientific Publications			
Yes	762	32.15±2.82	t:8.950
No	188	30.02±3.27	$p < 0.001$
Academic Encouragement			
Yes	866	31.89±2.96	$p > 0.05$
No	18	28.44±4.46	
Scientific Meetings			
Yes	421	32.07±2.92	t:3.201
No	533	31.43±3.12	$p = 0.001$
Academic Career			
Yes	717	31.75±2.94	$p > 0.05$
I don't know	90	31.05±3.57	
No	11	31.09±2.73	
School			
Faculty of Medicine	370	32.21±2.68	F:5.678 $p = 0.001$
Faculty of Pharmacy	92	31.65±3.48	
Faculty of Nursing	375	31.44±3.10	
Faculty of Dentistry	129	31.17±3.29	

F: ANOVA, **t:** student's t- test **n:** number of students, **SD:** standard deviation

scores achieved in scientific attitude questionnaire. The study found that students pursuing scientific publications and attending scientific meetings and medical school students had more favorable attitude toward scientific studies (Table 4). Female students, students pursuing scientific publications, and medical school students had more favorable attitude toward the place of women in science (Table 5).

DISCUSSION

The present study evaluated the attitudes of students attending medical school, pharmacy, dentistry, and nursing faculties at Ege University toward scientific research and place of women in science. This present study found that students had positive attitude toward and were enthusiastic about conducting scientific research. Previous studies conducted on the students attending the faculties of medicine, dentistry, nursing and pharmacy have also emphasized positive attitude of students toward scientific research.¹⁻⁴

A significant proportion of participating students were planning to build academic career and receiving support from their families in this study. Other reports have also mentioned significant family support due to high reputation of being an academician in the population.²⁰ They also emphasized that strong family support is particularly important for women in choosing the field of science.¹¹ Slightly more than half of the students reported that they could perform a scientific research. The percentage of students eager to perform research varies from 40% to 88% in previous studies.⁷⁻⁹ More male students than female students reported that they could perform scientific research. Previous studies have reported a similar finding.^{21,22} The reasons for this finding have been suggested to be small number of female students and therefore difficulty to find their peers, insufficient number of female academic members that would serve as a role model, and limited communication in terms of quality and quantity between female students and male faculty members/counselors.²³ However, these factors are not applicable to faculties of health sciences in which this study was carried out; in fact, health sciences are the most commonly preferred fields by female students for pre-graduate education and academic career. Other causes that would discourage female students include unsafe behaviors of students (i.e. walking to the transportation vehicles at night), expectations challenging domestic responsibilities, and scientific perspective encouraging one-sided approach to science, competition and standpoints promoting scientific tenets that are useless to society.²³

	n	Mean±SD	p	
Gender	Female	636	17.60±1.62	t=4.83
	Male	355	17.10±2.02	p<0.001
Pursuing Scientific Publications	Yes	781	17.53±1.72	t=3.967
	No	193	16.96±1.98	p<0.001
Academic Encouragement	Yes	888	17.49±1.76	p>0.05
	No	17	16.94±2.81	
Scientific Meetings	Yes	436	17.40±1.67	p>0.05
	No	542	17.43±1.88	
Academic Career	Yes	732	17.41±1.78	p>0.05
	I don't know	90	17.24±1.76	
	No	11	17.81±2.63	
School	Faculty of Medicine	383	17.64±1.85	F=5.558
	Faculty of Pharmacy	97	17.68±1.84	p=0.001
	Faculty of Nursing	388	17.15±1.65	
	Faculty of Dentistry	123	17.37±1.90	

F: ANOVA, t: student's t- test n: number of students, SD: standard deviation

The majority of the participating students were aware that scientific research is important for their professional development as well as for the improvement of health care services. Previous studies have also mentioned pursuing, understanding and even conducting scientific research as being among the components of professionalism in health care services and would have contribution in gaining strength in their profession.^{6,9,22,24} All health care workers are obliged to improve themselves throughout their careers, follow contemporary knowledge, and continue learning process throughout their lives. Research projects have the most significant effect on life-long learning process by developing favorable attitudes and executing the process.^{8,9} Attitudes toward science are an important aspect of students' interest in pursuing future science careers. Determining the attitudes of female students toward scientific studies and eliminating wrong information and concerns in this regard have an important contribution to scientific careers of female students.⁴ Health sciences students have reported the lack of time, routine tasks, intensive training program, lack of institutional motivation, insufficient infrastructure, and insufficient time allocated by

the lecturers as the obstacles in front on the road to conducting scientific research.⁷

The participating students expressed that they expect support from their schools and lecturers to conduct scientific research. The students in other studies have also reported similar demands.^{8,9,24} It is highlighted that supporting students to conduct research is important in accreditation process of the schools and would contribute to the development of mission and vision.²⁵ It is realized that students express conducting a research as a necessary tool, although they think conducting a research is challenging. Previous studies have also reported similar findings in students.^{7,26} Incorporation of a training module on conducting a research into pre-graduate education program has been proposed. An encouraging education environment must be developed for students to conduct research studies in pre-graduate training. It is important to eliminate obstacles to conducting research and encourage students.^{7,25} According to the results of the present study, medical school students and those pursuing scientific publications expressed more favorable attitude toward scientific research. There are also studies in the literature supporting this finding.⁷ The students in Turkey have to achieve high scores in the fields of life sciences and math in order to find an open position in university exams; in addition, the students are commonly prefer to continue residency training in an academic unit after graduating from medical school and therefore they may have developed more favorable attitude.

In the present study, women in science attitude scores were higher in students attending scientific meetings, pursuing scientific publications, and in medical school students. Although there was no significant difference between the scores of male and female students, there were differences when the items were assessed individually. Male students had different responses to most items in women in science domain compared to female students. It was reported that the stereotype of “males are talented and interested in science and math” and “imagination of a scientist as a man with white coat wearing glasses” has some effects in this ideation.²⁷ Science is regarded as a masculine and male-dominant subject and this perception affect both males and females. Male students are more prone to such biases and they do not completely agree to gender equity in science. Unfortunately, male scientists working with females have difficulties in perceiving females as their equals and this contributes to institutional environments, which do not support success of women.²³ The women

are obliged to choose family-flexible jobs due to their dual careers (home and work). The women start second shift when they come home from work and literally they continued working. Dual responsibility weakens the women’s hands in many fields of life. Many talented women do not take part in academic and scientific innovations areas and this complicates a career in science.^{15,26} Gender stereotypes and social structures affecting women in career choices also affect women while advancing in their careers. The term “glass ceiling syndrome” has been coined to explain the obstacles the women encounter during their careers. Another phenomenon is the “queen bee syndrome” that was coined to express intolerance of success-oriented women to other women in a male-dominated environment.^{15,19,28} It is a striking finding that women show the least academic activity in the field of engineering, technology, and math. The limited number of women in academic branches caused a misperception that women are not interested or have limited performance in these fields. Maternity period, as a consequence of social roles of women, causes the perception that women will not perform during this period. These gender stereotypic expectations are important obstacles for female scientists.^{10,28}

This study has some limitations in explaining causality due to the fact that it was conducted in four educational institutions on health sciences using a cross-sectional study design. On the other hand, this study important for being the first study to be conducted in schools training workforce in the field of health sciences and the study provides some clues on this subject for many instructors.

Involvement of students in a research study after graduating from schools increases their wish to take part in academic studies.^{7,9,24} For this reason, the students must be encouraged to conduct research studies during pre-graduate training. This is particularly more important for female students. In such a world that girls face many obstacles not only to become a scientist but also to continue their education, girls-friendly strategies may allow women choose their career in science during their education. This may also eliminate the prejudices of males about females in younger ages. More women prefer building a career in the field of health sciences and there is a growing interest among females in medicine in many countries. In addition, knowledge and skills in math and life sciences, the fields which are thought to be less frequently preferred by girls, are required to find a position in medicine and health sciences in many countries. Every individual, from the parents

and instructors to the politicians, have a control over females bear responsibility to get more women involved in science. The studies report that contexts and practices preventing females from being involved in universities having male-oriented culture and environment must be reformed.²⁷

CONCLUSION

Male and female had different opinions about the participation of women in science. Most of the participants believe that male and female had equal status and opportunity in science. Students attending faculties providing training on health sciences have

favorable attitude toward and enthusiastic about conducting scientific research. On the other hand, male students had relatively unfavorable attitude toward women in science. Generations with favorable attitude toward scientific research as well as to women in science in order to have more women involved in scientific studies and train female scientists.

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