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## Knowledge and awareness of a medical faculty students in Turkey about global warming, climate change and their consequences

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### Abstract

**Aim:** This study was conducted to assess the knowledge and awareness of the students of the Faculty of Medicine on global warming, climate change and their consequences.

**Method:** In this Cross-sectional study a questionnaire was applied by reaching 404 persons from the Faculty of Medicine.

**Findings:** The mean of knowledge points for global warming is  $26.15 \pm 2.88$ . The higher the grade, the lower the mean score ( $p=0.002$ ), the higher the knowledge score of women ( $p=0.001$ ). 4.5% of the students stated that they were a member of any environmental organization, 14.4% said they participated in environmental activities and 79.5% defended the necessity of environment related courses.

**Conclusions:** As a result, it is found that the students of the Faculty of Medicine have a high level of knowledge of global warming. However, there is a lack of knowledge on the link between global warming and climate change and health problems and a lack of sensitivity to environmental activities. Education programs on global warming and climate change will be useful in the study group and other young groups.

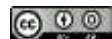
**Keywords:** Faculty of Medicine; Global Warming and Climate Change; Knowledge Level; Awareness.

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## Introduction

Mankind is in constant struggle with nature, and every day it raises its knowledge and technology to become a winner in this struggle. Perhaps the most important achievement in this process came with the Industrial Revolution. Many energy types were used from that day till now and the ecological balance was degraded as a result of the used energy. The deterioration of the ecological balance has brought up many environmental problems. The most important of these environmental problems is the global warming and the resulting climate change (Aksan and Celikler, 2015).

Global warming; It can be described as "the increase of the average world temperature of the atmosphere near the surface of the earth by natural or human effect" (Aksay et al., 2005). Although it can occur by natural means, it can be said that the most important reason for the global warming is the human factor and the human-produced greenhouse gases (Cimen and Ozturk, 2010).

Greenhouse gases, while allowing the sun's rays to reach the Earth's surface through the atmosphere, reflect the resulting heat waves reaching the earth, preventing them from escaping back to the upper layers of the atmosphere. This feature ensure that the world temperature stays at livable levels. However, the increase in the concentration of these gases in the atmosphere causes the resulting heat of the sun rays to be hold on the earth at a higher rate, causing the so-called global warming to appear as an inevitable result (Kahraman et al., 2008).

Changes expected to occur as a result of global warming; change of geographical distribution of ecosystems, increase of forest fires, extreme precipitation after severe drought in some regions, rise in sea level, increase in incidents such as strong waves and tsunami, contraction of the habitat of many animal species, annihilation of plants, insects and birds due to the adaptation problems to new conditions, increase in diseases seen in agricultural plants, the proliferation of infectious diseases (increased virus mutations and consequently malaria-like diseases, proliferation of cholera-type diseases resulting in reduction of water resources, etc.), social and economic changes in social life due to climate changes, increased hunger and malnutrition due to regional declines in production, negative effects to tourism and other economic activities (Yalcin, 2010).

The causes of global warming also cause the ozone layer to become thinner, which weakens the human immune system by increasing the ultraviolet (UV / ultraviolet) light reaching the earth. This leads to an increased incidence of infections and cancers (Peden and Reed, 2010).

It is necessary for countries to act jointly in Global Warming and Climate Change (GWCC) and all other environmental problems, because environmental problems are not only a problem of that country or region, but a serious problem affecting the whole World (Yalcin, 2010). In order to address this issue at global level, the "Framework Convention on Climate Change" was adopted in the Environment and Development Conference held in Rio de Janerio in 1992, which was strengthened by the Kyoto Protocol in 1997 (Dogan, 2005; Turkes, 2001).

As you can see, global warming causes both environmental and health problems. Specific studies should be done to avoid this. It would be beneficial for the community to be aware of the damages of global warming and its possible consequences (Aydin, 2014). Health personnel, especially physicians are seen as a group of role models by the community. They are expected to have knowledge of GWCC and other health outcomes, in terms of informing and raising awareness of society in the future. In this study, it was aimed to investigate and evaluate the knowledge and awareness of the students of the Faculty of Medicine on GWCC and its consequences. These outcomes will help the Faculty of Medicine students plan for their relevant training and raise their awareness of GWCC and its consequences.

## Methods

This cross-sectional study was conducted in Fırat University, Faculty of Medicine in Elazığ province in the Eastern Anatolia region of Turkey from October to December in 2017. For the study ethical approval was obtained from the Ethics Committee of Fırat University, Non-Interventional Researches with a number of 050.01.04/228118, and written administrative permission was obtained from the Faculty of Medicine Dean of the same university.

The research population consist of first, third and sixth grade students of Fırat University Faculty of Medicine (455 persons: first grade:155, third grade:158 and sixth grade:142 students) and it was aimed to reach to the whole population without choosing a sample. 404 of the students were reached (response rate 88.8%). The inability to reach the whole of the population is due to the non-compulsory attendance of the first and third year students who repeats a grade level. The reason for the inclusion of students from 1, 3 and 6 grades is to evaluate the change in the level of knowledge and awareness of the students about the subject during the study period of the Faculty of Medicine.

The questionnaire prepared by the researchers as literature-based (Aksan and Celikler, 2015; Temelli et al., 2011; Freije et al., 2017; Pandve and Raut, 2011; Xiao et al., 2015; Polivka et al., 2012; Akerlof et al., 2010; Demircioglu and Demircioglu, 2015) was applied to the volunteers under direct observation. Prior to the start of the survey, participants were informed that the information received would not be used outside the scientific platform of this study, and necessary explanations were made about the questionnaire. Validity and reliability were not studied because the questionnaire was not a scale study. The sociodemographic characteristics of the questionnaire consist of the questions about the knowledge and awareness of the GWCC. The total range of points that can be taken from the questions about global warming are determined with; 3 points for I agree, 2 points for Partially agree, 1 point for I do not agree and 0 points for I do not know.

Percentage, mean, t-test and One-Way ANOVA tests were used according to the characteristics of the variables in the statistical evaluations, and Tukey test was used in determining the group from which the significance was derived (According to the results of normality analysis data is distributed normally). Means were given with standard deviation (mean  $\pm$  SD) and  $p < 0.05$  was accepted as statistical significance.

## Results

53.5% of the students are female, 46.5% are male and the mean age is  $21.37 \pm 2.85$  (min: 17, max: 44). 32.7% of the students are first, 32.2% are third and 35.1% are sixth grade. The socio-demographic characteristics of the students are shown in Table 1.

**Table 1:** Socio-demographic Characteristics of Students (n=404)

Socio-demographic Characteristics	Number	%
<b>Gender</b>		
Female	216	53.5
Male	188	46.5
<b>Grade</b>		
1. grade	132	32.7
3. grade	130	32.2
6. grade	142	35.1
<b>Graduated High School</b>		
Science High School	142	35.2
Anatolian High School	198	49.0
Other High Schools	64	15.8
<b>Mother Education Status</b>		
Primary school graduate and lower	203	50.2
Secondary/High school graduate	109	27.0
Graduated from a University	92	22.8

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#### Father Education Status

Primary school graduate and lower	90	22.3
Secondary/High school graduate	126	31.2
Graduated from a University	188	46.5

The global warming knowledge point mean is  $26.15 \pm 2.88$  (min: 14, max: 30). The percentage distribution of students' responses to questions for global warming knowledge is given in Table 2.

**Table 2:** The Percentage Distribution of Students' Responses to Questions for Global Warming Knowledge\*

No:	QUESTIONS	I Agree	I Partially Agree	I Don't Agree	I Don't Know
1	One of the reasons for global warming is that individuals are not informed about global warming	65.3	27.3	7.2	0.2
2	Destruction of natural areas accelerates global warming	94.5	4.7	0.3	0.5
3	Global warming directly affects human health	73.4	23.9	2.5	0.2
4	Public transport must be preferred to reduce the effects of global warming	66.9	26.4	4.7	2.0
5	Glass products should be preferred for shopping in order to reduce the effects of global warming	59.2	29.6	7.7	3.5
6	To reduce the effects of global warming, houses must be insulated against heat loss	73.9	19.8	3.0	3.3
7	To reduce the effects of global warming, plastics, bags, food containers must be recycled	92.3	6.5	0.7	0.5
8	Natural energy sources such as water, sun, wind should be used to reduce the effects of global warming	92.5	6.7	0.5	0.3
9	I do not believe global warming makes a difference in human life **	52.8	12.3	12.8	22.1
10	The awareness-raising activities in our country are sufficient for enlightening the public about global warming ***	7.2	12.1	62.3	18.4
11	The insensible consumption of cosmetic products that people have used triggers global warming	70.6	22.4	4.5	2.5

\*Unanswered questions are not taken into consideration.

\*\*Reverse scored. \*\*\*It is not included in the score.

It has been determined that students showed a correct approach to the question, “destruction of natural areas is accelerating global warming” at most and to the question, “global warming does not have a noticeable effect on human life” at least.

40.6% of the students stated that they have been educated in the pre-university school and 19.6% have been educated about the environment outside the school. It was found that the knowledge score of global warming decreased as the class increased, and the female knowledge score was higher ( $p < 0.05$ , Table 3). No relationship was found between high school, parents' education, pre-university school or out-of-school environment education and knowledge level ( $p > 0.05$ , Table 3).

**Table 3:** Distribution of Global Warming Knowledge Points by Socio-demographic Characteristics of Students and Environmental Education Status\*

Socio-demographic Characteristics		number	mean±SS	P value
<b>Gender</b>	Female	216	26.59±2.60	t=3.317
	Male	187	25.64±3.11	p=0.001
<b>Grade</b>	1. grade	132	26.76±2.54	F=6.185
	3. grade	130	26.18±2.80	p=0.002
	6. grade	141	25.55±3.14	
<b>Graduated High School</b>	Science High School	141	26.25±2.65	F=0.997
	Anatolian High School	198	26.23±2.97	p=0.370
	Other High Schools	64	25.68±3.07	
<b>Mother Education Status</b>	Primary school graduate and lower	203	26.01±3.06	F=2.137
	Secondary/High school graduate	108	25.93±2.70	p=0.1
<b>Father Education Status</b>	Graduated from a University	92	26.72±2.62	
	Primary school graduate and lower	90	26.03±2.84	F=0.693
	Secondary/High school graduate	126	26.40±2.80	p=0.501
<b>Environmental education in pre-university school</b>	Graduated from a University	187	26.04±2.96	
	Received	164	26.01±2.67	t=-0.8
<b>Pre-university environmental education outside the school</b>	Not Received	239	26.24±3.02	p=0.424
	Received	79	26.11±2.74	t=-0.143
	Not Received	324	26.16±2.92	p=0.887

\*Unanswered questions are not taken into consideration.

79.5% of the students see environmental lessons as necessary, 17.8% as neither necessary nor unnecessary and 2.7% as unnecessary. The percentage of students who are members of an environmental organization is 4.5%, while 2.7% supported organizations financially. It is reported that 14.4% participated in activities related to the environment.

Percentages of respondents who stated that they benefited from television, internet, school, family/friends and non-governmental organizations as a source of information on GWCC and its consequences are 77.0%, 91.8%, 30.7%, 38.1% and 22.3% respectively. 65.6% of the students were worried about the GWCC and its consequences, 31.4% were somewhat anxious, and 3.0% were not worried. 34.2% found that the measures taken to prevent the GWCC were very inadequate, 47.5% found it inadequate and 18.3% found it partially inadequate.

The percentage distribution of the answers given by the students on the factors that could lead to the GWCC is shown in Table 4.

**Table 4:** Percentage Distribution of Students' Responses to Causes of Global Warming and Climate Change

		Very Effective	Effective	Less Effective	Ineffective	I Don't Know
1	Air pollution	77.2	21.3	1.2	-	0.3
2	Increasing consumption of fossil fuels (coal, oil, natural gas)	80.2	18.4	1.2	-	0.2
3	Use of nuclear power plants	53.1	20.7	14.5	6.7	5.0
4	Mixing of wastewater into water resources (sea, lake, river etc.)	50.9	37.2	8.2	1.5	2.2
5	Increase in the number of factories	70.1	25.2	3.5	0.5	0.7
6	Rapid population growth	42.3	35.8	18.2	2.7	1.0
7	Deforestation	78.0	19.1	2.7	0.2	-
8	Increasing individual consumption	46.3	35.8	14.7	2.2	1.0
9	Increase in greenhouse gas emissions (carbon dioxide, methane, ozone, chlorofluorocarbons, etc.)	76.5	21.3	1.5	0.2	0.5
10	Immigrations	16.1	26.3	33.8	14.9	8.9
11	Unplanned urbanization	31.5	32.8	25.5	6.2	4.0
12	Increase in the number of cars	59.5	33.3	6.0	1.0	0.2

14.4% of the students stated that they follow the news about the environmental problems mostly, 58.7% sometimes, 23.8% very little and 3.1% never followed up. Of the study group, 94.8% stated that human activities contributed to climate change, 97.3% said climate change affected public health, and 95.5% stated that morbidity in the world is increasing due to climate change.

Among the students, 98.8%, 86.4%, 94.1%, 92.6%, 77.7% and 50.0% think that the GWCC increases health problems such as respiratory problems, sunburn, heat stroke, cancer, infectious diseases and physical injuries, respectively. 38.2% reported that they heard about the Kyoto Protocol, and 61.8% said they did not. To the question, are the activities to prevent climate change mitigating the health-related negative effects of climate change, 86.4% of the students answered "yes", 5.9% answered "no", 6.4% gave "no opinion", and 1.3% did not give any answer.

The percentage distribution of correct and incorrect responses given by the research group to global warming questions is given in Table 5.

**Table 5:** Percentage Distribution of Students' Right and Wrong Responses to the Questions Related to Global Warming

Q.	Questions about global warming	Correct Answer	Wrong Answer
1	In recent years, the average global sea level is increasing	89.9	10.1
2	The use of solar energy is accelerating global warming	87.1	12.9
3	Carbon dioxide is a gas that increases global warming	92.3	7.7
4	In recent years, the ice mass at both poles increased	86.5	13.5
5	Global warming does not lead to a shift in the human population	90.5	9.5
6	As time progresses, the average global temperature increases	96.3	3.7
7	The increasing incidence of skin cancer in recent years is due to the thinning of the ozone layer	97.8	2.2
8	The amount of carbon dioxide in the atmosphere increases mainly due to the use of fossil fuels	94.3	5.7
9	In general, the use of public transport instead of personal vehicles contributes to the reduction of global warming	90.0	10.0
10	Use of solar energy increases global warming	87.3	12.7
11	The ozone layer prevents the ultraviolet rays of the sun from entering the atmosphere	92.8	7.2
12	Greenhouse gas allows the passage of sunlight, but it prevents the infrared rays from returning back to the space.	68.9	31.1
13	TV does not consume energy when turned off by remote control	88.5	11.5
14	The Kyoto Protocol is concerned with the reduction of greenhouse gases and, consequently, global warming	90.4	9.6
15	Greenhouse gases such as Argon, Neon, Helium, Methane, Hydrogen, Nitro Oxide and Ozone also affect global warming negatively.	84.3	15.7

92.8% of the students stated that “increase of education and awareness” in fighting with climate change will be effective, 80.4% said “lifestyle changes”, 70.5% said “international partnerships” and 68.3% said “strategies to do more research” will be effective. Again, 16.3% of the students found that they had enough knowledge about the GWCC and the health outcomes and other consequences, while 75.5% wanted to know more.

## Discussion

Global warming has undergone radical and unexpected changes over the past few decades on the nature and living as a result of human activities. It affects not only all living things but also human health. Global warming seems to be perceived as an important public health problem in the studies on GWCC (Temelli *et al.*, 2011; Demircioglu and Demircioglu, 2015).

In this study, students' mean knowledge score about global warming was found high. The question that students have the most correct approach is “destruction of natural areas accelerates global warming” with 94.5% (Table 2). This ratio was found to be 88.4% in Temelli and his colleagues

study of (Temelli *et al.*, 2011) primary school teachers. In addition, a large majority of the students stated that the consciousness-raising activities in our country were not enough to illuminate the public about global warming in parallel with the related literature. Increasing awareness raising activities and using more effective methods are thought to increase knowledge and awareness.

In this study, students were found to have less education about the environment in the pre-university environment and outside the school. A similar lack of such education has been reported in the related literature (Tetik and Acun, 2015; Kucuk Bicer and Acar Vaizoglu, 2015). The lack of adequate pre-university education on the subject may be one of the reasons for lack of knowledge and consciousness in the future.

In this study, it was determined that women's knowledge score was higher than men ( $p = 0.001$ , Table 3). There was no significant difference between genders in the study performed by Aksan and Celikler (Aksan and Celikler, 2015) on the primary school teachers' candidates and in the study conducted by Eroğlu and Aydogdu (Eroğlu and Aydogdu, 2016) on the science teacher candidates. In our study, no relation was found between, high school, parents' education level, pre-university school or out-of-school environment education level and global warming knowledge level, excluding gender and grade of education. In this case, it is suggested that the personal characteristics is more prominent for knowledge level.

Among students, the rate of participation in an environmental organization, providing financial support to such organizations and participating in physical activities related to the environment founded very low. These results are parallel to the results of the study of Tetik and Acun (Tetik and Acun, 2015). Students' lack of interest in environmental organizations can be seen as a sign of inadequacy of education and consciousness.

Students reported that the Internet was the most common source of information on the GWCC and its consequences and television was in the second place. In the study conducted by Tetik and Acun (Tetik and Acun, 2015), it was found that students use the television most and secondly the Internet as a source of information. In Pandve and Raut's (Pandve and Raut, 2011) study, it was reported that students used newspapers and magazines the most, television in second place, internet in third place as a source of information. It seems that the media has a strong influence on getting information. It is thought that students also evaluate developing and changing technology as a source of information about the environment.

In this study, it was determined that a large part of the students were concerned about the GWCC and its consequences. The level of anxiety was also found to be very high in the studies of Tetik and Acun, Aksan and Celikler and Leiserowitz (Tetik and Acun, 2015; Aksan and Celikler, 2015; Leiserowitz, 2005). The majority of students in our study do not find the measures to prevent the global warming and climate change as adequate. The high level of the concerns and inadequate measures taken were evaluated as the students are pessimistic about this situation.

Factors that students think are the most effective among the factors that can lead to the GWCC are fossil fuel consumption (80.2%) and disappearance of forests (78%) while unplanned urbanization (31.5%) and migrations (16.1%) are the least effective factors. In the study conducted by Majra and Acharya (Majra and Acharya, 2009) on medical students, the majority of participants counted deforestation and consumption of fossil fuels as the greatest causes of GWCC. It is known that the factors those can be altered with direct human intervention are the increase in fossil fuel consumption, the destruction of forests, and the increase in greenhouse gas emissions (Cimen and Ozturk, 2010). Most of the students reported that they sometimes follow the news about environmental problems (58.7%). In the literature (Aksan and Celikler, 2015; Demircioglu and Demircioglu, 2015; Tetik and Acun, 2015), the rate of follow-up of such news was similarly low. This may be due to the fact that in the media and mass media, the GWCC and its consequences are underestimated than other social and political issues.



A very large majority of the study group (94.8%) reported that human activities contributed to climate change. Similar results (Pandve and Raut, 2011; Majra and Acharya, 2009; Pandve et al., 2009; Buloshi and Ramadan, 2015) were found in studies conducted on this subject. A large majority of students believe that activities to prevent climate change will reduce the adverse health effects of climate change. In the study conducted by Polivka and colleagues (Polivka *et al.*, 2012), 37% of the nursing students participated in this recommendation. Nearly all of the students included in the study reported that climate change affected public health (97.3%) and increased morbidity around the world (95.5%). Similar results were found in the study conducted by Kucuk Bicer and Acar Vaizoğlu (Kucuk Bicer and Acar Vaizoğlu, 2015). In the study of Xiao *et al.* (Xiao *et al.*, 2015) the vast majority of nurses think that climate change affects public health.

Among the students, the rates of those who think that GWCC increases health problems such as respiratory problems, sunburn, heat stroke, cancer, infectious diseases are found very high. However, 50.0% gave the answer, did not affect / had no opinion, about the increase in physical injuries. In the study conducted by the Kucuk Bicer and Acar Vaizoğlu (Kucuk Bicer and Acar Vaizoğlu, 2015), students reported that cancer would increase with highest rate. It is also a fact that natural disasters have increased due to the GWCC change, and therefore physically induced deaths and injuries have increased (Akalin, 2013). A small proportion (38.2%) of the participants reported that they heard about the Kyoto Protocol. Similar results were obtained in the study of Pandve and Raut (Pandve and Raut, 2011) on medical students. This may be due to the fact that students do not follow environmental news very often.

In this study, it was determined that the vast majority of the students had a correct approach to global sea level increase as a result of the melting of the glaciers (Table 5). Likewise, 92.3% correctly answered the question “carbon dioxide is a gas that increases global warming”. A similar result was obtained in Aydin's (Aydin, 2014) study on secondary school students. A large majority of students correctly answer that global warming will lead to the human population to be shifted. 90.0% of the students think that the use of public transportation instead of personal vehicles will contribute to decrease the global warming (Table 5). It is important for students to find an important public health problem, such as migration, in relation to the GWCC, and to be aware of the importance of public transport in terms of general consciousness.

The percentage of students found that their knowledge of GWCC, health outcomes and other consequences sufficient was low (16.3%), while the percentage of those seeking more information was high (75.5%). In the study of Xiao and his colleagues (Xiao *et al.*, 2015) on nurses, a large majority of participants were eager to learn. Despite the fact that learners find their knowledge to be inadequate, the high demand for information can be explained by the high educational beliefs and desires.

## Conclusion

As a result, knowledge level of medical school students about global warming in a city in eastern Anatolia in Turkey were found to be high. However, there is a lack knowledge about relation between GWCC with health problems, a lack sensitivity for environment-related activities, nevertheless they often find their knowledge about GWCC and its consequences to be inadequate and are willing to obtain information. Educational programs related to GWCC will be useful in this study group and other groups of young people.

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