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Awareness on Climate Change Among Generations X, Y and Z: Cross-Sectional and Descriptive Study

X, Y ve Z Kuşakları Arasında İklim Değişikliği Farkındalığı: Kesitsel ve Tanımlayıcı Çalışma

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ABSTRACT Objective: Global climate change, which is primarily caused by human activities, is a serious problem for all living creatures and the next generations. Due to this reason, the level of individual awareness on global climate change seems to be an important point to be determined. This study aims to analyze the level of awareness among the participants from generation X, Y and Z and the factors affecting their awareness. **Material and Methods:** The study is descriptive and cross-sectional. The sample of the study consisted of 630 participants residing in Türkiye's Tokat province and born between 1965 and 2012. The data of the study were collected using the personal information form and the Global Climate Change Awareness Scale (GCCAS). **Results:** Accordingly, 62.7% of the participants were male and 46.8% were graduates of high school. The percentage of Gen Xers, Yers and Zers were 42.1%, 26.8% and 31.1%, respectively. Graduates of high school ($\overline{X}$=86.82) were statistically significantly higher than graduates of primary school ($\overline{X}$=48.29) and university (75.13) ($p<0.001$). Besides, mean GCCAS score of the graduates of university was statistically significantly higher than graduates of primary school ($p<0.001$). Awareness of gen Xers on global climate change was higher than gen Yers and gen Zers, whereas the awareness of gen Yers was higher than gen Zers. Besides, participants from gen Z did not give importance to practices to prevent climate change ($p=0.001$). **Conclusion:** Based on the findings, it was concluded that educators and media can bear responsibility for raising awareness about global climate change among the members of generation Z. We can also suggest that policy makers take the necessary measures and interventions to increase the knowledge of generation Z on global climate change. In this context, the issue of global climate change can be included in the school curriculum as a vital step. In addition, it is thought that digital media can play a very important role in raising awareness about climate change in the digital age.

Keywords: Awareness; climate change; generations X, Y, Z

ÖZET Amaç: Başta insan faaliyetleri sonucu oluşan küresel iklim değişikliği, tüm canlılar ve gelecek nesiller için ciddi bir sorundur. Bu nedenle küresel iklim değişikliği konusunda bireysel farkındalık düzeyinin belirlenmesi önemli bir nokta olarak görünmektedir. Bu çalışma, X, Y ve Z kuşağı katılımcılarının farkındalık düzeylerini ve farkındalıklarını etkileyen faktörleri incelemeyi amaçlamaktadır. **Gereç ve Yöntemler:** Çalışma tanımlayıcı ve kesitsel niteliktedir. Çalışmanın örneklemini Türkiye'nin Tokat ilinde ikamet eden ve 1965-2012 yılları arasında doğan 630 katılımcı oluşturmuştur. Çalışmanın verileri kişisel bilgi formu ve Küresel İklim Değişikliği Ölçeği (KİDO) kullanılarak toplanmıştır. **Bulgular:** Çalışmada yer alan bireylerin %62,7'sinin erkek, %42,1'inin X kuşağında, %26,8'inin Y kuşağında ve %31,1'inin Z kuşağında, %46,8'inin ise lise mezunu olduğu saptanmıştır. Katılımcıların eğitim durumları ve küresel iklim değişikliği farkındalığı karşılaştırıldığında lise mezunlarının ($\overline{X}$=86,82) ilköğretim mezunu ($\overline{X}$=48,29) ile lisans mezunu (75,13) olanlardan puan ortalamalarının istatistiksel olarak anlamlı derece yüksek olduğu bulunmuştur ($p<0,001$). X kuşağının küresel iklim değişikliği konusundaki farkındalığı Y kuşağı ve Z kuşağına göre daha yüksekken, Y kuşağının farkındalığı Z kuşağına göre daha yüksek olduğu saptanmıştır. Ayrıca Z kuşağından katılımcıların iklim değişikliğini önlemeye yönelik uygulamalara önem vermedikleri bulunmuştur ($p=0,001$). **Sonuç:** Bulgulara dayanarak, Z kuşağı üyeleri arasında küresel iklim değişikliği konusunda farkındalığı artırmak için eğitimcilerin ve medyanın sorumluluk taşıyabileceği sonucuna varılmıştır. Ayrıca politika yapıcıların, Z kuşağının küresel iklim değişikliği konusundaki bilgilerini artırmak için gerekli önlemleri ve müdahaleleri almalarını önerebiliriz. Bu bağlamda, küresel iklim değişikliği konusu hayati bir adım olarak okul müfredatına dâhil edilebilir. Ayrıca dijital medya, dijital çağda iklim değişikliği konusunda farkındalık yaratmak için çok önemli bir rol oynayabileceği düşünülmektedir.

Anahtar Kelimeler: Farkındalık; iklim değişikliği; X, Y, Z kuşakları

People of the 21st century have witnessed various national and international conflicts. However, the greatest war that they are not aware of is the fight against global climate change, which is not only a frightening issue dealt in science fiction scenarios but also a serious contemporary problem.

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Hazards caused by global climate change may influence all aspects of human life.[1-3] Rise in global temperature may result with serious problems, including precipitation regime change, sea level rise, floods, droughts, population movements, biological changes and sudden temperature changes.[4-7] These problems may create the suitable environment for new diseases and threaten food security which, in turn, may have negative social and physiological consequences for humanity.[6,8,9]

Humans are primarily responsible for the initiation and acceleration of the process of global climate change. Rise in greenhouse gas emission, pollution caused by industrialization and increase in population are the human activities triggering global climate change.[10-12] Besides, unsustainable consumption of natural and energy resources and environmental damage contribute to the process. It is certain that global climate change will accelerate and turn into an irreversible process as long as people do not take necessary measures to protect the natural balance.[13,14]

Although humans are responsible for the initiation and acceleration of global climate change, they may also slow down this process. Success in the fight against climate change depends on raising social awareness on this serious problem.[1,2] States and civil society organizations frequently use the media to change attitudes and behaviors related with climate change and raise social awareness, including brochures, pamphlets, billboards, movies and advertisements.[15] Low levels of knowledge and awareness on global warming, climate change and environmental problems lay at the heart of these problems.[5,6] Due to this reason, determining the level of awareness on environmental problems is a prerequisite to improve positive attitudes and behaviors towards environmental problems.[16]

All generations have different behavioral patterns shaped by values, cultural codes and ideas unique to each generation. Due to this reason, generational values, beliefs and behaviors may vary. Individuals, who hold the primary responsibility for global climate change, should be analyzed within this context. Therefore, we may wonder what the generations (gen) X, Y and Z did, are doing or will do to cope with climate change, whether they influenced each other and what the factors affecting the climate change awareness are. Within this context, this study aims to reveal the awareness on climate change among gen X, Y and Z, and the factors affecting their awareness. We believe that such an analysis may help us increase the awareness of the gen Zers, who will continue to fight against climate change in the future.

MATERIAL AND METHODS

PARTICIPANTS AND SETTING

This descriptive study was conducted to analyze the awareness on climate change among gen X, Y and Z. Individuals between the ages of 18-65 years, who resided in Tokat province of Türkiye, constituted the population of the study. Convenience sampling method was used and 630 people, who were born between the years 1965-2012 and agreed to participate, constituted the sample of the study. Data were collected via Google Forms and WhatsApp (Biran Acton ve Jan Koum ABD) between February and April 2021.

DATA COLLECTING

Two forms, the "personal information form" created by the authors, and the "Global Climate Change Awareness Scale (GCCAS)", which evaluates the level of climate change knowledge, were used to collect the research data.

PERSONAL INFORMATION FORM

This form was created by researchers. Personal information form asked 16 questions in 2 sections. The first section included 3 questions on age, gender and education level of the participants whereas the second section had 13 questions on environmental awareness.

GLOBAL CLIMATE CHANGE AWARENESS SCALE

Awareness scale for global climate change was developed by Deniz et al.[17] The scale consists of 21 items and four sub-dimensions. There is no item in the scale that needs to be reverse coded. It is scored in a five-point Likert type. The lowest score that can be obtained from the scale is 21 and the highest score

is 105. The increase in the scores obtained from the scale indicates that the climate change awareness of the participants is high. The scale explained 57.72% of the total variance. Cronbach's alpha of the original scale and our study were 0.826 and 0.991, respectively.

ETHICAL CONSIDERATIONS

We obtained permission from the Non-Invasive Clinical Research Ethics Committee of Tokat Gaziosmanpaşa University (date: March 12, 2021, no: 222391). Participants were informed about the aim and the scope of the study and written informed consent was obtained. The study was conducted in line with the principles of the Declaration of Helsinki.

DATA ANALYSIS

The data was analyzed with IBM SPSS V25 software (ABD). In the analysis of socio-demographic characteristics, frequency, percentage, average, minimum, maximum and standard deviation were used. The conformity to normal distribution was examined with the Shapiro-Wilk and Kolmogorov-Smirnov tests. The data not conforming to normal distribution were compared using the Mann-Whitney U test and the Kruskal-Wallis. The data not conforming to normal distribution were given as median (minimum-maximum). The significance level was $p<0.05$.

RESULTS

Table 1 presented the sociodemographic characteristics of the participants. Accordingly, 62.7% of the participants were male and 46.8% were graduates of high school. The percentage of gen Xers, Yers and Zers were 42.1%, 26.8% and 31.1%, respectively.

TABLE 1: Socio-demographic variables of participants.

Variables		n	%
Gender	Male	395	62.7
	Female	235	37.3
Generation	Gen Xers	265	42.1
	Gen Y's	169	26.8
	Gen Zers	196	31.1
Education level	Primary school	131	20.8
	High school	295	46.8
	University	204	32.4
Smoking	Yes	317	50.3
	No	313	49.7

Table 2 shows the average scores of the participants on the GCCAS. Participants' effects on the natural and social environment mean score is 32.46±11.48, awareness of global organizations and agreements mean score is 20.07±7.30, awareness of the causes of global climate change mean score is 11.18±3.19, and awareness of the energy consumption mean score is 11.29±3.48.

There was no statistical difference between the mean GCCAS score obtained by male ($\bar{X}$=73.51) and female participants ($\bar{X}$=77.57) ($p>0.05$).

The comparison of the average scores from the GCCAS and its subscales with the characteristics of the participants is given in Table 3. When the educational status of the participants is compared; it was found that the mean scores of the global climate

TABLE 2: Global Climate Change Awareness Scale mean scores of participants.

Scale	Sub-scales	$\bar{X}$±SD	Median	Minimum-maximum
Global Climate Change Awareness Scale	Effects on the natural and social environment	32.46±11.48	42	14-42
	Awareness of global organizations and agreements	20.07±7.30	26	7-28
	Awareness of the causes of global climate change	11.18±3.19	13	6-15
	Awareness of the energy consumption	11.29±3.48	14	6-15
	Total score	75.02±25.01	95	36-96

SD: Standard deviation.

change awareness scale and all sub-dimensions of high school graduates were found to be statistically significantly higher than those with primary education and undergraduate degrees (p<0.001). In addition, it was determined that the global climate change awareness scale and all sub-dimension score averages of undergraduates were significantly higher than those of primary school graduates (p<0.001) (Table 3). When the generations were compared, it was found that the mean scores of the global climate change awareness scale and all sub-dimensions of the X generation were statistically significantly higher than the Y generation and Z generation (p<0.001). In addition, it was found that the global climate change awareness scale and all sub-dimension mean scores of the Y generation were significantly higher than the Z generation (p<0.001) (Table 3). These findings implied that the participants from gen X had higher awareness on global climate change than other generations and the awareness was negatively correlated with age. Given that the maximum score to be obtained from the GCCAS was 105, participants from gen Z had a significantly low mean GCCAS score ($\overline{X}$=47.18).

TABLE 3: Comparison of the characteristics of participants with the average scores from the Global Climate Change Awareness Scale and its sub-scales.

Variables	Global Climate Change Awareness Scale				
	Effects on the natural and social environment	Awareness of global organizations and agreements	Awareness of the causes of global climate change	Awareness of the energy consumption	Total score
	Mean±SD				
Gender					
Male	31.75±12.05	19.51±7.78	11.03±3.31	11.21±3.40	73.51±26.08
Female	33.66±10.36	21.02±6.30	11.44±2.96	11.42±3.61	77.57±22.92
	U=43037.000 p=0.092	U=42966.500 p=0.083	U=44552.000 p=0.377	U=43638.000 p=0.162	U=45125.000 p=0.544
Generation					
Gen Zers	20.46±4.42[c]	12.34±3.18[c]	7.55±1.30[c]	6.82±1.61[c]	47.18±8.74[c]
Gen Yers	31.94±12.72[b]	19.92±7.96[b]	11.36±3.09[b]	12.29±2.50[b]	75.52±26.07[b]
Gen Xers	41.67±2.06[a]	25.89±0.91[a]	13.76±0.64[a]	13.95±0.59[a]	95.29±3.65[a]
	KW=349.610 p=0.000 a>b>c	KW=376.520 p=0.000 a>b>c	KW=379.718 p=0.000 a>b>c	KW=461.464 p=0.000 a>b>c	KW=364.188 p=0.000 a>b>c
Education level					
Primary school	21.50±4.70[c]	12.67±3.59[c]	7.56±1.56[c]	6.54±1.78[c]	48.29±10.85[c]
High school	37.61±8.99[b]	23.52±5.16[b]	12.80±2.06[b]	12.88±2.43[b]	86.82±18.30[b]
University	32.06±12.68[a]	19.84±8.09[a]	11.18±3.40[a]	12.03±2.86[a]	75.13±26.72[a]
	KW=146.081 p=0.000 b>a>c	KW=193.993 p=0.000 b>a>c	KW=221.198 p=0.000 b>a>c	KW=292.151 p=0.000 b>a>c	KW=183.199 p=0.000 b>a>c

a-c: There is no difference between values with the same letter; GCCAS: Global Climate Change Awareness Scale; KW: Kruskal-Wallis test; U: Mann-Whitney U Test; SD: Standard deviation.

TABLE 4: Knowledge, attitudes and behaviors related with environmental consciousness questions.

		Gen Zers n=196		Gen Yers n=169		Gen Xers n=265		Total n=630	
		n	%	n	%	n	%	n	%
Do you smoke?	Yes	113	57.7	46	27.2	158	59.6	317	50.3
	No	83	42.3	123	72.8	107	40.4	313	49.7
Have you ever heard about the term climate change?	Yes	45	23	123	72.8	245	92.5	413	65.6
	No	151	77	46	27.2	20	7.5	217	34.4
Do you prefer to buy goods in reusable or recyclable packages?	Yes	63	32.14	133	78.7	242	91.3	438	69.5
	No	133	67.86	36	21.3	23	8.7	192	30.5
Do you refrain from buying the goods produced by firms that harm the environment?	Yes	58	30	109	64.5	221	83.4	388	61.6
	No	138	70	60	35.5	44	16.6	242	38.4
Do you take the rubbish on the ground and put it into a bin?	Yes	47	24	136	80.5	232	87.5	415	65.9
	No	149	76	33	19.5	33	12.5	215	34.1
Do you turn off unnecessary lights?	Yes	64	32.7	98	58	251	94.7	413	65.6
	No	132	67.3	71	42	14	5.3	217	34.4
Do you prefer to buy energy-saving light bulbs?	Yes	46	23.5	116	68.6	209	78.9	371	58.9
	No	152	76.5	53	31.4	56	21.1	259	41.1
Do you plug off unused electronical devices?	Yes	75	38.3	96	56.8	242	91.3	413	65.6
	No	121	61.7	73	43.2	23	8.7	217	34.4
Do you pay attention to energy efficiency label of domestic appliances?	Yes	69	35.2	118	69.8	224	84.5	411	65.2
	No	127	64.8	51	30.2	41	15.5	219	34.8
Do you turn off faucet while brushing your teeth or washing your hands?	Yes	62	31.6	110	65.1	166	62.6	338	53.7
	No	134	68.4	59	34.9	99	37.4	292	46.3
Do you pay attention to avoid excessive water consumption in bath?	Yes	47	24	124	73.4	202	76.2	373	59.2
	No	149	76	45	26.6	63	23.8	257	40.8
Do you turn on your washing machine or dishwasher before it is full?	Yes	82	41.8	116	68.6	218	82.3	416	66
	No	114	58.2	53	31.4	47	17.7	214	34
Do you read publications about environment?	Yes	78	39.8	99	58.6	236	89.1	413	65.6
	No	118	60.2	70	41.4	29	10.9	217	34.4

Table 4 presented the frequency of the responses of the members of gen X, Y and Z to the questions on knowledge, attitudes and behaviors related with environmental consciousness. Accordingly, 59.6% of the participants from gen X smoked, 77% of gen Zers did not hear about the term climate change, 91.3% of gen Xers gave importance to recycling, 87.5% of gen Xers out the rubbish on the ground into a bin and 70% of gen Zers did not care about rubbish on the ground. Besides, compared to gen Zers, participants from gen Xers were more sensitive to issues related with energy and resource saving, such as, plugging off unused electronic devices, paying attention to the energy efficiency label of domestic appliances and turning off faucet if unnecessary.

Table 5 compared the GCCAS scores of male and female participants from gen X, Y and Z. Accordingly, mean GCCAS scores obtained by the female participants from gen Z and Y ($\overline{X}$=49.50 and $\overline{X}$=84.81, respectively) were statistically significantly higher than the male participants from gen Z and Y ($\overline{X}$=45.83 and $\overline{X}$=67.17, respectively) ($p<0.05$). Besides, mean GCCAS scores obtained by the female participants from gen X ($\overline{X}$=94.93) was significantly

TABLE 5: Comparison of gender, generation and awareness on climate change.

Variables	Gen Zers	Gen Y's	Gen Xers	
	$\bar{X}$±SD Median (minimum-maximum)			Test statistics
Gender				
Male	45.83±8.15[a]	67.17±28.52[b]	95.46±3.45[c]	KW=227.986 p=0.000* c>b>a
Female	49.50±9.29[x]	84.81±19.32[y]	94.93±4.05[z]	KW=138.931 p=0.000* z>y>x
Test statistics	U=3114.500 p=0.000*	U=2847.000 p=0.02*	U=7014.000 p=0.19	

*p: p<0.05; **a-c, x-z**: There is no difference between values with the same letter; KW: Kruskal-Wallis test; U: Mann-Whitney U test; SD: Standard deviation.

higher than female participants from gen Y and Z ($\bar{X}$=84.81 and $\bar{X}$=49.50, respectively). Finally, the mean GCCAS score obtained by the male participants from gen X ($\bar{X}$=95.46) was significantly higher than male participants from gen Y and Z ($\bar{X}$=67.17 and $\bar{X}$=45.83. respectively) (p<0.001).

DISCUSSION

Global climate change is not only an environmental problem but also a global threat to human life.[8,18] Due to this reason, individual awareness about this important threat should be determined. This study is one of the preliminary steps that focused on intergenerational differences about the awareness on climate change and that dealt with the reasons behind this difference. It provided an important contribution to the literature by dealing with various dimensions of the subject of climate change and analyzing the relationship between these dimensions and social characteristic of different generations.

Awareness of graduates of primary school on climate change was lower than the participants that graduated from high school or university. Given that knowledge is a prerequisite for conscious action, this finding might be caused by the lessons on science and technology during the education of the participants.[19] Consequently, various education programs have aimed to raise awareness on climate change.[20,21] On the other hand, some of the studies criticized the use of media to raise awareness on climate change without the integration of the subject to school curriculum.[22,23] The questions of why and how are fundamental for the attempts to change behaviors. Consequently, the subject of climate change might be an integral part of education.

Participants from the gen X had higher awareness on global climate change than the gen Yers and Zers, whereas the awareness of the participants from gen Y was higher than the gen Zers. The study of Göksu et al. also found that the participants from gen X were more likely to use environment-friendly goods than gen Yers.[24] These findings are related with the social characteristics of the members of different generations.

Members of gen X were born between 1965 and 1980 and were significantly influenced by the capitalist system. Concerns of gen Xers led them to work harder, focus on career advancement and earn more money. As highly motivated people, who respect authority, defend traditional values and do not use technology unless needed, members of gen X are more sensitive to social problems.[25] Decrease in resources during the postwar period shaped the consumption habits of gen Xers. Consequently, higher awareness of gen Xers on global climate change was an expected finding.

Born between 1981 and 1996 in an age of technological innovations, members of gen Y like to question existing knowledge, consider everything as ephemeral, seek for entertainment, and are passionate

and intolerant to criticism.[26,27] The most important point that distinguishes gen Yers from gen Xers is the importance of consumption and technology for the former. With the advent of gen Yers, consumers rather the producers began to dominate the market. Shaping the consumption society, members of gen Y are characterized by their consumer identities and are identified with consumption. Although they did not experience economic scarcity as the gen X, members of gen Y have experienced the rapid pace of globalization and consequent economic crises. We believe that these factors might have influenced the awareness of gen Yers on global climate change.

Gen Zers are definitely associated with consumerism. Born after 1996, members of gen Z are natives of digital age, who are highly individualistic and focus on consumption than production.[28,29] Better educated and having more economic opportunities, members of gen Z want to consume fast and experience new products.[30] However, they do not give importance to the concept of production. Unfortunately, this tendency has a negative impact on global climate change. Besides, this tendency is parallel to the low level of awareness on global climate change among the gen Zers in our study. Despite the fact that they are the digital natives that actively use social media, most of the participants from gen Z did not hear about the concept of climate change. This finding may be related with the tendency of gen Zers to use social media for entertainment and socialization rather than receiving information on social problems.

Participants from gen X were more sensitive to social and environmental problems and gave more importance to recycling than other generations. Despite their sensitivity, they were also the generation that smoked the most. This paradoxical finding may be interpreted as the use of smoking to cope with stress. Nevertheless, participants from gen X were more sensitive to recycling, environmental pollution and energy saving, which may be related with the higher importance given by the members of gen X to opinions and values.

Female participants from gen Y and Z had higher awareness on global climate change than their male counterparts. The study of Wodika and Middleton also found that climate change advocacy was higher among the female participants.[31] This and our finding may be related with emotionality of women, who are more likely to prioritize production over consumption.

Participants from gen Z mostly did not prefer reusable and recyclable products or refrain from using the goods produced by firms polluting environment. Besides, they did not read publications about environmental issues and pay attention to the issue of energy saving. On the other hand, participants from gen X and Y had higher awareness on these issues. This finding is alarming since the gen Zers will play a crucial role in the attempts to prevent and be the losers of global climate change in the near future.

CONCLUSION

It has been found that the awareness of generation X on global climate change is higher than generation Y and generation Z, and the awareness of generation Y is higher than that of generation Z. Again, it was determined that the Z generation participants did not attach importance to the practices aimed at preventing climate change. Based on our findings, we may suggest that policy makers might take necessary measures and interventions to increase the knowledge of gen Zers on global climate change. Within this context, the issue of global climate change might be incorporated to school curriculum as a vital step. Besides, digital media might play a crucial role to raise awareness on climate change in a digital age. We believe that our findings may contribute to further studies on awareness on global climate change.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or mem-

bers of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Tuba Karabey, Yasemin Boy;* ***Design:*** *Tuba Karabey, Yasemin Boy;* ***Control/Supervision:*** *Tuba Karabey, Yasemin Boy;* ***Data Collection and/or Processing:*** *Tuba Karabey, Yasemin Boy;* ***Analysis and/or Interpretation:*** *Tuba Karabey, Yasemin Boy;* ***Literature Review:*** *Tuba Karabey, Yasemin Boy;* ***Writing the Article:*** *Tuba Karabey, Yasemin Boy;* ***Critical Review:*** *Tuba Karabey.*

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