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The effect of the educational intervention based on the health belief model on the promotion of health beliefs of students towards air pollution

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ABSTRACT

Background: Students are a sensitive group in response to the dangers of air pollution. This study was conducted in order to determine the effect of education using the health belief model on the improvement of students' behaviors to prevent exposure to polluted air.

Methods: This study was a before-and-after controlled intervention. The participants included 184 people in the intervention group (82 boys and 102 girls) and 169 people in the control group (82 boys and 87 girls). The researcher-made questionnaire was distributed among the students based on the model. Then, four education sessions were held along with the distribution of pamphlets for the intervention group. Three months later, the questionnaire was completed again by the students. The data was analyzed using SPSS software. The intervention tests used included: paired t, independent t, chi square and Pearson correlation.

Results: Comparing the scores before and after, it was seen that the level of knowledge and attitude had increased significantly ($p<0.001$). In terms of the constructs of the health belief model, there was a significant difference between the intervention group and the control group after the education. There was a significant difference ($p<0.05$), which shows the effect of education, while before the education, the two groups did not have a significant difference in terms of scores.

Conclusion: The results of the study showed that the implementation of an educational program based on the health belief model with an emphasis on behavior predictors can be effective in reducing exposure to air pollution in students.

Keywords: Awareness, Attitude, Air pollution, Health belief model.

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Introduction

Air pollution is one of the biggest environmental threats to human health (1). Recent data from the World Health Organization (WHO) show that ambient air pollution has increased in hundreds of urban areas around the world. The WHO has described the known adverse human health consequences of exposure to high levels of pollution as a "public health emergency" and estimates that 99% of the world's population is exposed to unhealthy levels of air pollution exceeding WHO air quality guidelines (2). The impact of air pollution on human health includes a wide range of absence of clinical symptoms to death (3). Air pollution is a great threat to health and can seriously affect human health not only through direct inhalation but also indirectly through water contamination, food contamination, and skin transmission (4).

There is a direct and significant relationship between the increase in mortality and the incidence of air pollution (5). Most recent studies have reported a significant relationship between air pollution and cardiovascular and respiratory diseases (6, 7). In a study that investigated the acute cardiorespiratory effects of six important pollutants, i.e. sulfur dioxide, ozone, suspended particulate matter, nitrogen dioxide, carbon monoxide, and hydrocarbons, on the health of residents of Tehran, a significant relationship was observed between asthma and sulfur dioxide concentration and the concentration of nitrogen dioxide (6).

Creating and worsening health effects in all individuals, particularly most vulnerable populations of the society, hospitalization of patients, and increased risk of morbidity and mortality are some major consequences of air pollution. One of the ways to reduce the risks associated with air pollution on human health is to perform personal protective behaviors. The health belief model is one of the most important models showing the relationship between health beliefs and behavior. This model hypothesizes that protective behavior is based on beliefs. The model focuses on individual experiences, motivation, and changes in beliefs. Additionally, it can describe long-term and short-term behavior (8). This model consists of several constructs, including perceived susceptibility (based on a person's knowledge of the disease), perceived severity (a person's abstract belief in the intervention of the amount of harm that could occur as a result of the disease or harmful condition resulting from a particular behavior), perceived benefits (a person's perception of the benefits of their behavior), perceived barriers (a person's perception of the real problems and costs of a behavior), cues to action (forces promoting a behavior), and self-efficacy (a person's ability to perform a behavior (9). The results of previous studies show a low level of public awareness in the intervention of environmental issues (9, 10). With regard to the proper context of schools, teachers can play an effective role in implementing educational and disease prevention programs to promote the awareness and protective behaviors of students in the face of air pollution phenomenon (11).

Although governments are responsible for maintaining and improving people's health, as long as there is no common language between people as service recipients and service provider systems, we cannot expect much success in this regard. Basically and more importantly, what is the level of awareness of the society regarding environmental issues and how much are they aware of the close relationship between the issue and their health and what is their view and attitude towards it.

Adopting any type of decision and solution to control pollution without knowing people's information regarding environmental issues and without knowing the prevailing culture and belief of the society regarding the issue, makes the path to reach the goal longer. Therefore, it is necessary to carry out a study with the theme of providing basic information to the planners and officials who relying on these results, to make better efforts for solving the problems and control the pollution.

On the other hand, the role of people in development has been fully proven. Highlighting this role, which is the intervention of officials and stakeholders in development programs, is possible when the

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people have sufficient awareness of the favorable conditions of the environment. They do not know the duty of the government, but they will pay attention to the impact of their activities. In addition, according to the mentioned contents and the very limited number of interventions carried out in the field of education for students, in this study, the effect of educational intervention in air pollution intervention on increasing the awareness, attitude, and practice of students was carried out using the health belief model.

Methods

This quasi-experimental study was carried out in two cross-sectional and interventional sections. The intervention population of the study was male and female students of the first grade of middle school in district 6 of Tehran. Inclusion criteria for first year middle school students were not having cognitive problems. Exclusion criteria included: unwillingness to participate in the study and absence of 2 out of 4 sessions. The research intervention population is a sample of male and female first grade middle school students in district 6 of Tehran who were studying in the academic year of 2017-2018. The sampling method was clustered. First, 4 girls' schools and 3 boys' schools were selected among 43 secondary schools in the 6th district of Tehran. Then, in each school, 2 first grade middle school classes, one as the intervention group and the other as the control group, were selected randomly. After permission from the mentioned education authorities, the purpose of conducting this research was first explained to the teachers and students and their companions and they were assured that the information of the questionnaire will remain completely confidential.
Then, their verbal consent was obtained and they were informed that participation in this study is voluntary. According to the results obtained in the pilot study, the proportion of students with good and average knowledge was 37%.

The tool for collecting data in this study was a researcher-made questionnaire. This questionnaire included 15 demographic questions, 28 questions of awareness, 4 questions of Perceived susceptibility, 1 question of Perceived severity, 6 perceived barriers questions, 5 perceived benefits questions, 6 practice guide questions, and 5 practice questions. The total scores obtained in each section were used to measure awareness, attitude and practice of the intervention. It should be noted that the attitude score was obtained by summing the scores of Perceived susceptibility, perceived severity, and perceived benefits minus the Perceived barriers score. At first, a pilot study was conducted with an open questionnaire to determine the general level of students' knowledge on air pollution intervention. A total of 82 students from two girls' and boys' schools were randomly selected and the questionnaire was distributed among them. The questions of the questionnaire had 10 points, and a score of 5 and above was considered average and good respectively. The ratio of students with good and average knowledge in this study was 37%, according to which the main sample size was extracted. It should be noted that these 82 people did not participate in the next stages of the study.

Then questionnaire was designed. The validity of the questionnaire was confirmed by experts. The reliability of the questionnaire was measured in both sexes. In this way, the first two middle school classes were randomly selected and the questionnaire was completed by the students in two sessions with an interval of about two weeks. For the final evaluation of the validity of the content, the opinions of 15 experienced experts in different fields will be collected in person and by correspondence, and the intervention of researchers will be included in the questionnaire created in the previous stage, to confirm the face validity of a number of students Homogeneous and non-participating in the study) was given. To determine the validity of the CVI (Content Validity Index) and CVR (Content Validity Ratio) tools, 0.81 and 0.88 respectively were confirmed within the acceptable range. The educational intervention was designed based on the subject group and was implemented in the form of 4 sessions of 60 minutes during three months for the subject group. After preparing the questionnaire, the questionnaires were

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distributed among the students at the designated times. After that, the educational program was implemented under the format of group discussion in 4 sessions along with the distribution of pamphlets in the intervention group. After three months, the questionnaire was again distributed among the students and their results were analyzed. SPSS version 16 software was used for data analysis. The statistical tests used included: chi-square test, t-test, paired t-test and Pearson's correlation coefficient. Also, t-test was used to compare the mean before and after the same variables, and independent t-test was used to compare the intervention group and the control group at a significance level of 0.05.

Results

As mentioned in the research method, the participants in this research were first grade middle school students in two intervention and control groups. There were 102 women and 82 men in both intervention groups and 87 and 82 in the control groups, respectively. According to the value of P = 0.46, there was no significant difference in terms of gender in both groups. The frequency distribution of respiratory diseases between the control and intervention groups showed that there were 19 respiratory diseases in the intervention group and 165 people did not, and in the control group, there were 30 and 169 people, respectively. (P = 0.044). We also found that there was a significant difference between the two groups. It shows the frequency distribution of the students under study, according to father's education in two control and intervention groups, in the intervention group 11 people were below diploma, the level of literacy was 74 people in high school diploma, 97 people were above diploma. These values for the control group were 19, 65, and 82 people, respectively. Furthermore, based on P = 0.197, there was no significant difference between the two groups in terms of demographic characteristic .The frequency distribution of students under study, according to demographic characteristics, for the control and intervention groups is presented in Table 1.

Table 1. Comparison of demographic variables of study for both intervention and control groups

Variable		Intervention group		control group		P -Value
sex	Female	102	55.43	87	51.48	0.46
	Man	82	44.57	82	48.52	
Father's Education	Under Diploma	11	6.04	19	11.44	0.197
	Diploma	74	40.66	65	39.16	
	High Diploma	97	53.3	82	49.40	
Mother's Education	Under Diploma	19	10.38	17	10.56	0.941
	Diploma	83	45.36	73	45.34	
	High Diploma	81	44.26	77	44.10	
Housing	Apartment	153	87.08	138	81.21	0.14
	Non-Apartment	31	12.92	31	18.79	
Respiratory Diseases	Yes	19	10.33	30	17.75	0.044
	No	165	89.67	169	100	
Notification Status	Informed	177	96.2	162	95.86	0.87
	Uninformed	7	3.8	7	4.14	

There was a significant difference between the average knowledge scores of the intervention and control groups after the education, which shows the effect of the education; while before the education, the two groups did not have a significant difference in terms of the knowledge score ($p<0.001$). Three months after the measurement at the beginning of the attitude, significant changes in the reduction of this variable were observed in the intervention group.

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The correlation coefficient was 69% for male students and 86% for female students. Before the intervention, there was no significant difference between the average practice score of the intervention group and the control group. After the education, there was a significant difference, which indicates the effect of the education, while before the education, the two groups did not have a significant difference in terms of the attitude score ($p<0.009$) (Table 2). In terms of the constructs of the health belief model, before the intervention, there was no significant difference between the average score of the Perceived susceptibility of the intervention and control groups. ($p<0.03$).

Before the intervention, there was no significant difference between the average score of the Perceived severity of the intervention and control groups, and there was a significant difference after the education ($p<0.03$). Before the intervention, there was no significant difference between the average score of the Perceived barriers of the intervention and control groups, but there was a significant difference after the education ($p<0.05$).

There was a significant difference between the average score of the perceived benefits of the intervention and control groups after the education, which indicates the effect of the education, while there was no significant difference between the two groups before the education ($p<0.001$). Before the intervention, there was no significant difference between the average score of the intervention group and the control group, and after the education, there was a significant difference, which shows the effect of the education, while before the education, the two groups did not have a significant difference ($p<0.001$) (Table 3).

Table 2. Comparison of knowledge, attitude, and practice of participants in the intervention and control groups

Variable	group	Before intervention	After intervention	P-value
Knowledge	**Control**	38 (5.04)	38.07 (5.34)	0.28
	Intervention	37.43 (4.77)	40.25 (6.35)	0.001
Attitude	**Control**	10.03 (4.33)	10 (4.9)	0.926
	Intervention	8.94 (4.18)	10.52 (5)	0.001
Practice	**Control**	9.14 (2.61)	9.37 (3.07)	0.297
	Intervention	8.45 (3.01)	8.53 (2.92)	0.009

Table 3. Comparison of the stages of the health belief model of the participants in the intervention and control groups

Steps of the model	Variable	Before intervention	After intervention	P- Value
Perceived susceptibility	**Control**	8.44 (2.52)	8.6 (3.16)	0.52
	Intervention	8.26 (2.38)	8.77 (3.01)	0.03
Perceived severity	**Control**	1.68 (1.47)	2.04 (1.6)	0.46
	Intervention	1.56 (1.52)	2.2 (1.44)	0.001
Perceived Barriers	**Control**	6.61 (0.2)	7.23 (2.4)	0.06

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	Intervention	7.03 (2.05)	7.36 (2.2)	0.05
Perceived Benefits	**Control**	6.52 (2.11)	6.65 (2.13)	0.13
	Intervention	6.18 (2.17)	2.65 (6.96)	0.001
Cues to action	**Control**	1.79 (1.23)	2.77 (1.6)	0.06
	Intervention	2.07(1.49)	3.28(1.46)	0.001

Discussion

The present study was designed with a new approach in the field of health education and with the aim of investigating the effect of educational intervention in air pollution intervention on increasing the knowledge, attitude, and practice of first grade middle school students in district 6 of Tehran using the health belief model**.**

In the present study, the average knowledge score of the intervention group increased after education. The increase in the score in the intervention group was more affected for the girls' group. Also, the average knowledge score of boys increased, which was not statistically significant. In the intervention group of boys, after education, 13 people from the middle and poor class joined the good class, but this did not happen in the control group of boys. For girls, 35 people from the middle and poor class joined the good class, which was in line with the study of Ashrafi Hafez et al (9). But it was contrary to Liu et al.'s study that people had good knowledge (12). This reason can be attributed to lack of awareness. In general, education was more effective in girls. One reason could be that the person who taught the boys was less familiar with health education methods, or maybe the boys were less able to receive the education due to their playfulness.

Perceived susceptibility is a very important factor that affects a person's preventive behaviors. Real and successful prevention depends on real information on individual susceptibility intervention. In addition, a person's perception of the severity of the disease and its consequences is an important element in the health belief model. It is more important to adopt preventive behaviors than primary prevention (13). The present study showed a significant difference in terms of sensitivity between before and after the intervention in the intervention group, which indicates the positive effect of education on the elements of the health belief model, which was consistent with the study of Sarani et al. (8), Karimzadeh et al. (13).

By examining the findings, we found that again in the intervention and control groups, after the education, the average score of the Perceived severity has increased compared to before. In the intervention group, the average score increased from 1.56 to 2.2 and in the control group from 1.68 to 2.04. This increase in the average score of perceived severity shows that the participants believed that they were exposed to air pollution and considered it dangerous. This increase in Perceived severity was also reported in other similar studies (8, 13, 14). The results of the study conducted by Azizi showed that the structure of perceived severity in the healthy behaviors of TB patients is significant, which is due to observing the disease in friends or observing the injuries caused by the disease (15).

Perceived barriers compared before and after the control group, a significant difference can be seen. In the control group, it increased from 6.61 to 7.23. The average score of Perceived barriers in the intervention group has also increased. Comparing before and after all groups, an increase in the average score of Perceived barriers is observed. This point should be further investigated because the purpose of education is to reduce the amount of perceived obstacles. In the present study, the most obstacles that students reported were economic and financial problems for buying masks, respiratory diseases, heart diseases and allergies, sweating while using masks, and shortness of breath. In a study conducted by

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Ramzankhani et al., the protective behaviors were at an average level with an average of 16.18 (9). In Karimzadeh's study, the most barriers to preventive behaviors against metabolic syndrome from the women's point of view were cost, unpleasantness, inconvenience, and disorder. In everyday life, it was the family that reduced barriers led to less self-medication by women (13). According to Airhihenbuwa, correcting negative behaviors and removing barriers to adopting healthy behaviors requires the integration of positive health behaviors in society and cultural contexts, followed by the implementation of intervention based on the model (16).

A significant difference can be seen in the comparison of the perceived benefits before and after the intervention group. It has increased from 18.6 to 96.6. In the comparison before and after the intervention group of girls, a statistically significant difference can be seen, it had increased from 5.81 to 6.79; in the intervention group of boys, an increase of 0.57 in the average score of perceived benefits was observed, which was not significant. It is noteworthy that there was a significant difference between the intervention group of girls after the education, but this difference was not visible before the education. It seems that the current educational program in the form of questions and answers and group discussion has been able to clarify the benefits of adopting preventive behaviors for students. A person's understanding of the benefits increases the practice of health behavior (9). There is a significant relationship between perceived benefits and preventive measures. This is also consistent with the findings of Jihouni et al (17), Khazaian et al (18). According to the researchers, an individual's perception of the benefits paves the way for the adoption of preventive behaviors.

The most important guidelines for action before the intervention were friends' and classmates' recommendations, teachers' recommendations, reading books and media, respectively. After the intervention, the most important action guide was teachers' recommendations, friends' and acquaintances' recommendations, mass media and book reading, respectively. The studies showed a significant difference in the control and intervention groups before and after the intervention. This shows that education has no effect on action cues. Contrary to this research, several studies, including Yousefi et al., have been conducted (19). Mokhtari et al. (20) Alagili et al. (21) showed a significant difference after the intervention. It seems that some studies have emphasized a more limited number of elements. The practice guide after education showed a significant difference of 0.002 between the intervention group and the control group. Also, in the comparison between before and after, a significant difference can be seen in the intervention group. There was a significant difference between the intervention group and the boys after education. In the comparison between before and after, we observed a statistically significant difference in all groups. Here, we can see that the intervention group's sensitivity towards the subject increased and after the initial test, people went to more information sources.

Attitude Considering that the attitude score is calculated by summing the scores of Perceived susceptibility, Perceived severity, and perceived benefits minus the score of perceived obstacles, so the result of the scores of Perceived susceptibility, Perceived severity, perceived obstacles, and perceived benefits can be seen in the attitude score. Comparing before and after the intervention group, a very significant statistical difference was observed. Considering that the attitude score of the control group was higher than the intervention group at the beginning (10.03 vs. 8.94) and the average attitude score of the control group remained almost constant after the education and the intervention group had an increase in score, there was no statistical difference between the groups. Intervention and control after education is justified. So that the average attitude score of the intervention group of boys has increased from 9.8 to 10.38, but this difference was not significant. Comparing before and after in the intervention and control group of girls, a significant increase in the mean attitude score can be seen. It can be concluded that education has been more effective in changing the attitude of girls. Educational studies have shown that emotions and values play a more fundamental role in students' environmental attitudes than knowledge and awareness (21), because here the attitude score of the control group of girls has also increased, so it can be concluded that higher awareness in children necessarily leads to It does not make the attitude more favorable, but other factors may also be involved. The practice between the

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intervention group and the control group before the education reached 0.2 and after the education reached 0.009. But after the education, a significant difference can be seen in the intervention group. There was significance between the intervention group after education in girls, but this difference was from 0.6 to 0.002. There was no statistically significant difference between the groups before and after.

Conclusion

It seems that the educational intervention was effective in the intervention of air pollution in students. The educational intervention based on the health belief model improved the knowledge and attitude of the students, which also improved the structures of the health belief model during the 3-month period of the educational intervention. It is hoped that by using the results of this study, the education authorities can identify the weak and strong points of the students' awareness in the field of air pollution and use these findings in future planning. The difficulty of coordinating training sessions with students was solved by the researcher. Due to the fact that the participants were students, absenteeism, young age, etc., they may not have answered the questionnaire correctly.

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