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Effectiveness of Interventions to Reduce Water Pipe Smoking Behaviors among Adolescents: A Systematic Review

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Abstract

Review Article

The rate of water pipe smoking in adolescents and young adults is gradually increasing around the world. The aim of this systematic review was to evaluate the effectiveness of interventions performed to reduce water pipe smoking behaviors among adolescents. This review was conducted in Science Direct, Ebscohost (CINAHL Complete), OVID LWW, Springer Link, Wiley Interscience without limitation for the years in accordance with the Centre for Reviews and Dissemination 2009 guide developed by York University National Institute of Health Research. As a result of the review, two studies were included in the research. Video game-based interventions and visual campaigns were found to have positive results in reducing water pipe smoking behaviors.

INTRODUCTION

The 2000s initiated a new and rising period in tobacco control and also witnessed a new trend which posed a threat to tobacco control [1-3]. Water pipe smoking, which is one of the oldest form of tobacco and was replaced by cigarettes in the 20th century, has emerged simultaneously in many countries at the epidemic level in recent years. Nowadays, it is estimated that 100 million people around the world consume tobacco by smoking water pipe every day [4-7].

The new epidemic of water pipe, which includes a large number of additives and mainly targets the young ones, is different from classic hard water pipe product containing only dry tobacco leaves. This product contains additives that provide taste, odor and easy breathability such as sugar molasses (sugar product residues containing up to 50% sugar in syrup), honey, vanilla, liqueur, menthol, glycerin, various fruit flavors, in addition to tobacco. The amount of carbon monoxide (CO) to which water pipe smokers are exposed is higher compared to cigarette smokers. Heavy metals, such as cobalt, lead and chromium, and tar are also present at higher amounts in water pipe smoke compared to cigarette smoke [8,9]. The amount of smoke inhaled during a water pipe session is 49 times greater than the amount of smoke inhaled by a cigarette [10]. Water pipe smoke is richer in toxic volatile aldehydes (formaldehyde, acetaldehyde,…) compared to cigarette smoke [8,11-13]. The Union for International Cancer Control has defined "formaldehyde" as the first group carcinogen and announced that it causes nasal sinus cancer, nasopharyngeal cancer and leukemia. Sugar and fruit flavorings added to water pipe increase toxic aldehydes by 60% by changing the chemical composition of. Acetaldehyde has a synergistic interaction with nicotine and contributes significantly to the development of nicotine addiction, especially during adolescence. Nevertheless, sugary and flavouring agents that provide taste and odor and give aromatic feature are used in the production of cigarette, water pipe and cigar in order to make it easier for young people to get used to tobacco [14].

When the effects of water pipe on health are analyzed, it is directly associated with lung, mouth, bladder, esophageal and stomach cancers, Chronic Obstructive Pulmonary Disease (COPD), bronchitis, emphysema and causes respiratory tract problems and heart diseases. Infectious infections such as tuberculosis, herpes, hepatitis and AIDS may be observed

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frequently since the same mouthpiece is shared while smoking and mouthpieces are not well sterilized [15-18]. Water pipe leads to eczema especially in hands since it causes circulatory disorders due to the inhalation of high-dose and long-term tobacco smoke, as in all other tobacco products. Although it is attempted to ensure hygiene by using changeable mouthpieces called "reed" during common use since a layer of germs and bacteria is formed inside the hookah tube and on its walls because dozens of people breathe it, and it can be transmitted from one person to another by inhalation, actually, the risk of transmission of a disease is not reduced. Different interventions and campaigns are conducted to prevent water pipe that has become epidemic among young people around the world. In this systematic review, it was aimed to evaluate the effectiveness of interventions performed to reduce water pipe smoking behaviors among adolescents. This systematic review was initiated with the question "How is the effectiveness of interventions performed to reduce water pipe smoking behaviors among adolescents?".

METHOD

This study is a systematic review carried out to determine the effectiveness of "Interventions to Reduce Water Pipe Smoking Behaviors" applied for adolescents. This review was conducted in accordance with the Centre for Reviews and Dissemination (CRD) 2009 guide developed by York University National Institute of Health Research. The literature review was performed without limitation for the years covered in "Science Direct, Ebscohost (CINAHL Complete), OVID LWW, Springer Link, Wiley Interscience" databases. The literature search was performed using eight English keywords between May and August 2019. The keywords "Hookah" "Hookah and intervention", "Waterpipe", "Waterpipe and intervention", "Shisha", "Shisha and intervention", "Narghile", "Narghile and intervention" were used in the search. While the randomized, experimental, quasi-experimental studies carried out with adolescents were the inclusion criteria of this systematic review, reviews, qualitative and descriptive studies, congress papers, theses, book chapters, and the studies carried out in different sample groups with language differences were determined as the exclusion criteria. As a result of searching, a total of 4393 (Science Direct: 1648, Ebsco CINAHL: 465, OVID: 73, Springer Link: 1520, Wiley Interscience: 687) studies were reached. Two studies[19,20] were included in the study as a result of the eliminations performed in accordance with the criteria (Figure).

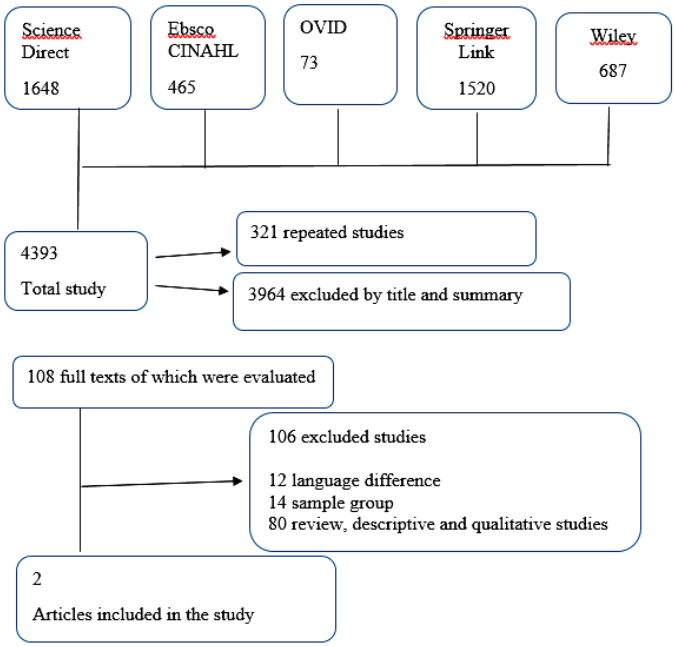

Figure. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow Chart

RESULTS

As a result of the review, two studies that met the inclusion criteria were included in this systematic review (Figure). The results obtained from the studies were presented by classifying under the headings of "Research Type/Sample Characteristics, Measurement Tools Used, Features of Application, and Results" (Table).

Sample characteristics

It was observed that the studies included in the review were belonged to the last year (2019). While only the adolescent age group constituted the sample of one of the studies examined, adolescent and young adult individuals constituted the sample of the other study. It was determined that the number of samples was minimum 23 and maximum 80 in the studies [19,20]. It was determined that one of the studies included in the review had a one-group pretest–posttest research design, and the other study had a mix method (screening-qualitative-quasi-experimental) research design.

Measurement tools used

Different measurement tools and methods were used in the studies included in the review. While Pentz et al. used the questionnaire form developed in accordance with the literature [19], Sutfin et al. used telephone questionnaire in the first stage of

Table. Studies and their features

Article/ Research	Research type/ sample characteristics	Measurement tools used	Features of application	Results obtained
Pentz et al. (2019)	Single group pre-test and post-test model 80 adolescents of 11-14 age group	A survey with questions adapted from national surveys (Global Youth Tobacco Survey Collaborative Group, 2002; National Youth Tobacco Survey (NYTS) 2018)	60 minutes of video games were played in a week for four weeks in one group.	There was an increase in participants' knowledge, risk perceptions and personal health beliefs after the video game intervention. Participants' knowledge about electronic cigarettes and other tobacco products increased. Their risk perceptions of electronic cigarette and cigarette were increased. According to the results of linear regression analysis, the risk perceptions of female participants about the use of cigarettes were observed to be higher compared to male participants. Older age also increased the risk perception of electronic cigarettes.
Sutfin et al (2019)	Systematic, three-stage study (Participant age range: 16-25 years). 1st stage: 896 participants	Random Digit Dial (RDD) and cell phone 100-banks were used to collect data in the 1st stage.	Telephone questionnaire was used in a large sample in order to confirm the effects of water pipe tobacco.	Results of stage 1: The participants found that the components and health effects of water pipe were more worrying than its cosmetic effects. It was found that young people in the 16-17 age group were more concerned about the components, health effect and cosmetic effects of water pipe than adults.
	2nd stage: 37 participants	Participants were determined using purposeful sampling methods in the North Carolina Triangle region (Raleigh, Durham, Chapel Hill) including personal participation, email and advertising.	Participants were given a booklet containing 12 sample messages (three for each of the four applications). It included sample messages for cigarillos, water pipe and six different components (Formaldehyde, carbon monoxide, cyanide, ammonia, arsenic, lead).	Results of stage 2: The participants generally found text-only messages similar, however, they thought that the text and visual background did not match. In the second set, the participants considered that the images were easy to understand and meaningful. In the next set, counterfeit products were considered very fine, and the participants worried that product advertisements could easily be misinterpreted. Although the portraits in the last set were remarkable, participants found the connection between the model and the unattractive product unclear. As a result of all these evaluations, half of the participants (51.4%) determined that video playback was the most effective option.
	3rd stage: 23 participants (17 intervention groups, 6 control groups)	Eight messages for water pipe and nine messages for cigarillos were developed. Messages contained a title identifying the tobacco product and a specific ingredient in smoke.	Several messages were developed with these principles for each tobacco product: (1) to use the known components; (2) to match with unattractive products; and (3) to use a funny sarcastic tone.	Results of stage 3: Exposure to messages led to significant changes in all risk beliefs, from pre-test to post-test for both intervention and control messages. Intervention messages led to further increase in the belief that people would become addicted to water pipe compared to control messages.

their study carried out in three stages. In the second stage, they qualitatively examined the content of anti-tobacco messages through group interviews. In the final stage, they applied the contents of most effectively selected messages as quasi-experimental [20].

Features of application

Different methods were also applied in all three studies included in the review. Pentz et al. played 60 minutes of video games in a week for four weeks in one group [19]. In the first stage of their study, Sutfin et al. applied telephone questionnaire in a large sample in order to confirm the components, health and cosmetic effects of water pipe tobacco. While four health effects (persistent respiratory problems, infectious diseases, lung cancer and carbon monoxide poisoning) and four components (arsenic, carbon monoxide, formaldehyde and benzo-a-pyrene) were evaluated for water pipe, two cosmetic effects (wrinkles, gingival disease and tooth loss) and four components (ammonia, gasoline, isoprene, hydrogen cyanide) were evaluated for cigarette. In the second stage, the participants were given a booklet containing 12 sample messages (three for each of the four applications). This booklet included sample messages for cigarillos, water pipe and six different components (formaldehyde, carbon monoxide, cyanide, ammonia, arsenic, lead). In the third stage, eight messages for water pipe and nine messages for cigarillos were developed and implemented [20].

Findings obtained

In the study carried out by Pentz et al., there was an increase in participants' knowledge, risk perceptions and personal health beliefs after the video game intervention. Participants' knowledge about electronic cigarettes and other tobacco products and risk perceptions of electronic cigarette and cigarette were increased. According to the results of linear regression analysis, the perceptions of female participants about the use of cigarettes and tobacco products were observed to be higher compared to male participants. Older age also increased the risk perception of electronic cigarettes, and knowledge and personal beliefs [19].

Sutfin et al. carried out their study in three stages. In the results of the first stage, the participants found that the components and health effects of water pipe were more worrying than its cosmetic effects. It was found that young people in the 16-17 age group were more concerned about the components, health effect and cosmetic effects of water pipe than adults. Although there are some important differences between the types of damages, the small effect sizes suggested that the messages targeting all three types of damages could be effective [20].

In the results of the second stage, the participants listed each application independently as attention grabbing, credibility, comprehension, learning something new, making participants think about the risks, and discourage participant from future use. The ratings were made on a five-point scale from “never” to “extreme”. Then, the moderator turned towards the discussion on attention, comprehension, cognitive and emotional responses, message design elements and perceived areas of influence. During the focus group discussion, larger examples of the 12 sample messages received from the booklet were shown, and after the discussion, the participants independently listed all four message execution processes from the most to the least. In the first set, participants generally found the text-only messages cute and pleasant, however, they thought that the text and visual background did not match. In the second set, they considered that the images were easy to understand and meaningful. In the third set, counterfeit products were considered very fine, and the participants worried that product advertisements could easily be misinterpreted. In the last set, the portraits attracted the attention, however, participants found the connection between the model and the unattractive product unclear. As a result of all these evaluations, half of the participants (51.4%) determined that video playback was the most effective option [20].

Results of stage 3: Exposure to messages led to significant changes in all risk beliefs, from pre-test to post-test for both intervention and control messages. Intervention messages led to further increase in the belief that people would become addicted to water pipe compared to control messages [20].

DISCUSSION

Nowadays, many water pipe smokers around the world further prefer maassel since it is more delicious and easier to prepare. This is rapidly turning into a world epidemic, affects especially young people and adolescents, and is spreading through hookah cafes. Due to the features and perceptions such as the passage of smoke through water, the filtering and cooling effects of water, and the length of the usage ranges, users think that water

pipe poses a less risk in terms of health problems related to tobacco use compared to cigarette smoking.

In a study carried out with the students of Erciyes University, 41.6% of male students and 20.2% of female students smoked water pipe [10]. In another study, the rate of water-pipe smoking was found to be 37.5% among male students and 17.2% among female students [21]. Although water pipe smoking is higher in males in most studies [11,22], a female population with increasing usage rate should not be ignored. The fact that water pipe smoking is considered more acceptable for women compared to cigarette smoking [22-24] may increase the rate of water pipe smoking among female adolescents.

People generally have very little knowledge about the effects of water pipe on health and believe that water pipe is less harmful. Another misconception about water pipe smoking is that to smoke water pipe occasionally rather than every day will not lead to any negative consequence. In a study carried out with university students, while 52.3% of the students thought that water pipe did not have addictive effect like cigarette, 30.6% of them thought that water pipe was less harmful to health compared to cigarette, 25.7% of them thought that the inhalation of water pipe smoke by passing through water removed the harmful substances in it, and 13.6% of them thought that the fruit pieces or aromas added to tobacco made water pipe healthier [1]. In the same study, it was determined that students had insufficient knowledge about water pipe and tobacco products [1]. In another study, the participants stated that water pipe smoking is less harmful than cigarettte smoking.[25] In another study with a systematic review, it has been reported in studies that hookah is considered less harmful than smoking.[26]

Although water pipe causes respiratory problems and cardiovascular diseases [9,27,28], it was demonstrated in many studies that water pipe was associated with many cancers such as lung, mouth, bladder, esophagus, stomach cancer [12,16]. In addition to these effects, it was reported that water pipe had oxidative stress increasing effect in regular use [11] and adversely affected the lung mucociliary clearance system [29]. Another negative effect of water pipe is that it increases the risk of spread of infectious diseases due to its re-useability feature [5,11]. When the content of water pipe is examined, while naturally derived aromas from plants can be used in water pipe blends, chemical flavors obtained by fully synthetic means by imitating plant extracts are also used. Solvent types are used as scavengers to prevent aromas from volatilization, chemicals are used so that aromas are resistant to high temperature, and glycerin is used in the whole water pipe production except for water pipes made of pure persian tobacco. Glycerin is obtained from burnt waste oils or plants with oil seeds in to keep the water pipe tobacco at a certain humidity level. Nevertheless, while starch based sugar is used in the production of water pipe tobacco products, sodium benzoate is used to prevent the deterioration and molding of the product and to maintain its properties until the expiration date. For all these reasons, in the study of Sutfin et al., the participants found that the components and health effects of water pipe were more worrying than its cosmetic effects.

In the study of Sutfin et al., it was reported that messages with high image and visual contents in the campaigns to quit water pipe smoking were effective on quitting water pipe smoking. The studies in the literature also support this result [30,31].

Water pipe is perceived by young people as a product that they smoke for pleasure while they are together with their friends, that appeals to their needs for socialization and facilitates their acceptance in the circles of friends. The businesses where water pipe is smoked have become one of the socially popular environments where young water pipe smokers and friends gather. In these businesses, water pipe sets with colorful appearance, decor, and the music played attract the young population in particular by creating an exotic environment. Adolescents are more prone to use new and remarkable products due to the identity confusion of the period and their efforts to prove themselves. From an industrial point of view, the tobacco industry considers the rising popularity of water pipe smoking as an inevitable opportunity for young populations at its target point.

CONCLUSION

In two studies included in the review, it was observed that the interventions to reduce water pipe smoking behaviors among adolescents had positive consequences. It was concluded that video games and visually influential campaigns specific to the period of adolescents were effective in reducing the use of water pipe and other tobacco products. As an answer to the research question, it can be said that the initiatives are effective. Young people's knowledge, attitudes and behaviors

on water pipe smoking, perceptions of smoking, and the factors that trigger its use should be determined, and health educations should be held for behavior changes and campaigns should be conducted to prevent water pipe smoking together with the young in order to prevent water pipe smoking that has become epidemic among young people around the world.

Conflicts of interest

The authors declare that there are no financial interests or personal conflicts that could affect the work reported in this article.

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