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The Dangers of Cigarette Smoke and the Role of Guided Inquiry for Prevention and Other Prevention

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ABSTRACT

Objective: The objectives are to discover the health impact of cigarette smoke, the factors make adolescents' smoking behavior, and how guided inquiry and other rules for preventing smoking behavior. **Method**: This research uses a literature review research method or literature study, collecting several sources that can later be used as a reference. This research is obtained from the seventy-five journals reviewed. **Results:** Based on the literature review, so many destructive impacts of cigarette smoke on health. Mostly factor in smoking behavior is an advertisement of cigarettes. Preventive ways to stop adolescents smoking behavior are also available. Nevertheless, the most effective ways are school-based learning. Primarily health education with guided inquiry learning based. **Novelty:** Previous research by another researcher needs to explain the factors of adolescent smoking behavior sufficiently; the previous research also needs to mention the prevention of that behavior. This research shows the health impact of smoking and prevention in social life, and this research shows the role of guided inquiry for prevention.

INTRODUCTION

As a country that produces and consumes tobacco, Indonesia is included in the highest category in terms of tobacco consumption. According to statistical data from the Indonesian Central Statistics Agency, in 2021, 28.96% of Indonesia's population aged 15 years, increasing are smokers—a large number for the country with the fourth-largest population in the world (BPS, 2021). While more than 480,000 deaths each year in the United States are caused by smoking, this is almost one in five deaths in a single day. Smoking causes more deaths than the following causes combined: Deaths from exposure to the Human Immunodeficiency Virus (HIV), Alcohol use, Motor vehicle accidents, Drug use, and Gun-related incidents (CDC, 2021).

Education about the dangers to the health of smoking must be part of it to reduce or stop that smoking behavior. Researchers believe that guided inquiry has many advantages that can be applied to that objective. According to Komariyah & Syam's (2016) research, the researcher's opinion is supported by previous research that guided inquiry through science learning; good science learning must be more student-oriented (student-centered). The role of the teacher is as a provider of information and a center of assistance so that students' learning experiences can improve. Through the Guided inquiry model, students master scientific concepts and are trained to research questions using existing facts and the role of the teacher as a guide. This aligns with Destryani et al. (2022) research that students' activities with guided inquiry based on animal respiration practicum significantly improve their generic science skills.

Amijaya et al. (2018) have argued that the guided inquiry learning model positively influences the learning outcomes and students' critical thinking skills. This aligns with Sarifah & Nurita (2023), and Maramis et al. (2022) that guided inquiry effectively

improves critical thinking skills. Maramis's (2022) research was particularly about awareness of maintaining the health of the respiratory organs because the current condition found that many Junior High School students smoke without knowing the impact of cigarettes on health, especially in the respiratory organs.

Smoking restrictions can be done in various ways, from applying No Smoking Areas (NSA) or *KTR (Kawasan Tanpa Rokok)*, making laws and regulations, to learning in the classroom. The NSA restriction limits smokers and protects the right to fresh air from non-smokers (Wijayanti et al., 2020). Another NSA was implemented at UIN Jakarta; half respondents have NSA knowledge, and half do not (Wiyarti et al., 2020). However, almost no smoking area was not enough to stop adolescents smoking behavior. Is needed school-based intervention education about the dangers of cigarette smoking (Azhary et al., 2021).

Based on the background described above, the researchers conducted a study entitled "The Dangers of Cigarette Smoke and the Role of Guided inquiry for Prevention and Other Prevention." This article is made from many theories about the impact of smoking, learning methods to prevent smoking behavior, and other prevention obtained from the seventy-five journals reviewed. The objectives are to discover the health impact of cigarette smoke, factors that make adolescents' smoking behavior, and how guided inquiry and other rules for preventing smoking behavior. This literature review on the future can serve as a reference for readers aligned with the topics discussed in this article.

RESEARCH METHOD

This research uses a literature review research method or literature study, collecting several sources that can later be used as a reference. Sources are obtained from various sources, such as journals, archives, and books, to obtain the author's desired results. The sources used in this research were several journals related to the impact of smoking on health and how to prevent it. The research flowchart is likely in Figure 1.

Figure 1. Flowchart of literature review.

In addition to journaling the impact of smoking on health and how to prevent it, the researchers also used a guided inquiry learning model journal on breathing material. Using the guided inquiry learning model, the author uses a guided inquiry journal on breathing material to determine whether smoking can be prevented. Researchers obtain data indirectly from the object under study or through intermediaries from various sources such as journals, archives, and books (Afnan et al., 2023; Marzali, 2016). The sources of this study were seventy-five journal articles related to the danger of cigarette smoking and the role of guided inquiry prevention and other prevention.

RESULTS AND DISCUSSION

Results

Impact of Smoking on Health

The health effects/impact of smoking started when one was an embryo and continued into adulthood. Active smokers, especially those who smoke more than nine cigarettes

daily, experience decreased sperm quality, manifested as decreased sperm motility, abnormal sperm head morphology, and significantly decreased sperm motility. Fathers who smoke increase the risk of babies with non-allergic early-onset asthma by 1.68 times. Besides babies, cigarette smoke also harms the health of pregnant women, 73.50% of 1,599 women are pregnant, and the proportion of low birth-weight babies born to mothers with husbands who are active smokers is 7.50%. The incidence of LBW (low birth weight) was slightly higher in mothers whose husbands were active smokers compared to mothers whose husbands were non-smokers, although the difference was not significant (PR 1.09; 95.00% CI 0.72-1.66) (Simamora & Ronoatmodjo, 2020).

This is in line with research from Kusumawardani et al.(2020). One of the causes of LBW is the mother's hypertension. Cigarette smoke can cause hypertension in pregnant women, although not significantly. A study of 10 pregnant women in Brangkal Bojonegoro Village revealed this. The study's chi-square test results showed a p-value of ($p=0.857$) or a p-value $<\alpha$. This is possible because most husbands work as farm laborers, which causes husbands to meet their wives while smoking rarely. Smokers in the house increase the risk of pneumonia in children by 1.20 - 6.70 times. In other words, smoking is more dangerous for children under five years old (Setiawati, 2019). That is supported by previous research by Soeseno et al. (2019), there is a relationship between the smoking behavior of husbands and the incidence of low birth weight babies in neonates. That research used 23 of 36 neonates/babies who suffer from birth as samples. Their weight babies prove it, and their babies have lower weight with smoking husbands (63.88%). From some of these studies, it can be seen that smoking can cause hypertension, affect pregnant women, and cause LBW. Meanwhile, the other 13 did not suffer from LBW babies (36.11%). So, smoking negatively impacts pregnant mothers, from hypertension to another chain impact.

Adolescent active smokers consume 11-20 cigarettes daily and have high hemoglobin levels. Besides, active smokers have high erythrocytes and blood viscosity levels, making the heart work harder and increasing the heart rate. (Irawan et al., 2019). The value of hemoglobin levels in the blood of adolescent smokers is higher than that of non-smokers, so it impacts the heart's work harder. In addition to working the heart more often to work hard, it can lead to a decrease in physical fitness, marked by a decrease in the average calorie intake of a smoker to 1787.37 calories. Smoking habits cause 3.51 times the risk of facing hypertension, and age can increase the risk by 3.08 times to face the incidence of hypertension, which means that increasing age and heavy smoking habits will accelerate a person experiencing hypertension (Suprapto et al., 2021). The relationship between smoking and stroke shows that smokers are 2.04 times more likely to suffer a stroke than non-smokers. An analysis by stroke subtype showed that smokers were 2.30 times more likely to have an ischemic stroke than non-smokers and 2.77 times more likely to have a hemorrhagic stroke than non-smokers. Hemorrhagic stroke is bleeding within the brain, and ischemic stroke is caused by the buildup of fatty deposits on the inner lining of blood vessels (Hasnah et al., 2020).

The relationship between smoking and hypertension is very close as one of the aggravating factors (Lusno et al., 2020). It is supported by previous research from Setyanda et al. (2015) showed a relationship between smoking habits, smoking duration, and type of cigarette smoking to the incidence of hypertension in men aged 35-65. Similar results were obtained in Angga & Elon's (2021) research and Apriza & Nurman's (2022) research, Angga's research has shown that smoking duration can increase systolic and diastolic blood pressure. Moreover, the result of Apriza's research

shows that respondents with smoking habits had a higher risk of hypertension than patients who did not smoke about 6.06 times.

Besides hypertension, cigarette smoke also affects the respiration organ. The average Lung Vital Capacity of smokers is lower than non-smokers. Research showed that smoking students' average values are FEV1 (Forced Expiratory Volume in one second) = 3.230 ml, FVC (Forced Vital Capacity) = 3.880 ml, FEV1/FVC= 83.25%, and VC =2,990 ml. Moreover, the average Lung Vital Capacity in the non-smoking group students is FEV1=3.360 ml, FVC=3.840 ml, FEV1/FVC= 86.79%, and VC= 3,320 ml. His research shows that smoking behavior does not affect Lung Vital Capacity (LVC) (Husodo et al., 2013).

Husodo et al. (2013) research is the opposite of Fadlilah et al. (2020), which shows that anti-smoke students have better lung vital capacity than students who smoke. In the smoker group, there was moderate to severe restrictive lung capacity; in the non-smoker group, there was none. This is also in line with Sitorus et al. (2021) research showing that smokers' lung capacity also experiences a decrease in %FVC and %FEV1, respectively 90.48% and 96.83% in active smokers. So the more active smoke, the absorption of calories will decrease, affecting the value of a smoker's lung capacity (Indraswari et al., 2018). The duration and number of cigarettes smoked affect the carbon monoxide content in respiration by 72.50%. In addition to the smoking frequency factor and the last smoking duration, there is the distance between the place of residence and the crowdsource or the density of motorized vehicles, which is only 28.50%.

Sathianathen et al. (2018) explained that smokers face a two-fold increase in surgical complications, such as wound dehiscence and myocardial infarction, following radical surgical cystectomy. In line with Sathianathen et al. (2018) and Hirobe et al. (2018), research showed a similarly high incidence of postoperative complications on open radical cystectomy, primarily 90 days after surgery. One of the factors that caused complications is smoking history for significant complications. Haeuser et al. (2021) made a similar statement to Hirobe, his research compared 50-year-old patients who had undergone cystectomy with 80-year-old patients who had had cystectomy. Patients with the potential for significant complications increased by nearly 10% (15.60% to 25.30%) for smokers and only about 4.00% (15.50% to 19.10%) for non-smokers. Cystectomy itself is a surgical procedure to remove the bladder. Removal can be done by the whole bladder (radical) or part of it.

The lightest impact of smoking on health is red eye syndrome or dry eye syndrome, which will change the color of the smoker's eyes. The risk factors for red eye: are smoking, diabetes, thyroid diseases, antidepressants, multivitamin, caffeine drinking, and contact lens usage (Alhamyani et al., 2017). A smoker will experience this syndrome 3.22 times more significant than a non-smoker. The higher the frequency or the more cigarettes consumed by a smoker, the greater the chance of developing this syndrome. This syndrome is the impact of smoke that leads to the smoker's eyes or even to the people around him (Pritasari et al., 2019). Cigarette smoke affects red eye syndrome. Based on research, cigarette smoke will attack the ocular surface and tear film. The Indicator of dry eye is The Schimer's II Test, Ocular Surface Disease Index (OSDI), Tear Meniscus Height (TMH), and Tear Break Up Times (TBUT). The OSDI questionnaire mean OSDI smoker scores were almost five times higher (20.80 ± 15.20) than in non-smokers, Smoker Schirmer's scores (22.30 ± 12.61 mm) were lower than

non-smokers, TMH scores of the smoker was lower (0.23 ± 0.06 mm) than non-smokers, TBUT smoker was (9.69 ± 3.96 s) less than in non-smokers (12.80 ± 1.93 s).

Factors Affecting Adolescent Smoking

The high prevalence of smoking among adults can influence the smoking behavior of adolescents who have lived together. Exposure to cigarette smoke by parents or families of smokers at home is not suitable for health, which will be a bad example for a child to emulate (Utami, 2020). Three variables influence adolescent smoking behavior, at the research of Beda et al. (2021). Their research was conducted on 153 Trisoko Middle School students; the results in this study indicate that advertising is the most dominant variable influencing smoking behavior in Trisoko Junior High School adolescents. Trisoko Junior High School adolescents' smoking is caused by cigarette advertisements that show intimacy and togetherness combined with diversity, especially not balanced by attitudes or ethics when smoking. Not only that, smoking behavior was also found in students who studied at the Lirboyo Islamic Boarding School. Based on the questionnaire results, 55.00% answered that smoking is good, calm, and stylish. Their perceptions of cigarette advertisements only visualize fun, relaxed, and togetherness activities. Those perceptions are caused by cigarette advertisements on television or billboards plastered on the streets. Adolescents living in the Lirboyo Islamic Boarding School also show that perceptions about smoking and a lack of understanding of advertising can cause teenagers to become smokers (Nurhasana et al., 2020). The image in cigarette advertising makes more adolescents exposed to cigarette advertisements is more and makes curiosity about smokers (Nurcahyani et al., 2019).

Other factors are achievement, drinking, and sexual activity from an adolescent. Park et al. (2022) research on multicultural adolescents in South Korea showed it. Multicultural adolescents become smokers when they have lower school achievement, drink, and are sexually active. In addition, those with drinking experience were more likely to smoke than that with non-drinking, about 15.79 times more. If smoking habits are not handled or even prevented properly, drug NAPZA abuse is possible. Form fourth drug addict of them is a smoker (Dalimunte & Harahap, 2019). Astuti & Hastono (2020) also revealed this, concluding that the more cigarettes consumed, the higher the survival rate for cannabis abuse. The more cigarettes consumed, the greater the danger of abusing cannabis compared to smokers who rarely smoke. Several other factors that cause drug (marijuana) abuse include: having a history of drinking alcohol, family exposure to alcohol or illegal drugs, having lived separately from parents for at least six months, and having peer influence. It will be hazardous when someone experiences these factors. However, smoking has no relation with amphetamine abuse, as shown by Idayani & Putri's (2020) research.

Based on the research of Ranaei et al. (2022), the evidence from their study suggested that reducing smoking behavior among adolescent primarily male students should be addressed before they become high school. Furthermore, the smoking behavior of adolescents must be reduced or stopped. Prevention through health education should be a priority in schools and society. With a health learning program at school, adolescents become aware of their respiration.

Prevention

Preventing cigarette smoking behavior is needed; government regulation is one of many ways of prevention—the relationship between smoke-free laws or regulations in

cities and the incidence of lung cancer. Individuals living in communities with comprehensive (broad and binding) smoke-free laws or regulations were 7.9% less likely than those living in non-smoking communities to develop lung cancer. However, individuals living in a community with moderate or weak smoke-free laws or regulations are as likely as those living without such laws to develop lung cancer, which means that the law on controlling and limiting cigarette smoke can reduce the rate of people living with lung cancer (Hahn et al., 2018). Another research shows that if the regulation is not strict or thoughtfully implemented, the result does not change. Kusworo & Rochmansjah (2020) researched if guidance to the community regarding the no-smoking area is only through a socialization approach. If there are violations, only giving verbal warning sanctions is a big obstacle. The regulation in Indonesia does not require strict or seriously implemented caused by the budget allocation of support and tobacco control activities to low absorption. However, if there is a low budget absorption, the impact is that the regulation cannot decrease smokers (Rahmayanti, 2019).

Health education on the cigarette smoking habits of adolescents effectively improves students' knowledge. Education about the dangers of smoking can be done anywhere; one way is through Instagram using posters and videos. This can increase smoking students' knowledge, attitudes, and practices regarding smoking cessation efforts. Utilization of social media in the form of Instagram as an educational tool that collaborates with technology. It is given to students about the dangers of smoking to provide education according to their characteristics so that the material presented is easy to understand and up to date (Swastika et al., 2021). According to Rahmah & Arbianingsih (2018), social media can be used to learn about the motivation to quit smoking on adolescents, primarily on Facebook. It is headed in that direction; quit motivational health education smoking with Facebook media can increase motivation to quit smoking students at State JHS 2 Lambu. It is effective for students at State JHS 2 Lambu, but adolescents' awareness (globally) of the dangers of cigarette smoking needs to be higher if correlated to social media content. This is due to the need for more awareness about the dangers of smoking, both in terms of the amount of content and quality (Kusuma et al., 2020). The dangers of cigarette smoking learning also can use in online game-based learning. As shown by Lestari & Huriah (2022), the game is chasing the symbol of the smoking dangers that can improve smoking prevention behaviors in school-age children.

Inquiry Learning for Prevention

In Indonesia, smoking is part of NAPZA (Narcotic, Psychotropic, and Addictive Substance), and many adolescents support the efforts to prevent and mitigate the impacts abuse occurs (Surya et al., 2020). Education about the health impact of cigarette smoke has already been present in science learning from elementary to high school. Because cigarettes contain additives or substances that can make a person addicted when entering high school grade XI, the impact of smoking is strengthened on BC (Basic Competence) 3.11: Evaluating the dangers of using psychotropic compounds and their impact on personal, environmental, and community health (Kusuma, 2021). Education must grow and have a new strategy based on the 21st century and cognitive-based to teach adolescents about the health effects of cigarette smoke. Learning with the lecturer method causes students to become passive and learning because memorizing concepts, facts, and laws are not attractive to students (Sutarningsih, 2022).

One of the learning methods is guided inquiry, one of the deep inquiry learning implementations. The teacher provides students with guidance and instructions about the study materials (Ratnaningrum et al., 2015). The inquiry learning model can carry out in groups with teacher guidance to give students the experience of thinking independently and interacting with friends through discussion forums (Umniyatun et al., 2019). Inquiry, primarily guided inquiry, can develop various abilities possessed by students. They allow students to participate in learning activities actively. In addition, an inquiry is straightforward and practical to use and can be combined with other learning strategies (Rizki et al., 2021).

Metaputri & Garminah's (2016) research stated the advantages of guided inquiry. Namely developing students and mastery of students' skills and cognitive processes; besides that, guided inquiry provides opportunities for students to move according to the abilities of students who are directly involved in learning so that they are motivated to learn. Guided inquiry is a flexible learning model that can be combined with other learning models or strategies. One of the guided inquiry blends is group investigation (group investigation/group discussion) which is used to improve students' science process skills. Using the combined model allows students to conduct group research interactively with friends and educators to exchange opinions, knowledge, and findings, solve problems, and be able to hypothesize through investigation, exploration, and discussion.

Moreover, these results are very significant compared to before the application of the alloy model (Indrawati et al., 2021). Guided inquiry is also effective in training scientific literacy skills. Several indicators of scientific literacy skills, such as problem-solving abilities, student activity, and student responses to students' scientific literacy skills, have increased (Choirunnisak et al., 2018; Kurniati et al., 2018). The science literacy capabilities combined with guided inquiry can improve students' science literacy enough to moderate the category (Haryadi & Pujiastuti, 2020). Guided inquiry and heat and temperature modules can also improve students' science literacy (Innatesari et al., 2020). Improving students' scientific literacy can use blended learning tools (a combination of learning tools). This blended learning tool, guided inquiry, and a combination of these learning tools can be an appropriate alternative to 21st-century learning based on blended learning that can be accessed freely (Gunawan et al., 2021).

Not only to improve students' creative thinking skills, but guided inquiry learning can also improve students' cognitive learning outcomes in human breathing material assisted by the e-module by obtaining an F count = 351394.01 and p-value = 0.00 < α (α = 0.05), which is included in the high category. This means that students equipped with an e-module based on research results combining guided inquiry can improve creative thinking skills and improve students' cognitive learning outcomes (Sari et al., 2020). In line with Awaluddin (2023), his research inquiry learning combined with Numbered Heads Together (NHT) can also improve the students' cognitive outcomes. It has been supported by Bago & Sarumaha's (2022) research, with inquiry learning students' cognitive outcomes being improved.

Research conducted by Liana et al. (2022), guided inquiry-based e-modules proven can improve critical thinking skills. Another research from Liana (2022) in the same article shows that guided inquiry can be combined with student worksheets to improve student's critical thinking skills. Guided inquiry combined with Cladistic E-Worksheet can also improve critical thinking skills (Pratiwi et al., 2022), in line with Ananda (2022). Using the Student Worksheet (SW) based on guided inquiry showed the same thing,

indicating that guided inquiry-based worksheets can improve students' critical thinking skills. Critical questions can also improve the student's critical thinking skills; with critical questions, learning will arouse students' curiosity (Kurniawati, 2019; Payu et al., 2022).

Inquiry learning can be used to increase knowledge and attitudes about the dangers of smoking. When given inquiry learning on students' knowledge and attitudes about the dangers of smoking, significant results were obtained. For knowledge, the result shows high categories after inquiry learning. Meanwhile, students' attitudes have medium scores (Hamzah, 2020). In science learning, the impact of smoking is included in the topic of NAPZA. A guided inquiry based on students' worksheets can be used to improve healthcare character on addictive substances. The attitude of adolescents who have not applied addictive substances impact inquiry-based learning has an average value, leading to negative. However, after applying inquiry learning, the value has improved. Tests were carried out on 105 grade XI Vocational School 8 Makassar students using the inquiry learning method. It can be concluded that the inquiry learning method can improve attitudes at the receiving and responding stage of receiving, responding, appreciating, and being responsible (Asrina et al., 2020).

In addition to learning, evaluation of school-based smoking prevention is also needed; evaluation is used so that students can improve anti-smoking attitudes in students. Evaluation learning based on this experience is proven to increase adolescent attitude change. In the study, as many as 351 students participated, and the average age of the participating students was 13 years. It was found that students in the experimental group could increase their knowledge about the adverse effects of smoking, develop attitudes towards anti-smoking, and report harmful intentions to smoke in the first year after program administration. Very different when compared to the group that has not received it (Mpousiou et al., 2021). Another evaluation of school-based is ASSIST (A Stop Smoking in Schools Trial), peer-led evaluation (friends lead a program. One responded that they are likelier to listen to friends than the teacher (Dobbie et al., 2019). The above research is supported by Huriah & Lestari's (2020) research on anti-smoking curriculum, BCI, and peer education effectively preventing adolescent smoking.

Discussion

After reviewing several articles, the researcher found much destructive health impact on smokers. From embryos to older people has the same impact as a destructive impact. This research shows that adolescents' smoking is caused by cigarette advertisements, family, and the environment—also, lack of knowledge about the health impact of cigarettes is why they are smoking. However, smoking behavior can be reduced or stopped by giving them knowledge about the dangers of smoking. If the smoking behavior not If problem is not handled correctly, it will lead to drug abuse, especially cannabis.

Based on research, the prevention of smoking behavior is provided by social media that contains health education on cigarette impact on health; provided anti-smoking advertisements; provided regulation, and well budget to restrict smokers in public; and school-based learning. This research shows that government regulation about the anti-smoking area needs to be improved, caused to weak law enforcement. The role of guided inquiry can reduce or even stop smoking behavior. Other anti-smoking areas like campus or school regulations are only effective if accompanied by anti-smoking

education. Based on this research, guided inquiry can improve health care character on addictive substances and improve the student's attitude toward smoking behavior. The guided inquiry is easy to use and can combine with another learning strategy or method. Guided inquiry can improve scientific literacy skills, students' creative thinking skills, students' cognitive learning outcomes, and critical thinking skills on students.

Several previous studies needed more guided inquiry studies to reduce or even stop smoking. Suggestions from researchers for future research is better to integrate guided inquiry with other learning methods or strategies so that the number of smokers can be reduced.

CONCLUSION

Fundamental Finding: This research concludes that guided inquiry can be a learning method to prevent smoking behavior. **Implication:** Other prevention like anti-smoking areas, health education with social media, and others can also reduce or stop smoking behavior, but school-based learning is more effective than other research. **Limitation:** The limitation of this research is that there are very few studies using guided inquiry for smoking prevention, causing researchers not to review the role of guided inquiry for prevention in depth. **Future Research:** The researcher recommended further developing guided inquiry on smoking prevention.

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