



## Teachers' Views on Air Pollution and Personal Hygiene Promotion Strategies

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### Abstract

**Background:** Children are vulnerable to air pollution, especially in their early life and so far there are no personal hygiene promotion strategies specifically aimed at addressing health threats or vulnerabilities in children in industrial areas. Therefore, the study aimed to determine teachers' views on air pollution and personal hygiene promotion strategies for children's health.

**Methods:** This study used a quantitative method conducted with structured interviews. Respondents in this study were kindergarten teachers who taught in Ngaliyan District, totaling 95 teachers. The data analysis technique used was theme analysis technique.

**Results:** Based on the interview results, teachers' views on air pollution are categorized as good. Respondents can mention sources of information about air pollution, causes of air pollution, the effect of air pollution on children's health, and diseases that arise due to air pollution. Teachers' views regarding personal hygiene promotion strategies are not good, especially in protecting children's health from air pollution.

**Conclusion:** Teachers' views on air pollution are good but in personal hygiene promotion strategies, especially related to protecting children's health from exposure and the impact of air pollution, counseling, seminars, workshops, or similar activities are still rare. This study is expected to contribute to early childhood education, especially related to children's health.

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## INTRODUCTION

In recent years, various regions of the world such as the UK and China have taken measures to improve air quality and the concentration of some pollutants (PM<sub>2.5</sub> and NO<sub>2</sub>) in the atmosphere has decreased (Bai et al., 2024; Zhu & Xu, 2022). Air pollution is a major environmental problem with health consequences affecting billions of people worldwide and has been shown to be associated with increased morbidity and mortality (Abrham et al., 2023; Landrigan et al., 2018; T. Wang et al., 2020). Indoor and ambient air pollution is the world's most detrimental threat to children's health and is also a major cause of global inequality (T. Wang et al., 2020).

Severe air pollution can also affect sleep quality and even cause premature death in people after prolonged exposure (Liao et al., 2021). Therefore, air pollution is one of the major environmental risks affecting human health (Hartinger et al., 2020; Zhu & Lu, 2023). In addition, air pollution exposures that occur in early developmental periods (prenatal to preschool age) have stronger effects on telomere (DNA structure) reduction than exposures that occur in adulthood (De La Rosa et al., 2024).

Air pollution and inadequate child stimulation are major risk factors affecting early childhood health and well-being in low- and middle-income countries. Then in research conducted by Aryanta & Maharani (2023), explained that the greater the value of air quality, the more diverse the pollutants, and the more sensitive the individual group, the worse the relationship between air pollution and public health. Then research conducted by Puspita & Fauziah (2023) explains that air pollution will get worse along with technological developments because technological developments produce and increase air pollution.

Increasing air pollution needs to be balanced with implementing personal hygiene in children to maintain their health. Personal hygiene plays an important role in supporting, maintaining the development and well-being of children aged 4 to 6 years who are particularly at risk of health problems (Shazali et al., 2023). Poor personal hygiene practices, coupled with inadequate nutrition and lack of stimulation can increase the number of children who do

not reach their full developmental potential (Petermann-Rocha et al., 2023). Therefore, in order to optimize personal hygiene practices, it is necessary to promote personal hygiene by teachers to students.

The promotion of personal hygiene is an important component in disease prevention and improving quality of life, making it a central concept in the field of public health (Heo et al., 2023). Furthermore, teachers need to monitor children's health, starting from prevention of various diseases and maintaining hygiene. Health needs to be considered because now and in the future because exposure to air pollution is increasing by more than 0.5% per year (Murray et al., 2020). Efforts that teachers and schools make in promoting personal hygiene in children such as planning agendas related to healthy lifestyles that integrate with UKS (Santoso & Sugiri, 2022). UKS are efforts made by schools in promoting, fostering, and developing a culture of healthy living (Aryastuti et al., 2024).

Then this research was carried out for the following reasons, first, many studies have been carried out in the scope of early childhood related to aspects of personal hygiene, personal hygiene independence, application of parenting patterns related to personal hygiene, parental knowledge about personal hygiene (Kapur, 2023; Magany et al., 2022; Olowe et al., 2020; Rahil et al., 2020; Rukmana, 2020; Santoso & Sugiri, 2022). Unfortunately, no published research has been found on the topic of personal hygiene promotion strategies in areas located in industrial areas.

Second, health in childhood determines the degree of health at a later age (Idris et al., 2023; Sholikhah, 2019). Healthy children are characterized by a fresh physical appearance, agile activity, and immune system (Idris et al., 2023). The goal of healthy development is to present a quality next generation and form human resources that support national development. The benefits obtained if children are introduced to healthy living from an early age, then children will have clean and healthy living behavior (Sholikhah, 2019). Children's health that will be examined in this study is children's health from the teacher's perception, where the teacher is asked questions about the

teacher's views regarding knowledge about air pollution and personal hygiene promotion strategies for children's health.

Third, children are particularly vulnerable to air pollution, especially early in their lives and even during fetal development, as their lungs, brains, organs and immune systems are immature (Elshaer et al., 2023; Gheissari et al., 2022; Newbury et al., 2024). Early exposure to ambient air pollution can affect children's normal growth, especially when their lungs are rapidly developing and therefore more susceptible to respiratory diseases caused by air pollutants (Huang et al., 2022). Severe air pollution can also affect sleep quality and even cause premature death in people after prolonged exposure (Heyes & Zhu, 2019; Liao et al., 2021; H. Wang et al., 2017).

Fourth, so far there are no personal hygiene promotion strategies specifically aimed at addressing health threats or vulnerabilities in children in industrial areas. Therefore, this study will discuss personal hygiene promotion strategies that teachers implement to address health vulnerabilities in children in industrial estates. Fifth, teachers are seen as strategic actors in personal hygiene promotion (Gordon et al., 2024; Oktabiyana, 2023; Reindrawati, 2020; Santoso & Sugiri, 2022; Triasmari & Kusuma, 2019). The Ngaliyan area was chosen as the research setting because it is one of the sub-districts within Semarang City that is included in the development area of Semarang City. In addition, as of 2019, there were around 46 industrial companies in Ngaliyan (Putra et al., 2019).

The importance of researching teachers' views on air pollution is to find out what teachers know and what they have learned about air pollution. Then the importance of examining teachers' views on personal hygiene promotion strategies is to find out what promotional strategies teachers have done at school related to children's health. According to Ramli et al (2023) health promotion strategies include advocacy, partnerships, community empowerment, and atmosphere building and in this study what is highlighted is the health promotion strategies that teachers do to maintain children's personal health at school. These strategies are needed to realize and

achieve the vision and mission in line with the vision of health development (Pakpahan et al., 2021). This research is expected to be taken into consideration for teachers so that they can provide an optimal role in maintaining children's health from air pollution and maintaining children's personal hygiene. Based on this, this study is intended to determine the views of teachers regarding air pollution and personal hygiene promotion strategies on children's health.

## METHOD

This study used a qualitative research design. The qualitative method was conducted with structured interviews related to teachers' views on air pollution and personal hygiene promotion strategies for children's health. The research was conducted in July 2024 and the research site was conducted in kindergartens located in Ngaliyan District. Respondents in this study were teachers. Before conducting interviews, kindergarten teachers in Ngaliyan District were asked to fill out a questionnaire related to the research topic. Then from the results, four teachers (two teachers who scored high and two teachers who scored less high) were taken to be interviewed. According to Martha & Kresno (2016) in Heryana (Heryana, 2018), determining the number of respondents must at least fulfill two conditions, namely adequacy and suitability. The selection of two respondents from each category is sufficient and appropriate to provide the information needed. The interview aims to describe the description of teachers' knowledge about air pollution and personal hygiene promotion strategies.

The data collection technique in this study was carried out by offline interviews and online interviews through the WhatsApp application with teachers. The interviews were conducted by the researcher over a period of two weeks and the teachers interviewed were from TK ABA 54 Semarang, TK Bintang Kecil, TK PGRI 88, and TK Ar-Rahmah. Some respondents wanted to be interviewed offline and some wanted to be interviewed online. Offline, the researcher conducted the interview directly with the teacher at the school, which was recorded using a voice recorder. Online, researchers conducted interviews using WhatsApp using

chat and voice notes. Then the points examined on the variable of teacher knowledge about air pollution are sources of information about air pollution, causes of air pollution, the effect of air pollution on children's health, and diseases that arise due to air pollution. Furthermore,

the points examined on the personal hygiene promotion strategy variable include advocacy, partnerships, community empowerment, and atmosphere building. The following are interview questions that researchers asked respondents (teachers):

Table 1. Interview Question

| Interview Question  |
|---|
| 1. Where do you get information or knowledge or insights about air pollution?   |
| 2. What are the causes of air pollution?  |
| 3. Does air pollution affect early childhood health? If so, what are the effects?   |
| 4. What diseases can arise as a result of air pollution in early childhood?   |
| 5. Does the school have regular meetings with the community health center or doctors or midwives or other partners to discuss activities that can be done related to early childhood health? Moreover, the air we breathe cannot always be guaranteed good quality. If there is a routine meeting, when is it usually held and what is discussed? |
| 6. Does the school get support from the community health center or doctors or midwives or other partners in carrying out activities related to maintaining children's health at school? What are the forms of support?  |
| 7. Do health promotion activities to improve or maintain children's health take into account children's existing problems, especially when the school is located in an area with high potential for air pollution?  |
| 8. Does the school conduct counseling for parents to provide information and knowledge about the importance of maintaining children's health or other related topics? Especially as more and more factories are popping up over the years and people owning private vehicles are increasing.  |

The data analysis technique used is the theme analysis technique by making interview transcripts from the respondents' answers which were previously recorded during the interview. The interview transcripts were made by the researchers themselves manually using Microsoft Word. After that, the researcher made coding, found themes to ensure all codes had been placed on themes, defined themes, and made charts from the results of the theme analysis.

## RESULT AND DISCUSSION

The following is a chart 1 of the results of the theme analysis of the research. Based on the interview results, teachers' views regarding knowledge about air pollution are categorized as good. Respondents were able to mention sources of information about air pollution, the causes of air pollution, the effect of air pollution

on children's health, and diseases caused by air pollution. Respondents gave different answers, but their answers were correct. Regarding sources of information about air pollution, respondents' answers were as follows.

"Here, before giving the lesson to the children, the teacher must understand what air pollution is. I usually look for this information on the internet, a trusted wikipedia. In addition, from YouTube about animated videos so that children can easily understand" (AR).

"From various existing sources, for example from books, magazines, newspapers, social media, and the surrounding environment" (SH).

"I get information or knowledge about air pollution from books when I was in school, news from television, and the internet" (PA).

"I usually get the information from the internet and television, like that" (NH).

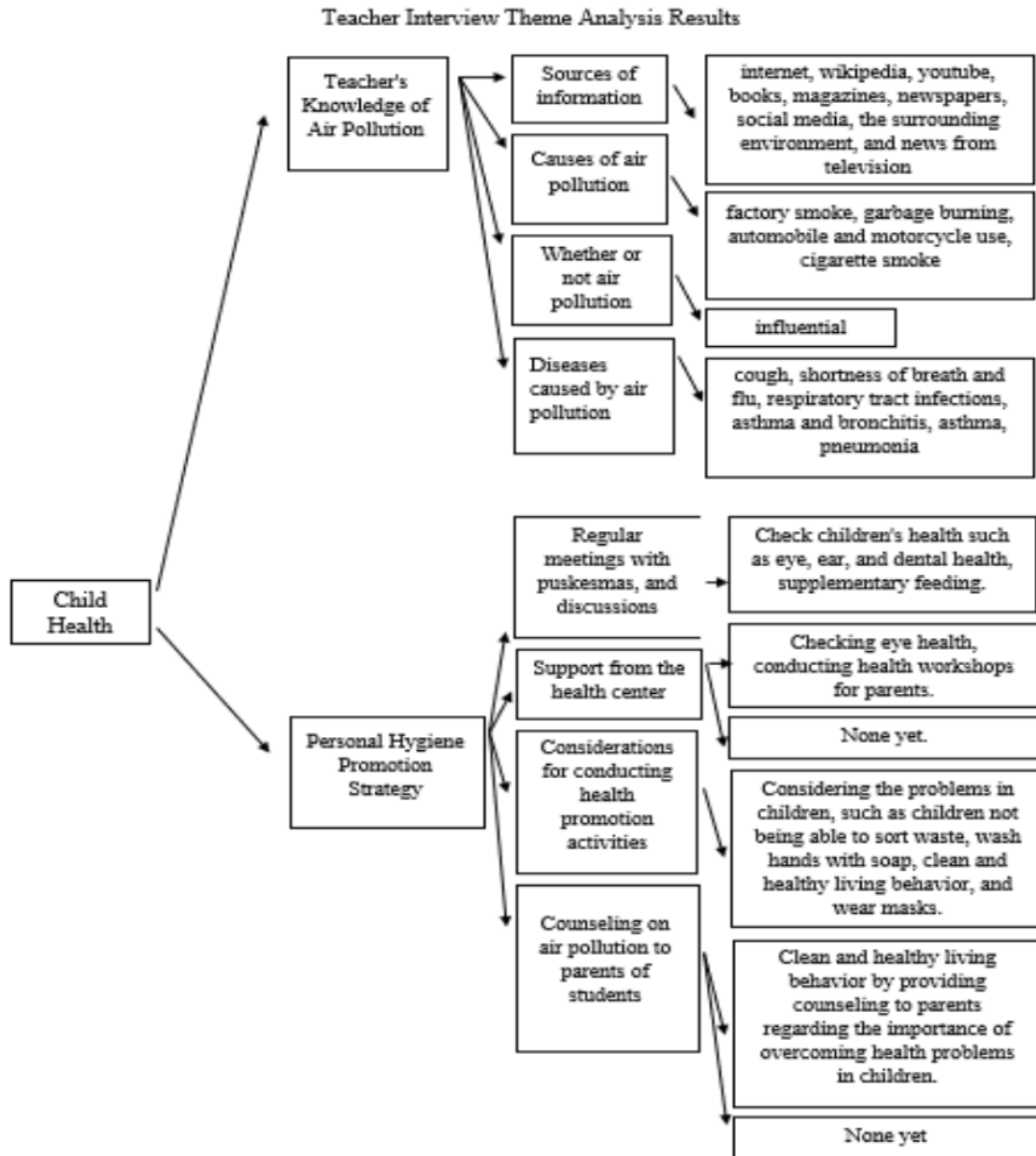


Figure 1. The theme analysis of the research

Based on the results of the interviews above, information was obtained that teachers obtain knowledge related to air pollution from quite diverse sources. Summarized from the answers of the four respondents, the sources of information used by teachers to add insights related to air pollution are from electronic media (internet) through wikipedia, youtube, social media, and television; print media through books, magazines, and newspapers; and the surrounding environment. The source of information submitted by respondents is

part of the health promotion media. Health promotion media aims to convey advice or reviews through print media, electronic media, and outdoor media in order to expand knowledge (Yulyanti et al., 2020). Regarding the causes of air pollution, respondents' answers were as follows.

“Around the school, air pollution is mainly from factory smoke. Besides that, there is also the burning of garbage, the use of cars and motorcycles. These all cause air pollution” (AR).

“Industry or factories, motor vehicles, and

garbage” (SH).

“Causes of air pollution from factory activities, vehicle fumes, cigarette smoke, smoke from burning garbage” (PA).

“In this area, the pollution is mostly from people burning garbage carelessly, because people here still burn garbage. In addition, smoke from vehicles because the road here is getting crowded” (NH).

From the results of the interviews above, it was found that teachers' knowledge of the causes of air pollution is quite good. Summarized from the respondents' answers, the causes of air pollution that teachers know are factory smoke, garbage burning, vehicle use, and cigarette smoke. This is corroborated by research from Candrasari et al (2023), Sulistiani & Kanda (2024), and Makgalemane et al (2024) which state that air pollution is caused by factors such as industrial activities, vehicle fumes, waste burning, dust, household waste, mining, and illegal logging. Regarding the effect of air pollution on children's health, respondents' answers were as follows.

“In early childhood, the immune system is still vulnerable. So we don't know whether they are physically strong or not. If they are strong, they are safe, but if their immune system is not strong, children are easily sick, coughing, shortness of breath. Learning becomes disrupted. Sometimes children are also curious about the factory, why the factory can emit smoke. They are afraid that if they come to the location to learn about it, they will inhale the smoke and it can cause negative things for the children” (AR).

“Yes, air pollution can affect the health of early childhood, the reason is that the respiratory system is immature, the lungs and respiratory tract in early childhood are still in the developmental stage, so they are vulnerable to damage from air pollutants” (SH).

“Yes, it definitely affects children's growth and health, which will indirectly affect children's development” (PA).

“Very influential, sometimes children's immune system is weak. If they inhale, for example, cigarette smoke, they can easily cough. Especially if my child inhales smoke, his chest is also tight” (NH).

From the results of the interviews above, it was found that teachers' knowledge of the effects of air pollution on children's

health is quite good. Summarized from the answers of the four respondents, the effect of air pollution on children's health is coughing, shortness of breath, and the respiratory system and lungs are still in the developmental stage. This is reinforced by research from Maarpaung (2023) which states that air pollution affects children's health, as happened in Medan, where air pollution generated from industrial areas affects the increase in lung disease in children. In addition, it is also in line with research from Wang et al (2020) that air pollution will not only affect overall lung health in childhood but also be a factor in the onset of chronic obstructive pulmonary disease and related diseases such as lung cancer and cardiovascular disease later in life. In relation to diseases that arise due to air pollution, respondents' answers were as follows.

“It can be like coughing, shortness of breath, and what else. It might cause flu” (AR).

“There are several diseases that arise due to air pollution, namely respiratory tract infections, asthma, and bronchitis” (SH).

“Diseases that can arise from air pollution are Acute Respiratory Infection (ARI), asthma, cough, pneumonia” (PA).

“Because it is inhaled, maybe respiratory infections or asthma like that, the lungs are affected” (NH).

From the interviews above, it was found that teachers' knowledge of diseases caused by air pollution included coughing, shortness of breath, flu, respiratory infections, asthma, bronchitis, and pneumonia. Children, especially those less than 5 years old, suffer from respiratory infections more often than children over 5 years old or adults, because these children are in the stage of learning personal hygiene practices (Leung et al., 2023). This is reinforced by research from Huang et al (2022) that air pollution shows significant effects on respiratory diseases, especially pneumonia and exposure to various air pollutants is clearly associated with a significant risk of hospitalization for total respiratory disease and pneumonia.

In line with this statement, air pollution causes acute respiratory infections, asthma, wet lung or pneumonia, and heart attacks (Akenroye et al., 2024; Aryanta & Maharani, 2023; Liu et al., 2022; Moro et al., 2024; J. Wang et al., 2024). In addition, exposure to air pollution in early

childhood is also associated with reduced lung function and other adverse health outcomes in adulthood (Gehring et al., 2018; Usemann et al., 2019). Based on the discussion of teachers' views on air pollution knowledge on children's health, it is concluded that respondents have a fairly good knowledge of air pollution.

Furthermore, teachers' views on personal hygiene promotion strategies for children's health, which include advocacy, partnerships, community empowerment, and atmosphere building. In relation to regular meetings between the school and community health center, the respondents' answers were as follows.

"For routine meetings, the school checks the children's health, how healthy their eyes, ears, teeth are. It must be routine in collaboration with the community health center. If a diagnosis is found, it will be conveyed to the parents. So far, parents also understand and understand related to this. Now that it has been conveyed to parents, what is the response, positive or negative. If it is positive, it means that it will be followed up properly" (AR).

"The school is usually visited by the local community health center to conduct routine examination activities, usually carried out in a semester" (SH).

"The school and the community health center collaborate every semester with a discussion on child development" (PA).

"For last year, the community health center came only to give polio. There has not been any counseling like that. They only come to measure height, weight, head circumference. Sometimes if there are children who are underweight, they are given additional food" (NH).

From the results of the interview above, it was found that the personal hygiene promotion strategy, where the school holds regular meetings with the community health centers, is quite good. Summarized from the respondents' answers, routine meetings are held once every semester. The meeting checks the health of the eyes, ears, teeth, child growth and development such as measuring height, weight, and head circumference.

Although there are activities related to children's health, there are no activities such as counseling, seminars, workshops or other

activities related to personal hygiene promotion that are specific and related to air pollution with the aim of maintaining children's health. In addition to partnering with community health centers, teachers who understand the purpose and potential of personal hygiene promotion will participate more fully and maintain that commitment. Personal hygiene promotion strategies can address specific illnesses, and improve wellbeing. Regarding the support provided by the community health center, respondents' answers were as follows.

"The school has collaborated with the community health center and Widya Husada College of Health Sciences" (AR).

"The community health center is very supportive with regard to early childhood health. The form of support is by visiting schools and conducting routine checks" (SH).

"Support from the community health center is by routinely conducting visits to check children's growth and development" (PA).

"So far there has been no support from the community health center. If there are things that need to be done to anticipate and maintain children's health, it is still from the school" (NH).

From the results of the interviews above, information was obtained that the personal hygiene promotion strategy, where the community health center provides support to the school, is quite good. Summarized from the answers of the four respondents, the school provides support by visiting schools to conduct routine checks. In addition, from the statement of respondent AR, activities carried out with Widya Husada College of Health Sciences are preventive activities, where children are checked for eye health, then children are invited to play games that hone their motor skills with the aim of seeing whether the child's motor development has developed properly or not. Although three out of four respondents said that the community health center provides support to the school, the support provided is only related to routine growth and development checks, there is no other support that leads to personal hygiene promotion strategies related to air pollution to maintain children's health. Regarding personal hygiene promotion activities that take into account children's

existing problems, respondents' answers were as follows.

“Every Friday, we clean the school and teach the children about organic and inorganic waste, waste that can be processed, waste that must be buried or thrown away. Waste that takes a long time to decompose, such as plastic, snack containers. Continue to familiarize children with disposing of waste in its place. There are washing hands with soap activities, washing hands clean and according to the rules” (AR).

“Usually by promoting cleanliness by throwing garbage in its place, washing hands with soap and running water” (SH).

“Yes, the problem is dental caries so teachers urge children to brush their teeth diligently. In addition, they encourage them to cut their nails once a week” (PA).

“For activities such as washing hands with soap and clean and healthy living behavior, it has been taught every day to children, it includes children's independence. Later, if there is time to anticipate so as not to get sick quickly, such as wearing a mask so as not to be susceptible to the virus when it is still covid, if for the topic of air pollution there is no” (NH).

From the results of the interviews above, it was found that the personal hygiene promotion strategy, where the school considers the problems that exist in children in personal hygiene promotion activities, is quite good. Summarized from the answers of the four respondents, existing problems such as children not knowing the type and processing of waste, proper hand washing, dental caries, nail hygiene, and the use of masks at school when children are sick. Activities related to personal hygiene promotion strategies in maintaining children's health from air pollution, from the respondents' answers, it is known that they are carried out with *Perilaku Hidup Bersih dan Sehat* (PHBS) programs and *Cuci Tangan Pakai Sabun* (CTPS) programs. The introduction of PHBS or clean and healthy living behavior must be implemented in early childhood to maintain health and fend off disease in the first five years of life (Rizka et al., 2024). CTPS is the hygienic procedure of washing hands with soap and water to rid hands of germs and prevent from illness (Wiritanaya et al., 2024). In improving children's health, it is necessary to promote

personal hygiene through teachers and other school parties, especially in developing healthy living behavior by washing hands properly (Mufida et al., 2023). Regarding counseling activities for parents, respondents' answers were as follows.

“At school, it has been done and followed up by parents such as clean and healthy living behavior” (AR).

“So far, the school has never held parenting activities regarding air pollution” (SH).

“Appeals to parents to maintain health. However, the school has never conducted appeals to parents to maintain health such as parenting, seminars.” (PA).

“Not yet for that” (NH).

From the results of the interviews above, information was obtained that the personal hygiene promotion strategy, namely where the school provides counseling to parents of students, is not good. Summarized from the answers of the four respondents, that only one respondent stated that he had conducted counseling to parents. As explained in the results of the study by Huang et al (2022), exposure to various air pollutants is clearly associated with a greater risk of hospitalization for respiratory diseases and pneumonia. Therefore, there should be an activity plan such as counseling for parents of children regarding the importance of maintaining children's health from exposure to air pollution and it would be better if counseling is also carried out in the scope of educators and the community.

Based on teachers' views on personal hygiene promotion strategies, it can be concluded that the school's partnership with the community health center is only at the level of routine checks of children's growth and development, with no further activities in personal hygiene promotion strategies. Despite this, the school has taken the initiative to introduce handwashing with soap, introduce the use of masks to reduce exposure to air pollution, and introduce clean and healthy living so that it can be said that teachers are trying to maintain children's health.

Related to the weaknesses of this research is that during the data collection process, respondents have busy activities that can affect the concentration of respondents when conducting the interview process. In



addition, the answers given by respondents are not optimal, this can occur because there is no strategy, program, or activity that supports success in promoting personal hygiene. The advantage of this research is that the topic chosen can still be said to be a topic that has not been widely researched so that research can be input or ideas for further research. Suggestions for future research, in order to objectively measure children's health in a longitudinal time, of course, related to air pollution, so that we can know what the reality in the field is like. In addition, related to personal hygiene promotion strategies, it is hoped that future researchers can examine more deeply related to advocacy, partnerships, community empowerment, and atmosphere building in each school.

## CONCLUSION

Teachers' views on air pollution are good, teachers understand that air pollution has a negative effect on children's health but in personal hygiene promotion strategies related to children's health, especially related to maintaining children's health from exposure and the impact of air pollution, counseling, seminars, workshops, or similar activities for parents are still rare. For teachers, there needs to be an appropriate personal hygiene promotion strategy to prevent children from exposure to air pollution that can cause various diseases. In order for this to work optimally, there needs to be counseling related to personal hygiene that teachers can apply to children in accordance with the conditions of their schools in industrial areas. For future research, to be able to measure children's health objectively in a longitudinal time and comprehensively examine the profile for each school (kindergarten).

## REFERENCES

- Abrham, Y., Zeng, S., Tenney, R., Davidson, C., Yao, E., Kloth, C., Dalton, S., & Arjomandi, M. (2023). Effect of a Single One-Hour Teaching Session About Environmental Pollutants and Climate Change on the Understanding and Behavioral Choices of Adolescents: The BREATHE Pilot Randomized Controlled Trial. *Journal PLoS ONE*, 18(11), 1–20. <https://doi.org/10.1371/journal.pone.0291199>
- Akenroye, A., Banzon, T. M., & Phipatanakul, W. (2024). Socioeconomic Status is of Higher Importance Than Air Pollution and Environmental Factors in Childhood Asthma Prevalence in Urban Australia. *Journal of Allergy and Clinical Immunology*, 278–279. <https://doi.org/10.1016/j.jaci.2024.05.021>
- Aryanta, I. W. R., & Maharani, S. E. (2023). Dampak Buruk Polusi Udara bagi Kesehatan dan Cara Meminimalkan Risikonya. *Jurnal Ecocentrism*, 3(2), 47–58.
- Aryastuti, A. A. S. A., Dewi, N. W. E. S., Cahyawati, P. N., & Suaridewi, I. G. A. A. M. (2024). Penguatan Tim Usaha Kesehatan Sekolah (UKS) SD Genta Saraswati Gianyar dalam Membangun Perilaku Hidup Bersih dan Sehat. *Abdimas Galuh*, 6(2), 1654–1662.
- Bai, S., Zhang, J., Cui, L., Du, S., Lin, S., Liang, Y., Liu, Y., & Wang, Z. (2024). The Joint Effect of Cumulative Doses for Outdoor Air Pollutants Exposure in Early Life on Asthma and Wheezing Among Young Children. *Ecotoxicology and Environmental Safety*, 273, 1–11. <https://doi.org/10.1016/j.ecoenv.2024.116097>
- Candrasari, S., Clarissa, E. C., Kusumawardani, F., Cristabel, G. P. H., Eugenia, J. F., Cahyadi, L. B., Syabanera, N. D., & Silvian, V. (2023). Pemulihan Dampak Pencemaran Udara Bagi Kesehatan Masyarakat Indonesia. *Jurnal Professional*, 10(2), 849–854.
- De La Rosa, R., Le, A., Holm, S., Ye, M., Bush, N. R., Hessler, D., Koita, K., Bucci, M., Long, D., & Thakur, N. (2024). Associations between Early-Life Adversity, Ambient Air Pollution, and Telomere Length in Children. *Psychosomatic Medicine*, 86(5), 422–430. <https://doi.org/10.1097/PSY.0000000000001276>
- Elshaer, S., Martin, L. J., Baker, T. A., Roberts, E., Rios-Santiago, P., Kaufhold, R., & Butsch Kovacic, M. (2023). Environmental Health Knowledge Does Not Necessarily Translate to Action in Youth. *International Journal of Environmental Research and Public Health*, 20(5). <https://doi.org/10.3390/ijerph20053971>
- Gehring, U., Milanzi, E. B., Koppelman, G. H., Smit, H. A., Wijga, A. H., Oldenwening, M., Vonk, J. M., & Brunekreef, B. (2018). Air Pollution Exposure and Lung Function until Age 16 Years: The PIAMA Birth Cohort Study. *European Respiratory Journal*, 52(3). <https://doi.org/10.1183/13993003.00218-2018>
- Gheissari, R., Liao, J., Garcia, E., Pavlovic, N., Gilliland, F. D., Xiang, A. H., & Chen, Z. (2022). Health Outcomes in Children Associated with Prenatal and Early-Life

- Exposures to Air Pollution: A Narrative Review. In *Toxics* (Vol. 10, Issue 8). MDPI. <https://doi.org/10.3390/toxics10080458>
- Gordon, N. A., Brijlal, P., Rayner, C. A., Abdullah, M., & Funu, M. (2024). Enabling Educator Oral Health Literacy: An Impetus for Oral Health Promotion in Early Childhood Development. *International Journal of Dental Hygiene*, 22(3), 639–646. <https://doi.org/10.1111/idh.12736>
- Hartinger, S. M., Nuño, N., Hattendorf, J., Verastegui, H., Karlen, W., Ortiz, M., & Mäusezahl, D. (2020). A Factorial Cluster-Randomised Controlled Trial Combining Home-Environmental and Early Child Development Interventions to Improve Child Health and Development: Rationale, Trial Design and Baseline Findings. *BMC Medical Research Methodology*, 20(1), 1–12. <https://doi.org/10.1186/s12874-020-00950-y>
- Heo, M. L., Jang, Y. M., & Kim, H. Y. (2023). Development and Validation of a Scale Measuring the Post Pandemic-Health Promotion Behavior (PP-HPB) of Young Adults in the Digital Era. *Journal of Multidisciplinary Healthcare*, 16, 2449–2462. <https://doi.org/10.2147/JMDH.S421060>
- Heryana, A. (2018). *Informan dan Pemilihan Informan dalam Penelitian Kualitatif*. <https://www.researchgate.net/publication/329351816>
- Heyes, A., & Zhu, M. (2019). Air Pollution as a Cause of Sleeplessness: Social Media Evidence from a Panel of Chinese Cities. *Journal of Environmental Economics and Management*, 98. <https://doi.org/10.1016/j.jeem.2019.07.002>
- Huang, Z. H., Liu, X. Y., Zhao, T., Jiao, K. Z., Ma, X. X., Ren, Z., Qiu, Y. F., Liao, J. L., & Ma, L. (2022). Short-Term Effects of Air Pollution on Respiratory Diseases among Young Children in Wuhan city, China. *World Journal of Pediatrics*, 18(5), 333–342. <https://doi.org/10.1007/s12519-022-00533-5>
- Idris, D. N. T., Mahanani, S., & Wahyuningsih, A. (2023). Peningkatan Derajat Kesehatan melalui Kegiatan Observasi Psikologi Perkembangan Anak dengan Metode Terapi Bermain. *JURNAL PENGABDIAN MASYARAKAT INDONESIA (JPMI)*, 2(2), 99–111. <https://doi.org/10.55606/jpmi.v2i2.1904>
- Kapur, R. (2023). Understanding the Meaning and Significance of Personal Hygiene. *International Journal of Information, Business and Management*, 15(3), 43.
- Landrigan, P. J., Fuller, R., Acosta, N. J. R., Adeyi, O., Arnold, R., Basu, N. (Nil), Baldé, A. B., Bertollini, R., Bose-O'Reilly, S., Boufford, J. I., Breyse, P. N., Chiles, T., Mahidol, C., Coll-Seck, A. M., Cropper, M. L., Fobil, J., Fuster, V., Greenstone, M., Haines, A., ... Zhong, M. (2018). The Lancet Commission on Pollution and Health. In *The Lancet* (Vol. 391, Issue 10119, pp. 462–512). Lancet Publishing Group. [https://doi.org/10.1016/S0140-6736\(17\)32345-0](https://doi.org/10.1016/S0140-6736(17)32345-0)
- Leung, M. W., O'Donoghue, M., & Suen, L. K. P. (2023). Personal and Household Hygiene Measures for Preventing Upper Respiratory Tract Infections among Children: A Cross-Sectional Survey of Parental Knowledge, Attitudes, and Practices. *International Journal of Environmental Research and Public Health*, 20(1), 1–17. <https://doi.org/10.3390/ijerph20010229>
- Liao, L., Du, M., & Chen, Z. (2021). Air Pollution, Health Care Use and Medical Costs: Evidence from China. *Energy Economics*, 95, 1–8. <https://doi.org/10.1016/j.eneco.2021.105132>
- Liu, Y., Lu, C., Li, Y., Norbäck, D., & Deng, Q. (2022). Outdoor Air Pollution and Indoor Window Condensation Associated with Childhood Symptoms of Allergic Rhinitis to Pollen. *International Journal of Environmental Research and Public Health*, 19(13). <https://doi.org/10.3390/ijerph19138071>
- Maarpaung, A. P. (2023). Pengaruh Polusi Udara terhadap Kesehatan Paru-Paru pada Anak-Anak di Kawasan Industri Kota Medan. *Jurnal Ilmiah Simantek*, 7(2), 144–147.
- Magany, R. M., Djaya, P. N., & Kurniawan, F. (2022). Relationship Between Parenting Style and Maternal Personal Hygiene with Children's Personal Hygiene in North Jakarta. *Althea Medical Journal*, 9(3), 163–167. <https://doi.org/10.15850/amj.v9n3.2294>
- Makgalemane, M. R., Patrick, S., & Shirinde, J. (2024). Respiratory Conditions and Health Symptoms Associated with Air Pollution Amongst Children Aged Six Years and Below in Melusi Informal Settlement, Tshwane Metropolitan Municipality, South Africa: a Cross-Sectional Study. *BMC Public Health*, 24(1). <https://doi.org/10.1186/s12889-024-19324-w>
- Moro, A., Nonterah, E. A., Klipstein-Grobusch, K., Oladokun, S., Welaga, P., Ansah, P. O., Hystad, P., Vermeulen, R., Oduro, A. R., & Downward, G. (2024). Early Life Ambient Air Pollution, Household Fuel Use, and Under-5 Mortality in Ghana. *Environment International*, 187, 1–9. <https://doi.org/10.1016/j.envint.2024.107000>

- org/10.1016/j.envint.2024.108693
- Mufida, N., Mualim, A., Idawati, & Ismuntania. (2023). Edukasi Cuci Tangan Pakai Sabun (CTPS) sebagai Upaya Pencegahan Tranmisi Penyakit Dalam Keluarga di Desa Mesjid Bungie. *Jurnal Lebah*, 17(01), 28–33.
- Murray, C. J. L., Aravkin, A. Y., Zheng, P., Abbafati, C., Abbas, K. M., Abbasi-Kangevari, M., Abd-Allah, F., Abdelalim, A., Abdollahi, M., Abdollahpour, I., Abegaz, K. H., Abolhassani, H., Aboyans, V., Abreu, L. G., Abrigo, M. R. M., Abualhasan, A., Abu-Raddad, L. J., Abushouk, A. I., Adabi, M., ... Lim, S. S. (2020). Global Burden of 87 Risk Factors in 204 Countries and Territories, 1990–2019: a Systematic Analysis for the Global Burden of Disease Study 2019. *The Lancet*, 396(10258), 1223–1249. [https://doi.org/10.1016/S0140-6736\(20\)30752-2](https://doi.org/10.1016/S0140-6736(20)30752-2)
- Natasha Binti Shazali, N. F., Yahya, H. B., Aljibori, H. S. S., Al-Tamimi, A., Mohammed, M. N., Alfiras, M., Abdullah, O. I., Abdelgnei, M. A., & Ibrahim, F. M. (2023). Augmenting Early Childhood Education: The Integration of Augmented Reality in Promoting Personal Hygiene. *2023 IEEE 8th International Conference on Engineering Technologies and Applied Sciences (ICETAS)*, 1–7. <https://doi.org/10.1109/ICETAS59148.2023.10346460>
- Newbury, J. B., Heron, J., Kirkbride, J. B., Fisher, H. L., Bakolis, I., Boyd, A., Thomas, R., & Zammit, S. (2024). Air and Noise Pollution Exposure in Early Life and Mental Health From Adolescence to Young Adulthood. *JAMA Network Open*, 1–16. <https://doi.org/10.1001/jamanetworkopen.2024.12169>
- Oktabiyana, N. (2023). *Strategi Guru dalam Menerapkan Perilaku Hidup Bersih dan Sehat (PHBS) pada Anak Usia 5-6 Tahun di RA AR RASYID Kartasura*.
- Olowe, A. O., Ademuyiwa, I. Y., & Baiyeri, O. E. (2020). Knowledge and Practice of Personal Hygiene Among School Children in Magboro Community, Ogun State. *Bayero Journal of Nursing and Health Care*, 2(1), 573–580.
- Pakpahan, M., Siregar, D., Susilawaty, A., Mustar, T., Ramdany, R., Manurung, E. I., Sianturi, E., Tompunu, M. R. G., Sitanggang, Y. F., & M. Maisyarah. (2021). *Promosi Kesehatan dan Perilaku Kesehatan* (Ronald Watrianthos, Ed.). Yayasan Kita Menulis.
- Petermann-Rocha, F., Rao, N., Bala, M., Parshad-Asnani, M., Sifuna, A., Yousafzai, A., Ho, F. K., & Ip, P. (2023). Hygiene Practices and Early Childhood Development in the East Asia-Pacific Region: A Cross-Sectional Analysis. *International Journal of Environmental Research and Public Health*, 20(4), 1–12. <https://doi.org/10.3390/ijerph20042798>
- Puspitasari, R. D., & Fauziah, S. (2023). *Faktor Risiko Pencemaran Udara Terhadap Kesehatan Di Indonesia Risk Factors Of Air Pollution On Health In Indonesia*.
- Putra, M., Juhadi, & Tjahjono, H. (2019). Dampak Spasial Berdirinya Kawasan Industri Candi terhadap Penggunaan Lahan di Wilayah Kecamatan Ngaliyan Kota Semarang. *Geo Image (Spatial-Ecological-Regional)*, 8(1), 22–28. <http://journal.unnes.ac.id/sju/index.php/geoimage>
- Rahil, D. L., Fahrudin, & Rachmayani, I. (2020). Upaya Meningkatkan Kebiasaan Personal Hygiene dalam Kegiatan Mencuci Tangan Melalui Metode Demontrasi pada Anak Usia 5-6 Tahun. *Indonesia Journal of Elementary and Childhood Education*, 1(3), 112–115.
- Ramli, Ishak, S. N., Nurliyani, Ayu, J. D., Wahyuni, R., Setyawan, D. A., Pertiwi, G. H., Rohani, S., Nuraeni, A., & Arsyad, G. (2023). *Teori dan Aplikasi Promosi Kesehatan*.
- Reindrawati, D. Y. (2020). Pembiasaan Menjaga Kebersihan Sejak Usia Dini (Pengabdian Pada Murid TK Bintang Kecil Surabaya). *Jurnal Anadara Pengabdian Kepada Masyarakat*, 2(1), 18–21.
- Rizka, N., Rahayu, S., & Alim, M. L. (2024). Analisis Perilaku Hidup Bersih dan Sehat (PHBS) Anak Usia Dini di Satuan PAUD. *Indonesian Research Journal on Education*, 4(3), 40–44. <https://irje.org/index.php/irje>
- Rukmana, I. S. (2020). *Habitiasi Personal Hygiene pada Anak Berusia 3-6 Tahun di PAUD Insan Cendekia Bululawang-Malang. Tumbuh Kembang: Kajian Teori Dan Pembelajaran PAUD*, 7(2), 164–176. <https://doi.org/10.36706/jtk.v7i2.12563>
- Santoso, S. T. P., & Sugiri, W. A. (2022). Proses Adaptasi Perilaku Personal hygiene Pada Anak Usia Dini. *PAUDIA: Jurnal Penelitian Dalam Bidang Pendidikan Anak Usia Dini*, 11(2), 562–572. <https://doi.org/10.26877/paudia.v9i1.11519>
- Sholikhah, L. (2019). *Perilaku Hidup Bersih dan Sehat pada Anak Usia Dini di TK Dewi Sartika Turen*.
- Sulastiani, E., & Kanda, A. S. (2024). Fenomena Pencemaran Lingkungan: Dampak Pencemaran Udara terhadap Kesehatan. *Jurnal Manajemen Dan Bisnis Ekonomi*, 2(2), 301–305.
- Triasmari, U., & Kusuma, A. N. (2019). Determinan Personal Hygiene Pada Anak Usia 9-12

- Tahun. *Faletehan Health Journal*, 6(1), 37–44. [www.journal.lppm-stikesfa.ac.id/ojs/index.php/FHJ](http://www.journal.lppm-stikesfa.ac.id/ojs/index.php/FHJ)
- Usemann, J., Decrue, F., Korten, I., Proietti, E., Gorlanova, O., Vienneau, D., Fuchs, O., Latzin, P., Rösli, M., & Frey, U. (2019). Exposure to Moderate Air Pollution and Associations with Lung Function at School-Age: A Birth Cohort Study. *Environment International*, 126, 682–689. <https://doi.org/10.1016/j.envint.2018.12.019>
- Wang, H., Zhang, Y., Zhao, H., Lu, X., Zhang, Y., Zhu, W., Nielsen, C. P., Li, X., Zhang, Q., Bi, J., & McElroy, M. B. (2017). Trade-Driven Relocation of Air Pollution and Health Impacts in China. *Nature Communications*, 8(1). <https://doi.org/10.1038/s41467-017-00918-5>
- Wang, J., Cortes-Ramirez, J., Gan, T., Davies, J. M., & Hu, W. (2024). Effects of Climate and Environmental Factors on Childhood and Adolescent asthma: A systematic Review Based on Spatial and Temporal Analysis Evidence. *Science of the Total Environment*, 951. <https://doi.org/10.1016/j.scitotenv.2024.175863>
- Wang, T., Wang, H., Chen, J., Wang, J., Ren, D., Hu, W., Wang, H., Han, W., Leng, S., Zhang, R., & Zheng, Y. (2020). Association Between Air Pollution and Lung Development in Schoolchildren in China. *Journal of Epidemiology and Community Health*, 74(10), 792–798. <https://doi.org/10.1136/jech-2020-214283>
- Wiritanaya, S., Wati, N., & Yanuarti, R. (2024). Edukasi Cara Mencuci Tangan yang Baik dan Benar di Sekolah Dasar Negri 67 Kota Bengkulu. *Jurnal Mandala Pengabdian Masyarakat*, 5(1), 61–65. <https://doi.org/10.35311/jmpm.v5i1.395>
- Yulyanti, D., Lukita, G. D., & Priyatna, B. S. (2020). Pengaruh Peran Keluarga, Petugas Kesehatan, dan Media sebagai Sumber Informasi terhadap Pengetahuan Larangan Merokok dalam Rumah di Desa Ujunggebang Kecamatan Sukra Tahun 2019. *Jurnal Kesehatan Indra Husada*, 8(1), 104–116.
- Zhu, J., & Lu, C. (2023). Air Quality, Pollution Perception, and Residents' Health: Evidence from China. *Toxics*, 11(7). <https://doi.org/10.3390/toxics11070591>
- Zhu, J., & Xu, J. (2022). Air Pollution Control and Enterprise Competitiveness – A Re-Examination Based on China's Clean Air Action. *Journal of Environmental Management*, 312, 1–13. <https://doi.org/10.1016/j.jenvman.2022.114968>