



Risk Factors of Acute Respiratory Infection in Children Aged 6-12 Years in Urban Areas: A Literature Review Study

Shenia Rully Arvian¹, Nikita Alia Rajebta², Winda Dwi Astuti³, Chendy Yugu Tanca⁴, Chahya Kharin Herbawani⁵

^{1,2,3,4,5}Faculty of Health Science, Universitas Pembangunan Nasional "Veteran" Jakarta, Indonesia

ARTICLE INFORMATION

Received: June 25, 2024

Revised: May 9, 2025

Available online: May 2025

KEYWORDS

Acute Respiratory Infection (ARI); Child; Environment; Pollution; Urban

CORRESPONDENCE

E-mail: nikitarajebta12@gmail.com

A B S T R A C T

One disease that affects school-aged children is Acute Respiratory Infections (ARI). Acute Respiratory Infections (ARI) can be caused by various causative agents, such as viruses, bacteria, or even fungi; air pollution from smoke or gas can also cause Acute Respiratory Infections (ARI). The method used in preparing this article is a literature review. Article or journal searches were conducted on five databases: Mendeley, PubMed, ScienceDirect, Google Scholar, and Garuda. The keywords used in Mendeley, Google Scholar, and Garuda were "*Faktor Risiko ISPA*" AND "*Anak*", while PubMed and ScienceDirect used "risk factor" AND "acute respiratory infection" AND "child". Several risk factors exist for Acute Respiratory Infections (ARI) in children in urban areas. Environmental factors such as roofing, ventilation, and occupancy density are the risk factors for Acute Respiratory Infections (ARI) in urban school-aged children. Then, there are individual factors where age, gender, and other congenital diseases also affect the occurrence of ARI in children.

INTRODUCTION

At school age, children are still vulnerable to disease, and this is a crisis that school-aged children must face (Sitohang, 2016). Acute Respiratory Infection (ARI) is among the most vulnerable diseases experienced by school-aged children, and this is due to the weak immune system of children, who are still susceptible to diseases that viruses and bacteria can easily enter the child's body (Tomatala et al., 2019). According to the Ministry of Health of the Republic of Indonesia (2023), respiratory diseases, or Acute Respiratory Infections (ARI), are one of Indonesia's most common health problems. Infectious diseases that attack the respiratory tract can be triggered by many things, including viruses, bacteria, fungi, and air pollution from smoke or gas that can cause Acute Respiratory Infection (ARI) and various other types of diseases (Putra and Wulandari, 2019).

Air pollution and smoke can be caused by environmental conditions around the place of residence and can affect the occurrence of ARI (Haryani and Misniarti, 2021). As smoke generated by parents who are smoking is included in factors that can affect exposure to respiratory tract diseases or ARI, the duration of smoking and the number of cigarettes consumed are also related to exposure to Acute Respiratory Infection (ARI) and other diseases associated with the respiratory system (Rullah, Arlianti, In, and Arbi, 2023). In addition, it can trigger various diseases, such as acute respiratory infections (ARI). This is interrelated because the surrounding environment is not proper, healthy, and clean due to bacterial and

viral infections that can spread when children gather and play (Jayanti, Ashar, and Aulia, 2018). Densely populated residential areas like this are often seen in urban areas because many people move from villages to cities, which is what is commonly called urbanisation (Pasya, 2016).

According to the Central Bureau of Statistics of Indonesia (BPS), 15,736 cases of ARI occurred in Malang City in 2019. They became the highest disease in Malang City (Badan Pusat Statistik (BPS), 2019). Similarly, in Kupang City in 2018, Acute Respiratory Infection (ARI) occupied the top position as the disease with the highest incidence of 65,844 (Badan Pusat Statistik (BPS), 2019). In Tasikmalaya City, the ARI rate reached 36.466 in 2019 (Badan Pusat Statistik (BPS), 2020). Similarly, in Pakistan, the prevalence of Acute Respiratory Infections (ARI) in children was 29% (Mir et al., 2022). In contrast to rural areas, school-aged children are rarely affected by Acute Respiratory Infections (ARI) compared to children living in urban areas. This is influenced by residential or environmental factors such as air pollution, population density, cigarette smoke and kitchen smoke, nutritional status, and demographic factors such as age and other congenital diseases. Besides that, people who live in densely populated areas have a high risk of developing an infectious disease (Simbolon and Wulandari, 2023).

Urban areas have 1.2x more potential for ARI or Acute Respiratory Infection than rural or non-urban areas (Simbolon and Wulandari, 2023). Some of the effects of acute respiratory infections in school-aged children are body weakness, decreased appetite, influenza, malaise, headaches, and feelings of discomfort that will cause children's activities at school and at home to be disrupted and sleep quality to be affected (Sholeh, Juliningrum, and Rahmawati, 2024). Another impact that can be caused by respiratory tract diseases or ARI is that it can cause irritation and infection of the respiratory tract, sputum secretion, inflammation of the respiratory tract, coughing, chest pain, and shortness of breath (Cahyani et al., 2024). Therefore, early detection and treatment of acute respiratory infections will immensely help save lives, and paying attention to their developmental process is essential so that children can achieve their best potential from optimal child development. Therefore, this article aims to find out what factors can influence ARI in children aged 6-12 years in urban areas.

METHOD

The preparation of this article uses the literature review method by following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) and PECO (Population, Exposure, Comparison, Outcome) guidelines to identify and determine the risk factors for ARI in children ages 6-12 years in urban areas. The search for sources was carried out through databases of articles or journals published nationally and internationally and for searching articles or journals in 5 databases, such as Mendeley, PubMed, ScienceDirect, Google Scholar, and Garuda. The keywords used in Mendeley, Google Scholar, and Garuda were "Faktor Risiko ISPA" AND "Anak", while PubMed and ScienceDirect

used "risk factor" AND "acute respiratory infection" AND "child". In the search for articles in the PubMed database, there were 3,522 articles, Mendeley there were 96 articles, ScienceDirect there were 45,799 articles; in Google Scholar, there were 1,780 articles; and in Garuda, there were 10 articles. The total for all articles obtained was 51,204 articles.

After conducting the search process, a screening process was carried out wherein each database, an automatic filter process was carried out, which eliminated articles that were not included in less than five years (2019-2023), free full text, books & documents, clinical trials, and children 6-12 years old. After filtering, the articles obtained from the five databases were 1,868 articles. The next step is to eliminate articles based on duplication (articles published in all databases used), of which there are 7 duplicate articles. The next step is to filter articles based on PECO and Repository; in this process, the articles that have been obtained will be checked based on population, exposure, comparison, and the result. After all the screening processes, 8 articles will be used to prepare this article.

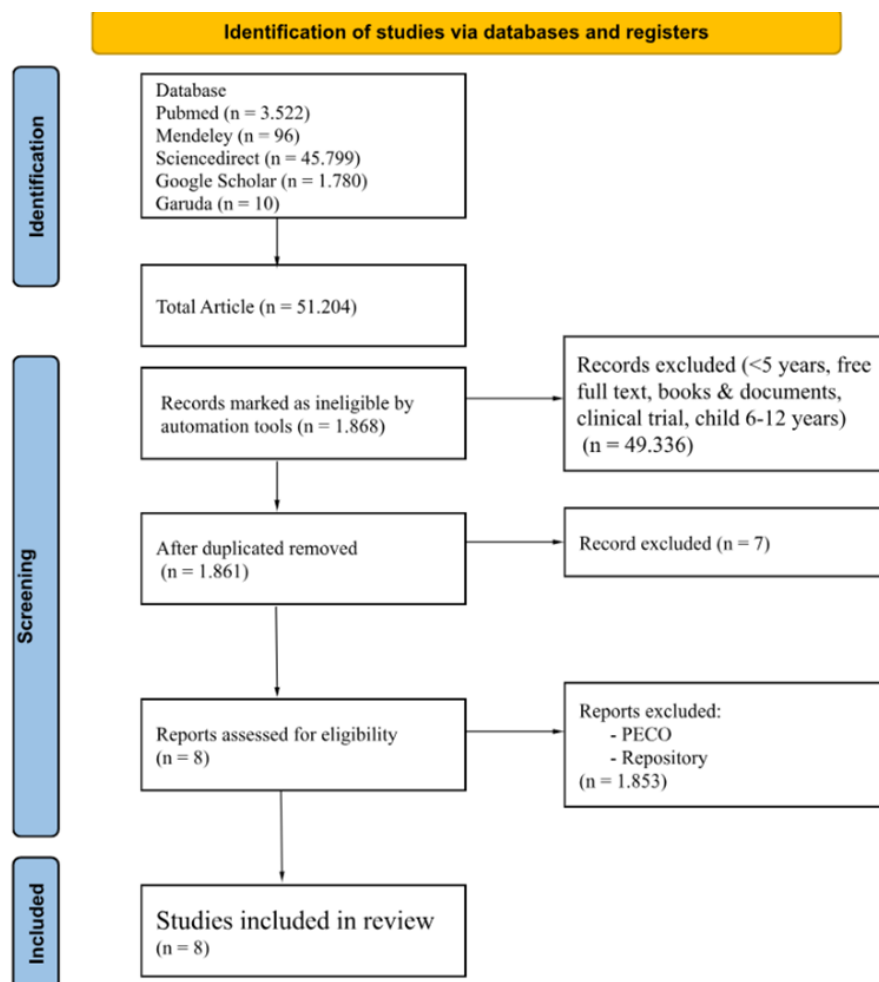


Figure 1. Article Selection with PRISMA Diagram

RESULT

The result of the search for scientific articles through various national and international databases, such as PubMed, ScienceDirect, Google Scholar, Mendeley, and Garuda, obtained eight supporting articles published between 2019 and 2024. The findings present a comprehensive study of the risk variables that cause Acute Respiratory Infection (ARI) in school-aged children. The keywords used were "ARI risk factors", "child", "risk factor", "acute respiratory infection", and "child". Researchers used the Boolean principle "AND" to narrow down the documents to be obtained.

Table 1. Study Results

No	Researcher, Year	Title	Research Design	Sample Size	Results
1	Ritonga & Kurniawan (2021)	Relationship Risk Factors with Arrives in Children in The Working Area of The Tanjung Beringin Puskesmas, Serdang Bedagai Districtin 2020	<i>Cross-Sectional</i>	53 children aged 6-13 years in the working area of Tanjung Beringin health center.	The results showed that the p-value = 0.000 (p-value <0.05) for each risk factor. It can be concluded that there is a relationship between age, gender, height, and weight with the incidence of ARI in children.
2	Ningrum & Ardillah (2021)	Determinants of ARI in School-Age Children in Prabumulih	<i>Cross-Sectional</i>	106 children aged 10-12 years in the Prabumulih Community Health Center area	The results showed a relationship between the incidence of ARI and the physical environment of the house. The most crucial factor is the type of roof. The absence of a ceiling will make it easier for dust to enter the house.
3	Tomatala, et al. (2019)	Relationship Between Physical Activities with The Construction of Artificials in School Age Children in Bringin District, Semarang District	<i>Correlation Study</i>	62 elementary school children aged 6-12 years old in Bringin Subdistrict, Semarang Regency who had a history of ARI.	The correlation test results showed a weak association between physical activity and ARI recurrence with between physical activity and ARI recurrence with a p-value of 0.107, which means the significance value is 0.01. It can be assumed that other factors besides physical activity are associated with ARI risk factors. In addition, the coefficient of the relationship between physical activity was 0.206. This proves that a person's chance of suffering from ARI will increase along with the level of frequent physical activity.
4	Hanifiah, (2024)	Y Relationship Between History of Infectious Disease Symptoms and Sanitation with Nutritional Status of Children Aged 6-12 Years at UPT SDN 060831 Medan	<i>Cross-Sectional</i>	225 children 6-12 years old	The results showed no significant correlation between children's nutritional condition and risk factors for infectious diseases, especially ARI.
5	Anggraini, et al. (2021)	Off-Label Prescribing of Drugs in Children with Acute	<i>Cross-Sectional</i>	124 school-aged pediatric ARI patients	The results showed a substantial correlation between gender and age and ARI incidence. Boys supported by environmental factors will be

		Respiratory Infections			more susceptible to ARI than girls. The results showed that the use of off-label drugs that are not appropriate for the age of the child can increase the likelihood of ARI. Studies show that close contact with infected family members may increase the risk factor for SARS-CoV-2 respiratory infection in children.
6	Ng, et al. (2021)	Clinical and Epidemiological Characteristics of Children with COVID-19 in Negeri Sembilan, Malaysia	<i>Retrospective Observational</i>	261 children aged <12 years old	
7	Haryanto & Djafri (2020)	Air Pollution and School Children Respiratory Diseases in Indonesia: A Cohort Study	<i>Cohort Study</i>	392 schoolchildren from 25 elementary schools	The results showed a significant influence of air pollution on the risk of respiratory diseases in elementary school students in Jakarta's high and low-pollution areas.
8	Martinez-Vega et al. (2019)	Risk Factor Profiles and Clinical Outcomes for Children and Adults with Pneumococcal Infections in Singapore: A Need to Expand Vaccination Policy?	<i>Retrospective Observational</i>	88 children aged 5-15 years	The results showed that age, gender, history of disease syndromes, especially meningitis, and vaccination status were the main risk factors for pneumococcal infection.

DISCUSSION

After conducting a study review of the eight articles, there are articles with a cross-sectional research design, two articles with a retrospective observational research design, 1 article using a cohort research design, and 1 article using a correlation research design; the results show the factors that cause Acute Respiratory Tract Infection (ARI) disease. In general, there are 3 (three) risk factors for the incidence of acute respiratory infections (ARI), namely environmental factors, individual child factors, and behavioural factors. Ecological factors include air pollution in the neighbourhood, the physical condition of the house, and occupancy density. Child factors include age, birth weight, nutritional status, vitamin A, and immunisation status. Meanwhile, behavioural factors are related to preventing and warding off diseases (Cahyani et al., 2024).

1. Environmental Factors

Environmental factors include the shape of the floor, wall selection, roof type, ventilation area, humidity, room temperature, distance of the dwelling occupied, and the house's physical condition. For proper air exchange to occur in the house, the house should have an air passage or ventilation area of at least 10% of the floor area. The house should have a temperature of 18-30°C and an air humidity of 40-60%. High or low air humidity can cause rapid microbial development (Agungnisa, 2019). The findings of Ningrum and Ardillah (2021) show a relationship between the shape of the house and ARI disease. The most dominant condition of the shape of the residence is the type of roof. If there is no ceiling, dust will

quickly enter the house. Besides that, the distance between houses that are too close can also affect the condition of children because of the lack of sufficient space for them to breathe clean air, which can trigger the occurrence of various diseases, such as ARI, due to a poor home environment due to viral and bacterial infections that spread when families gather and play (Jayanti, Ashar and Aulia, 2018). Environmental conditions with air pollution can cause inflammation of the mucosal surface of the respiratory tract. If a room with a lot of pollution does not have ventilation, smoke and pollution can be trapped in it, so breathing becomes very stuffy and uncomfortable. For good air exchange, houses should have a ventilation area or breezeway of at least 10 per cent of the floor area (Sofia, 2017). If the air cycle is reasonable with high oxygen levels in the dwelling, this will significantly affect the health of the occupants (Jayanti, Ashar, and Aulia, 2018). Air pollution from dust or gas can lead to ARI, bronchitis, asthma, and lung cancer (Putra and Wulandari, 2019). Atmospheric pollution from particulate matter can also trigger pharyngitis, pneumonia, allergies, and irritation. This is reinforced by the findings of Haryanto & Djafri (2020), which show a correlation between air pollution factors and risk factors for respiratory diseases in elementary school children with high and low pollution levels.

2. Individual Factors

Individual factors in children include age, gender, low birth weight, nutritional status, and immunisation status. Children's defence systems and physical endurance are deficient at school, making them vulnerable to bacteria and viruses (Tomatala et al., 2019). Individual factors related to Acute Respiratory Tract Infection (ARI) are corroborated by the results of the Ritonga & Kurniawan study (2021), which states that there is a relationship between the risk factors of age, height, weight, and gender with ARI disease in children. In this study, it is explained that body weight is an indicator of health. The research results by Anggraini et al. (2021) showed a strong relationship between age and gender factors and the risk of ARI. In the study, it was found that most ARI patients were children aged 2-12 years. The survey by Hasan et al. (2022) identified significant age inequalities in the incidence of childhood ARI, where older children were considered more protected. Similar results have been observed in several studies conducted at local (states in India), national, and global levels. Male children tend to be more susceptible to ARI than girls because boys are more often outside the home than girls (supported by environmental factors). The research results by Martinez-Vega et al. (2019) showed that, in addition to age and gender, a history of specific disease syndromes and other congenital diseases, such as meningitis, and vaccination status were the main risk factors for pneumococcal tract infections.

3. Behavioural Factors

Behavioural factors have a close relationship with the management and prevention of ARI in children. Parents' knowledge is essential for disease management because children's health and life are the parents' responsibility. Maternal knowledge and attitudes about the characteristics and treatment of ARI are the

most essential elements in shaping good behaviour for improving children's health (Zaman and Rabial, 2023). In addition to the influence of parental knowledge, children's behaviour and habits also affect their health, such as the results of research by Tomatala et al. (2019), which showed a relationship between physical activity and the recurrence of weak ARI. Physical activity is a factor in the incidence of ARI in these children, but other factors cause recurrence. The behaviour of children at school who consume food sold in the area near the school will increase the high risk of ARI in children because these snacks may not be well-managed, processed, and clean. The behaviour of children who often play outside and ignore the surrounding conditions can also affect their exposure to a disease. This statement is corroborated by the research results by Ng et al. (2021), which show that a risk factor that can potentially cause SARS-CoV-2 respiratory tract infection in children is close contact with infected families.

CONCLUSION

Acute Respiratory Infection (ARI) is the most common disease in childhood because the child's body is still vulnerable to invading bacteria and viruses. The risk factors for Acute Respiratory Infection (ARI) in urban school-age children are environmental factors such as the roof of the house, air ducts or ventilation, and the density of the home and residential environment. Then, there are individual factors where age, gender, and other congenital diseases also affect the incidence of Acute Respiratory Infections (ARI) in school-age children. Behavioural factors are also one of the risk factors for Acute Respiratory Infection (ARI), which includes parental knowledge, children's physical activity, and others.

REFERENCES

- Agungnisa, A. (2019) 'Faktor Sanitasi Fisik Rumah yang Berpengaruh Terhadap Kejadian ISPA Pada Balita di Desa Kalianget Timur (Physical Sanitation of the House that Influence the Incidence of ARI in Children under Five in Kalianget Timur Village)', *Jurnal Kesehatan Lingkungan*, 11(1), pp. 1–9. Available at: <https://doi.org/10.20473/jkl.v11i1.2019.1-9>.
- Anggraini, E.D., Putra, O.N. and Faizah, A.K. (2021) 'Peresepan Obat "Off-label" Pada Anak Dengan Penyakit Infeksi Saluran Pernapasan Akut', *Jurnal Ilmu Kefarmasian*, 2(1).
- Arragaw, et al. (2024). *Magnitude and Determinant of Healthcare-seeking Behavior for Childhood Acute Respiratory Tract Infections in Ethiopia: A Cross-Sectional Study*. 24:3.
- Badan Pusat Statistik (BPS) (2019a) *Jumlah Kasus 2018-2019*, *Badan Pusat Statistik (BPS) Kota Kupang*. Available at: <https://kupangkota.bps.go.id/indikator/30/256/1/jumlah-kasus.html>.
- Badan Pusat Statistik (BPS) (2019b) *Jumlah Kasus Penyakit Terbanyak di Kota Malang*, *Badan Pusat Statistik (BPS) Kota Malang*. Available at: <https://malangkota.bps.go.id/indikator/30/371/1/jumlah-kasus-penyakit-terbanyak-di-kota-malang.html>.
- Badan Pusat Statistik (BPS) (2020) *Jumlah Kasus 10 Penyakit Terbanyak Menurut Jenis Penyakit di Kota Tasikmalaya*, *Badan Pusat Statistik (BPS) Kota Tasikmalaya*. Available at:

<https://tasikmalayakota.bps.go.id/statictable/2022/09/18/315/jumlah-kasus-10-penyakit-terbanyak-menurut-jenis-penyakit-di-kota-tasikmalaya-2019-dan-2020.html>.

- Cahyani, A.R. *et al.* (2024) 'Dampak Aktivitas Vulkanik Terhadap Kualitas Udara pada Penyakit ISPA Akibat Letusan Gunung Berapi', *Jurnal Ilmiah Multidisiplin*, 1(5), pp. 31–37. Available at: <https://doi.org/10.62017/merdeka>.
- Hanafiah, Y. (2024) 'Hubungan Riwayat Gejala Penyakit Infeksi dan Sanitasi Dengan Status Gizi Anak Usia 6-12 Tahun di UPT SDN 060831 Medan', *Jurnal Rumpun Kesehatan Umum*, 2(2), pp. 35–42. Available at: <https://doi.org/10.62027/vitamedica.v2i2.85>.
- Haryani, S. and Misniarti (2021) 'Faktor Yang Mempengaruhi Kejadian Infeksi Saluran Pernapasan Akut (ISPA) Di Provinsi Bengkulu', *Quality: Jurnal Kesehatan*, 15(2), pp. 95–104. Available at: <https://doi.org/10.36082/qjk.v15i2.240>.
- Haryanto, B. and Djafri, D. (2020) 'Air Pollution and School Children Respiratory Diseases in Indonesia: A Cohort Study', *ASM Science Journal*, 13(Specialissue5).
- Hasan, M.M. *et al.* (2022) 'Prevalence of Acute Respiratory Infections among Children in India: Regional Inequalities and Risk Factors', *Maternal and Child Health Journal*, 26(7), pp. 1594–1602. Available at: <https://doi.org/10.1007/s10995-022-03424-3>.
- Jayanti, D.I., Ashar, T. and Aulia, D. (2018) 'Pengaruh Lingkungan Rumah Terhadap ISPA Balita di Wilayah Kerja Puskesmas Tanjung Haloban Kabupaten Labuhan Batu Tahun 2017', *Jurnal JUMANTIK*, 3(2), p. 63.
- Kemkes RI (2023) *Mengenali Gejala ISPA dan Tindakan yang Perlu Dilakukan*, Direktorat Promosi Kesehatan dan Pemberdayaan Masyarakat. Available at: <https://ayosehat.kemkes.go.id/mengenali-gejala-ispa-dan-tindakan-yang-perlu-dilakukan>.
- Martinez-Vega, R. *et al.* (2019) 'Risk Factor Profiles and Clinical Outcomes for Children and Adults with Pneumococcal Infections in Singapore: A Need to Expand Vaccination Policy?', *PLoS ONE*, 14(10), pp. 1–17. Available at: <https://doi.org/10.1371/journal.pone.0220951>.
- Mir, F. *et al.* (2022) 'Risk Factors for Acute Respiratory Infections in Children Between 0 and 23 Months of Age in a Peri-Urban District in Pakistan: A Matched Case–Control Study', *Frontiers in Pediatrics*, 9. Available at: <https://doi.org/10.3389/fped.2021.704545>.
- Ng, DCE *et al.* (2021) 'Clinical and Epidemiological Characteristics of Children with COVID-19 in Negeri Sembilan, Malaysia', *International Journal of Infectious Diseases*, 108, pp. 347–352. Available at: <https://doi.org/10.1016/j.ijid.2021.05.073>.
- Ningrum, S.A. and Ardillah, Y. (2021) 'Determinan ISPA pada Anak Usia Sekolah di Prabumulih', *Prosiding Forum Ilmiah Berkala Kesehatan Masyarakat Universitas Prima Indonesia* [Preprint].
- Pasya, G.K. (2016) 'PERMUKIMAN PENDUDUK PERKOTAAN', *Jurnal Geografi Gea*, 12(2). Available at: <https://doi.org/10.17509/gea.v12i2.1785>.
- Putra, Y. and Wulandari, S.S. (2019) 'Faktor Penyebab Kejadian ISPA', *Jurnal Kesehatan : Stikes Prima Nusantara Bukittingi*, 10(1). Available at: <http://ejurnal.stikesprimanusantara.ac.id/>.
- Ritonga, K. and Kurniawan, B. (2021) 'Hubungan Faktor Risiko Dengan Kejadian ISPA Pada Anak di Wilayah Kerja Puskesmas Tanjung Beringin Kabupaten Serdang Bedagai Tahun 2020', *Jurnal Kedokteran STM (Sains dan Teknologi Medik)*, IV.
- Rullah, I., Arlianti, N. and Arbi, A. (2023) 'Faktor-Faktor Yang Berhubungan Dengan Kecenderungan Gejala Infeksi Saluran Pernapasan Akut (ISPA) Pada Pekerja Kilang Padi di Kecamatan Sukamakmur Kabupaten Aceh Besar Tahun 2022', *Journal of Health and Medical Science*, 2(1).

- Sholeh, B., Juliningrum, P.P. and Rahmawati, I. (2024) ‘Gambaran Karakteristik Balita dengan Penyakit ISPA di Puskesmas Kanigaran Kota Probolinggo’, *e-Journal Pustaka Kesehatan*, 12(1).
- Simbolon, P.T. and Wulandari, R.A. (2023) ‘Hubungan Lingkungan Fisik Dengan Kejadian ISPA Pada Balita di Wilayah Perkotaan Indonesia Tahun 2018 (Analisis Data Riskesdas Tahun 2018)’, *JAMBURA JOURNAL OF HEALTH SCIENCE AND RESEARCH*, 5(2). Available at: <https://ejurnal.ung.ac.id/index.php/jjhsr/index>.
- Sitohang, N.A. (2016) ‘Pengaruh Terapi Musik Terhadap Stres Hospitalisasi pada Anak di RSUD. dr. Pirngadi Medan’, *Jurnal Ilmu Kesehatan (JIK)*, 9(1).
- Sofia (2017) ‘Faktor Risiko Lingkungan Dengan Kejadian ISPA Pada Balita di Wilayah Kerja Puskesmas Ingin Jaya Kabupaten Aceh Besar’, *Jurnal AcTion: Aceh Nutrition Journal*, 2(1), pp. 43–50.
- Tomatala, S. *et al.* (2019) ‘Hubungan Antara Aktivitas Fisik Dengan Kekambuhan ISPA Pada Anak Usia Sekolah di Kecamatan Bringin Kabupaten Semarang’, *Jurnal Keperawatan Respati Yogyakarta*, 6(1), pp. 537–541. Available at: <http://nursingjurnal.respati.ac.id/index.php/JKRY/index>.
- Zaman, B. and Rabial, J. (2023) ‘Hubungan Tingkat Pengetahuan Orang Tua Dengan Kejadian Ispa Pada Balita Di Wilayah Kerja Puskesmas Simpang Tiga (Relationship Between The Level of Parental Knowledge and The Incidence of Ispa In Toddlers At The Public Health Center of Simpang Tiga, Pidie)’, *Journal of Healthcare Technology and Medicine*, 9(1), pp. 2615–109.
- Zhao, H. *et al.* (2022) ‘WU Polyomavirus Infection in Children With Acute Lower Respiratory Tract Infections in China, 2017 to 2019: Case Reports and Multicentre Epidemiological Survey’, *Frontiers in Cellular and Infection Microbiology*, 11. Available at: <https://doi.org/10.3389/fcimb.2021.835946>.