

## Research article

# Risk Factors of Acute Respiratory Infection in Children Under Five in Banjaran Bandung Regency

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## Abstract.

Acute respiratory infection is a major public health problem because it contributes to the high mortality rate of children under five. The prevalence of acute respiratory infection in West Java province is estimated to be 4.7%. This study aimed to examine the relationship between ventilation, humidity, temperature, and lighting with the incidence of acute respiratory infection in children under five in Banjaran Bandung Regency. This was a case-control study that used a survey approach. The sample consisted of 132 children under five; data for 66 of these children were based on medical records at the Banjaran Nambo DTP health center, and the other 66 children were a control group who were close neighbors of the cases that met the criteria. Data were collected through observations, a roll meter, thermohygrometer and lux meter. Data were analyzed using the Chi-square test. The results showed that ventilation ( $p = 0.001$ , OR: 6.6, 95% CI: 3-14), humidity ( $p = 0.009$ , OR: 2.6, 95% CI: 1-5), temperature ( $p = 0.001$ , OR: 5, 95% CI: 2-10), and lighting ( $p = 0.001$ , OR: 7, 95% CI: 3-17) were significantly related to acute respiratory infection in the children. Therefore, acute respiratory infection in children under five can be prevented by educating the public about the importance of the physical environment of the house.

**Keywords:** acute respiratory infection, children under five, humidity, lighting, temperature, ventilation

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**Published:** 3 June 2022

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Selection and Peer-review under the responsibility of the ISGH4 Conference Committee.

## 1. Introduction

Acute respiratory infection are respiratory infections caused by viruses or bacteria and last for 14 days. Acute respiratory infection is an acute infectious disease of the upper and lower respiratory tract. Acute respiratory infection causes mild symptoms (cough and runny nose), moderate symptoms (shortness of breath) and even severe symptoms. Severe acute respiratory infection that infects lung tissue will cause pneumonia[1].

Acute respiratory infection disease often occurs in childrens, where the duration of cough and cold in childrens under five in Indonesia is estimated at tree to six times per year[2]. Childrens under five are susceptible to various types of diseases including

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acute respiratory infection because childrens under five do not yet have an optimal immune system. Acute Respiratory Infection always ranks as the first cause of death in infants and childrens under five in Indonesia[3].

The national prevalence of acute respiratory infection according to the diagnosis of health workers is (4.4%). The highest prevalence of acute respiratory infection in five provinces is Papua (10.5%), Bengkulu (8.9%), West Papua (7.5%), East Nusa Tenggara (7.3%), and Central Kalimantan (6.2%). West Java Province is included in the top ten provinces with the highest incidence of acute respiratory infection. West Java ranks ninth with a prevalence of (4.7%). Cases of acute respiratory infection in Bandung Regency in 2018 reached (5.66%)[4].

Based on data from the Bandung District Health Office in 2020, the Banjaran Nambo DTP Health Center ranks second with the highest acute respiratory infection cases, namely 2,156 cases (8.4%)[5]. The results of the preliminary study showed that acute respiratory infection was in the first place of the ten biggest diseases at the Banjaran Nambo Health Center DTP. Based on data on visits from childrens under five patients during January–June 2021, there were 625 cases and an average visit of 104 childrens under five per month[6].

A house with ventilation that does not meet health requirements will affect the health of the occupants of the house, this is because the air exchange process in the house is not smooth, so the bacteria that cause acute respiratory infection disease in the house cannot get out. Air from the wild has health benefits, such as oxygen is needed by humans for the body's metabolic processes[7]. Based on the results of research at the Remu Health Center, Sorong City, it showed that there was a significant relationship between air ventilation and the incidence of acute respiratory infection in infants[8].

Air humidity does not meet the requirements to be a good medium for the growth of pathogenic microorganisms. According to the Regulation of the Minister of Health of the Republic of Indonesia No. 1077/MENKES/PER/V/201 humidity requirements in the house range from 40%-60%. Based on the results of research in the Wawonasa Health Center area of Manado City, humidity has a significant effect on acute respiratory infection in childrens under five[9]. Low room temperature causes health problems to hypothermia, while high room temperature causes health impacts. Based on the results of research in Kotagajah, Lampung Regency, it showed that there was a significant relationship between temperature and acute respiratory infection in childrens under five[10].

Natural lighting from sunlight that enters the house through recesses and open spaces serves to reduce room humidity, kill mosquitoes, and kill germs such as the cause of tuberculosis, influenza, eye diseases, and others[7]. Based on the results of

research at Ogan Komering Ulu, it shows that there is a significant relationship between lighting and the incidence of acute respiratory infection in childrens under five[11]. The results of a preliminary study in Banjaran Bandung Regency area found that many acute respiratory infection in childrens under five ventilation, humidity, temperature, and lighting in the house did not meet the requirements and could be risk factors for respiratory infection disease.

Based on these problems, the purpose of this study was to examine the relationship between ventilation, humidity, temperature, and lighting with the incidence of acute respiratory infection in childrens under five in the Banjaran Bandung Regency.

## 2. Methods

### 2.1. Study Design

This research is an analytical survey using a case-control design.

### 2.2. Sample

a sample of 132 childrens under five consisting of 66 cases, namely toddlers suffering from acute respiratory infection and 66 controls, namely childrens under five not suffering from acute respiratory infection, taken by purposive sampling, namely neighbors of the case but not suffering from respiratory problems, having the same sex and age as the case. The study was conducted in the Banjaran Bandung Regency in July-August 2021.

### 2.3. Instruments

The technique for collecting house ventilation data is measurement using a roll meter, the ventilation area meets the requirements if 10% of the floor area of the house. Measurement of humidity and temperature of the house using a thermohygrometer, the humidity of the house is qualified if it is 40-60% and the temperature of the house is qualified if it is 18<sup>o</sup>-30<sup>o</sup>C. The measurement of the lighting of the house is using a lux meter, the lighting of the house is qualified, that is 60 lux and not dazzling.

## 2.4. Data collection procedure

Observations of the home environment were carried out from morning to noon assisted by sanitarian officers at the Banjaran Health Center and Cadre. Data on the incidence of acute respiratory infection in childrens under five was obtained from medical record data at the Banjaran Health Center.

## 2.5. Data Analysis

Statistical analysis using chi-square test and assessing the magnitude of risk using Odd Ratio (OR: 95% CI).

## 3. Results

Table 1 showed that most of the childrens under five in the case group were one year old (45.5%), male (74.2%), maternal age 20-30 years (60.6%), mother's education was high school (57.6%), and housewives (84.8%). Childrens under five in the control group were mostly one year old (31.8%), female (59.1%), maternal age 20-30 years (72.7%), senior high school mother education (62.1%), and housewives. (65.2%).

Table 2 shows that there are 46 (69.7%) childrens underfive whose houses do not meet the requirements and 17 childrens (25.8%) do not suffer from acute respiratory infection. There is a significant relationship between the house and the incidence of acute respiratory infection in childrens under five ( $p = 0.001$ ). Childrens whose house humidity does not meet the requirements are 40 (60.6%) suffering from acute respiratory infection and there are 24 childrens under five (36.4%) not suffering from acute respiratory infection.

There is a significant relationship between humidity in the house and the incidence of acute respiratory infection in childrens under five ( $p=0.009$ ). Childrens under five whose house room temperature did not meet the requirements were 38 (57.6%) suffering from acute respiratory infection and 14 childrens under five (21.2%) did not suffer from acute respiratory infection. There was a significant relationship between house temperature and the incidence of acute respiratory infection in childrens under five ( $p=0.001$ ). Childrens under five whose home room lighting does not meet the requirements there are 55 (83.3%) suffering from acute respiratory infection and there are 26 childrens under five (39.4%) not suffering from acute respiratory infection. There is a relationship

TABLE 1: Childrens Under Five Characteristics in Banjaran Bandung Regency.

Variabel	Acute Respiratory Infection				Total					
	Cases		Controls		n	%				
	n	%	n	%						
Childrens Under Five	30	15	10	45,5	21	15	31,8	51	30	38,6
Age One year	11			22,7	15	2	22,7	27	24	22,7
years Tree years				16,7			25,8			20,5
Four years							19,7			18,2
Gender Bor	49	17		74,2	27		40,9	76	56	57,6
Girl				25,8	39		59,1			56
Mother's Age <20 years										
20-30 years										
31-40 years										
>41 years	3	40	21	2	4,5	60,6	1	48	1,5	4
				31,8	3		17	0	72,7	38
									25,8	2
									0	88
										3
										66,7
										28,8
										1,5
Mother's Education Ele- mentary school										
Junior high school										
Senior high school										
College	4	15	38	9	6,1	22,7	2	4	6,1	6
				57,6	13,6		19		62,1	19
									28,8	79
										4,5
										14,4
										59,8
										21,2
Mother's Job										
Housewives	56			84,8	43		65,2	99		75
Work	10			15,2	23		34,8	33		25
Total	66			100	66		100	132		100

between home lighting and the incidence of acute respiratory infection in childrens under five (p=0.001).

TABLE 2: Relationship Ventilation, Humidity, Temperature, and Lighting With Acute Respiratory Infection in Childrens Under Five at Banjaran Bandung Regency.

Independent Variable	Acute Respiratory Infection				Total		p	OR (CI 95%)	
	Cases		Controls		n	%			
	n	%	n	%					
Ventilation Not Qualify	46	69,7	17	49	25,8	63	47,7	0,001	6,6 (3-14)
Qualify	20	30,3			74,2	69	52,3		
Humidity Not Qualify	40	60,6	24	36,4	64	48,5	0,009	2,6 (1-5)	
Qualify	26	39,4	42	63,6	68	51,5			
Temperature Not Qualify	38	57,6	14	52	21,2	52	39,4	0,001	5 (2-10)
Qualify	28	42,4			78,8	80	60,6		
Lighting Not Qualify	55	83,3	26	39,4	81	61,4	0,001	7(3-17)	
Qualify	11	16,7	40	60,6	51	38,6			
Total	66	100	66	100	132	100			

## 4. Discussion

The results of this study indicate that there is a significant relationship between home ventilation and the incidence of acute respiratory infection in childrens under five in the Banjaran Region, Bandung Regency. Childrens under five whose house ventilation does not meet the requirements have 6 times the risk of getting acute respiratory infection compared to childrens under five whose house ventilation meets the requirements. Air exchange that does not meet the requirements can cause the growth of microorganisms and health problems[12]. If the ventilation of the house is good, fresh air can easily enter the house, ventilation that does not meet the requirements can endanger health, especially the respiratory tract. The ventilation function of the house keeps the air flow in the house cool and the oxygen balance needed by the occupants of the house is maintained. The lack of ventilation in the house causes a lack of oxygen in the house, so that carbon dioxide which is toxic to the occupants increases[13]. Childrens who live in well ventilated homes have a lower acute respiratory infection incidence rate than children who live in poorly ventilated homes[11].

This study is in accordance with the results of research in Surakaraya Baturaja Timur, which shows that there is a significant relationship between air ventilation and the incidence of acute respiratory infection in childrens under five[14]. The results of the study in Padang showed that there was a significant relationship between home ventilation and the incidence of acute respiratory infection, childrens under five living in homes with ventilation that did not meet the standards had an 11.7 times risk of getting acute respiratory infection[15]. The results of the study in Indramayu Regency showed that there was a significant relationship between home ventilation and the incidence of acute respiratory infection in childrens under five[16].

The results of the observation showed that most of the ventilations in the house for childrens under five with respiratory tract infection did not meet the requirements, namely the ventilation area <10% of the floor area. This is due to the respondent's lack of knowledge about the ventilation area that meets the requirements when building a house. Most of the houses for childrens under five with acute respiratory infection have home ventilation only in the front room of the house, then the lack of habit of family members to open the windows of the house causes the air to not flow properly.

The results of this study indicate that there is a significant relationship between humidity and acute respiratory infection in childrens under five in the Banjaran area, Bandung Regency, childrens under five who live in homes with humidity that do not meet the requirements are 2.6 times more likely to suffer from acute respiratory infection than

childrens under five who live in homes with adequate humidity. Room humidity is a factor that affects the health of its occupants, increased air humidity is a medium for the growth of disease-causing bacteria, one of which is acute respiratory infection[13]. The higher the humidity in the room, it can affect a person's immune system and can increase the body's susceptibility to diseases, especially respiratory infections. Humidity meets the requirements of 40-60% and does not meet the requirements if <40% or >60%[12]. High humidity in the house results in evaporation of skin fluids, so that it can become a place for the growth of pathogenic germs and increase the risk of the incidence of acute respiratory infection childrens in under five[1].

The results of this study are in accordance with research in Wua-Wua Anawai which showed that there was a significant relationship between house humidity and the incidence of acute respiratory infection in childrens under five[17]. Research in Makassar showed that there was a significant relationship between physical sanitation of the house and the incidence of acute respiratory infection in childrens under five[18]. The results of observations obtained that most of the toddlers' house humidity did not meet the requirements, namely the ventilation was less than optimal so that the sunlight entering the house to kill bacteria was reduced so that it could cause acute respiratory infection. At the time of observation, black spots were found on the walls of the house caused by the humidity in the room. Humidity in the room can spread micro-organisms in the home environment, if the house is humid then germs that cause acute respiratory infection will grow.

The results of this study indicate that there is a significant relationship between room temperature and the incidence of acute respiratory infection in childrens under five in the Banjaran Region, Bandung Regency. Childrens under five who live in homes with temperatures that do not meet the requirements are five times more likely to suffer from acute respiratory infection than childrens under five who live in homes with temperatures that meet the requirements. Room temperature that does not meet health requirements can cause disease, one of which is acute respiratory infection. Changes in air temperature in the house are caused by several factors, including inadequate ventilation, occupancy density, use of biomass fuels, building materials and structures, geographical and topographical conditions. The ideal and comfortable air temperature ranges between 18°30°C and house temperatures that do not meet the requirements <18°C or >30°C[12].

The results of this study are in accordance with the results of research in Central Lampung showing that there is a significant relationship between temperature and the incidence of acute respiratory infection[10]. Research in Purwokerto shows that

there is a significant relationship between room temperature and the incidence of acute respiratory infection in childrens under five, childrens under five whose room temperature does not meet the requirements have a 3.5 times risk of suffering from acute respiratory infection compared to childrens under five whose room temperature meets the requirements[19]. The results of the observations obtained that most of the homes for children with acute respiratory infection that did not meet the requirements were due to air exchange in closed houses so that there was no air exchange in the house. The room is cramped and filled with stuff, making the house feel cramped and hot.

The results of this study indicate that there is a significant relationship between lighting and the incidence of acute respiratory infection childrens in under five in the Banjaran Community Health Center, Bandung Regency. Childrens under five living in houses with ventilation that do not meet the requirements are at risk of suffering from acute respiratory infection seven times compared to childrens under five living in houses with adequate ventilation. Light has properties that can kill bacteria, sufficient light for lighting the home space is a human health need[1]. A healthy house is a house that has good lighting, not too much or not enough lighting. Lack of lighting makes the occupants uncomfortable and bacteria, viruses, parasites develop, causing health problems, especially respiratory problems. Natural light from sunlight enters the room through windows, crevices, and open parts of the building. In addition to being useful for room lighting, sunlight can also reduce room humidity, repel mosquitoes, kill disease germs such as tuberculosis, influenza, eye diseases, and other[7].

The results of this study are in accordance with the results of research Samarinda showed that there was a significant relationship between lighting and the incidence of acute respiratory infection in childrens under five[20]. Research in Tanjung Agung shows that there is a significant relationship between lighting and the incidencacute respiratory infection in childrens under five[11]. The results of the observations obtained that most of the houses for childrens under five with acute respiratory infection did not meet the requirements, this was because the childrens under five houses were located in residential areas, the distance between the houses was close to each other so that they did not get enough sunlight, and the ventilation was always closed so that natural lighting did not enter the house. Study Limitations in this study are risk factors for acute respiratory infection in childrens under five, includingv, humidity, temperature, and lighting in the house.



## 5. Conclutions

There is a significant relationship between ventilation, humidity, temperature, lighting with acute respiratory infection in childrens under five. Acute respiratory infection childrens under five can be prevented by educating the public about the importance of the physical environment of the house that meets the requirements.

## Acknowledgment

We would like to express our gratitude to the head of The Health Department of Bandung Regency, the head of the public health centers Banjaran Bandung Regency and the Parents of Acute Respiratory Infection Childrens Under five.

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