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# THE DIFFERENCE OF RISK FACTORS OF ACUTE UPPER RESPIRATORY TRACT INFECTION IN THE URBAN AND RURAL PUBLIC HEALTH CENTER SEMARANG

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## ABSTRACT

**Background:** The acute upper respiratory tract infection was an infection on respiratory tract organ from the nose until pharynx. The geographical condition of a region could affect the case of acute upper respiratory tract infection. The factors related to both urban and rural life could affect in the difference of respiratory condition. The biological change of age, nutritional status, and allergy status were highly related to the increase of respiratory condition. **Aim:** To identify the risk factors of acute upper respiratory tract infection in the urban and rural public health center of Semarang. **Methods:** This research exerted observational research design and case control method. This research took place in Semarang with 400 patients participated in this study. The risk factors were comprised of age, gender, body height, body weight, and drug allergy status. The data sampling was taken through consecutive sampling technique. Moreover, the statistic test used Chi-square test. **Results:** This research finding referred that the largest number of sample on the age category in both urban and rural public health center were in the adult age (20-60 years old) with percentage of urban public health center (66,5%) and rural public health center (46%). The risk factor of age indicated a significant result in the urban public health center (p = 0,000) and rural public health center (p = 0,010). Next, the risk factor of gender indicated an insignificant result in the urban public health center (p = 0,391) and rural public health center (p = 0,885). Last, the risk factor of nutritional status in the urban public health center indicated an insignificant result (p = 0,094), while in the rural public health center indicated a significant result (p = 0,006). **Conclusion:** The risk factors of acute upper respiratory tract infection in rural public health center was different from the risk factors in urban public health center. The risk factors of acute upper respiratory tarct infection in the rural public health center were age and nutritional status, while the risk factor of acute upper respiratory tract infection in the urban public health center was age.
***Keywords**: Acute URTI (Upper Respiratory Tract Infection), Urban Public Health Center, Rural Public Health Center*

## INTRODUCTION

The acute upper respiratory tract infection is a kind of infection on respiratory tract organ from the nose until pharynx that lasts for less than 14 days and is diagnosed as common cold, rhinitis, sinusitis, tonsillitis, and pharyngitis.[1,2] According to the World Health Organization (WHO) on the prevalence of acute respiratory infection, the majority of death as the consequence of acute respiratory tract infection case were in the Asian and African developing countries: India (48%), Indonesia (38%), Sudan (1,5%), and Nepal (0,3%).[3] The symptom of acute respiratory tract infection varies as cough, sore throat, cold, nasal congestion, headache, light fever, facial pain and sneeze.[4]

The factors that may affect the individual to suffer acute upper respiratory tract infection are comprised of age, gender, nutritional status and allergy status. The infection on toddler is the first infection and the immune system has not optimally formed yet in this age, so the upper respiratory tract infection on toddler can illustrate the severe clinical overview.[5] The nutritional status also takes a role in the cause of a disease. The nutritional status is a determinant of human resource quality, since the nutritional element is able to affect the health level, physical endurance, and human mind quality.[6] The children under 5 years old is the vulnerable age group to nutritional disorder issue, thus, it is the vulnerable age to get the disease attack.[7] The gender also has a close relation with the incident of acute upper respiratory tract infection. Many outdoor activities enable the man to get exposed more to the agent of acute upper respiratory tract infection than the woman.[5] The allergy is defined as a reaction of individual immune system to dangerous allergen for the human body, because the body immunity system misidentifies the allergen. The allergen can form antibody named as immunoglobulin E (IgE) which triggers the allergy symptoms.[8,9] A number of allergen substances

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can be in forms of food, medicine, chemical, animal fur, and insect.[10]

The geographical condition of a region also affects the case of acute upper respiratory tract infection. The region with dense population, high pollution environment, bad sanitation and high humidity will certainly increase the rate of acute respiratory infection case. According to the Ministry of Health of Republic Indonesia on RISKESDAS 2018, based on the household knowledge which is related to the ease of access to reach the public health center is valued as easy 39,2% difficult 31,8%, and very difficult 29,0% with the comparison in urban area: easy 46,1%, difficult 31,5%, very difficult 22,5%, while in the rural area: easy 31,0%, difficult 32,2%, very difficult 36,8%, which have indicated that the treatment in rural area is still harder than in the urban area.[11] The urbanization is a significant determinant factor of health, because it can form an incubator for the transmittable disease. The factors related to both urban and rural life affects the difference of respiratory and allergy condition. The pollution, climate change, and industrial exposure are closely related to the increase of respiratory condition and allergy status.[12] This research is aimed to identify the difference of risk factors of acute upper respiratory tract infection (URTI) in the urban and rural public health center, Semarang.

## METHODS

This research was conducted in June 2020, particularly in Puskesmas Pandanaran and Puskesmas Kedung Mundu (as urban public health center) and Puskesmas Sekaran and Puskesmas Karang Malang (as rural public health center) in Semarang. The research design was observational design and case control method. The research subjects were taken from the patients with diagnosis of acute upper respiratory tract infection (URTI) who were recorded in a medical record along August 2019 – May 2020 and selected through consecutive sampling method which fitted to the inclusion criteria as age, gender, body height, body weight, history of drug allergy on the medical record, and outpatient data. Meanwhile, the patients with benign or malignant tumor, patients with congenital disorder, patients with Chronic Obstructive Pulmonary Disease (COPD) and tuberculosis (TBC) were excluded. The independent variable used in this research were risk factors of age, gender, nutritional status, and drug allergy status, while the dependent variable was acute upper respiratory tract infection. The category of acute upper respiratory tract infection diagnosis was based on ICD 10: common cold (code J00), acute rhinitis (code J00), acute sinusitis (code J01), acute pharyngitis (code J02), and acute tonsillitis (code J03). The minimum amount of sample was calculated through the following sample quantity formula according to lemeshow:

$$n = \frac{Z^2\, p(1-p)}{(d)^2}$$

The calculation on sample size according to lemeshow has referred 96,04 and was then rounded up to 100 respondents in each group.

This research was done after acquiring a research approval from the Medical and Health Research Ethics Commission of Medical Science Faculty of Diponegoro University, Semarang with the following ethical clearance number 81/EC/KEPK/FK-UNDIP/V/2020. The data analysis was covered to univariate and bivariate analysis. The univariate analysis was used to determine the frequency distribution of either independent variable or dependent variable. The bivariate analysis was an analysis exerted to find the relation between independent variable and dependent variable by using chi-square statistic test and if the subject did not fulfill the conditions of chi-square test, it would be continued by fisher test as the alternative test. The data was then processed and analyzed in computer. The significance of statistic calculation used a limit value 0,05 against the hypothesis, thus, when the p value $\leq$ 0,05, it referred a relation between independent variable and dependent variable.

## RESULTS

The total subject who contributed in this research were 400 subjects, they were consisted of 200 subjects from urban and rural public health center and were divided into two groups: the acute and healthy upper respiratory infection groups. The risk factors that would be examined in this research were gender, age, nutritional status, and drug allergy status.

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The distribution frequency in urban public health center on the variable of female gender was 114 (57.0%) and male gender was 86 (43.0%). There were 35 (17.5%) people who were underweight, 21 (10.5%) people who were overweight, 54 (27.0%) people who were obesed, while the rest (45.0%) was normal. Furthermore, in this study there were 4 (2.0%) infant, 20 (10.0%) children, 24 (12%) adolescent, 133 (66.5%) adult, and 19 (9.5%) elderly. In the rural public health center, there were 81 (40.5%) female and 119 (59.5%) male. On the nutritional status, the BMI with underweight category was 63 (31.5%), the normal BMI was 86 (43.0%), the BMI with underweight category was 14 (7.0%), the obesity BMI was 37 (18.5%). Furthermore, there were 16 (8.0%) infant, 53 (26.5%) children, 23 (11.5%) adolescent, 92 (46.0%) adult, and 16 (8.0%) elderly.

**Table 1.** The Result of Chi-square Test on Gender Factor to the Case of Acute Upper Respiratory Tract Infection

| Public Health Center | Gender | Acute URTI | | | | p |
|---|---|---|---|---|---|---|
| | | URTI | | Non-URTI | | |
| | | n | % | n | % | |
| Urban | Male | 46 | 53,5 | 40 | 46,5 | 0,391 |
| | Female | 54 | 47,4 | 60 | 52,6 | |
| Rural | Male | 41 | 50,6 | 40 | 49,6 | 0,885 |
| | Female | 59 | 49,6 | 60 | 50,4 | |

**Table 2.** The Result of Chi-square Test on Age Factor to the Case of Acute Upper Respiratory Tract Infection

| Public Health Center | Age | Acute URTI | | | | p |
|---|---|---|---|---|---|---|
| | | URTI | | Non-URTI | | |
| | | n | % | n | % | |
| Urban | Infant | 4 | 100 | 0 | 0 | <0,001 |
| | Children | 19 | 95 | 1 | 5 | * |
| | Teenager | 9 | 37,5 | 15 | 62,5 | |
| | Adult | 49 | 36,8 | 84 | 63,2 | |
| | Elderly | 19 | 100 | 0 | 0 | |
| Rural | Infant | 6 | 37,5 | 10 | 62,5 | 0,010* |
| | Children | 37 | 69,8 | 16 | 30,2 | |
| | Teenager | 12 | 52,2 | 11 | 47,8 | |
| | Adult | 40 | 43,5 | 52 | 56,5 | |
| | Elderly | 5 | 31,3 | 11 | 68,8 | |

*sig value (p < 0,05)

**Table 3.** The Result of Chi-square Test on BMI Factor to the Acute Upper Respiratory Tract Infection

| Public Health Center | BMI | Acute URTI | | | | p |
|---|---|---|---|---|---|---|
| | | URTI | | Non-URTI | | |
| | | n | % | n | % | |
| Urban | Underweight | 22 | 62,9 | 13 | 37,1 | 0,094 |
| | Normal | 37 | 41,1 | 53 | 58,9 | |
| | Overweight | 10 | 47,6 | 11 | 52,4 | |
| | Obesed | 31 | 57,4 | 23 | 42,6 | |
| Rural | Underweight | 29 | 46 | 34 | 54 | 0,006 |
| | Normal | 36 | 41,9 | 50 | 58,1 | * |
| | Overweight | 7 | 50 | 7 | 50 | |
| | Obesed | 28 | 75,7 | 9 | 24,3 | |

*sig value (p < 0,05)

The statistical analysis on drug allergy status could not be calculated, since this research did not find the sample who have a history of drug allergy in the urban public health center, while only a sample found in the rural public health center with the history of drug allergy.

## DISCUSSION

This research was conducted and aimed to identify the difference of risk factors of acute upper respiratory tract infection (URTI) in urban and rural public health center of Semarang. Puskesmas Pandanaran and Puskesmas Kedungmundu were chosen as the urban public health centers in this research. Based on the data, the total population were 68.057 and 180.500, while Puskesmas Sekaran and Puskesmas Karang Malang were chosen as the rural public health center. Based on the data, the total population were 94.347 and 74.696.

The majority of patients who have visited to urban and rural public health center were woman with the total number of 114 patients (57%) in urban public health center and 119 patients (59.5%) in rural public health center. The statistical analysis did not find any significant relation between gender and acute upper respiratory tract infection (URTI) in the urban public health center (p = 0,391) and rural public health center (p = 0,885). A research which has been done in Australia at the age of less than 5 years old stated a relation between gender and case of acute upper respiratory tract infection (URTI) which was caused by the factor of man activity that was valued as more active than woman, so it enabled the man to get more exposure of acute upper respiratory tract infection agent.[13] The result difference was affected by the difference of

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age on research subject population. In this research, the researcher used cross sectional design which the population of research subject were taken from all age ranges from the baby until elderly people. The other researchers used a descriptive design with the different range of age, but the age distribution has stated that the dominant gender which could affect the case of upper respiratory tract infection was on toddler. The result difference was also found in this research which might be caused by the condition that the population were in the productive age or group of 15 years old and more with the assumption that on this range of age, the people were ready to involve in the work. Based on the sakernas data on August 2018, approximately 1.405.604 people in productive age were found in Semarang, particularly 724.922 were female, and the rest 680.680 were male gender.[14] Therefore, this condition would enable the result where the woman have more outdoor activities and cause the more woman to get exposure of infectious agent.

The most age with complaint of acute upper respiratory tract infection in either the urban or rural public health center was on adult (20-60 years old), particularly 49 subjects (36,8%) in the urban public health center and 40 subjects (43,5%) in the rural public health center. Further, this research referred a significant relation between age and case of acute upper respiratory tract infection (URTI) in urban public health center (p=0,000) and rural public health center (p=0,002). This result was in line with the previous researches which have asserted that the age was related to the case of acute upper respiratory tract infection (URTI) that showed the toddlers of 2 - 3 years old have a chance of 1.389 times to suffer URTI.[5] Another research has been done in Ireland and used cross sectional design. This preliminary research has found that the most common age group who experience the acute upper respiratory tract infection was the age under 6 years old, while the old age (above 56 years old) was the age group who least likely to experience acute upper respiratory tract infection.[15] This research supported the theory which asserts that the disease of acute respiratory tract infection was more likely suffered and experienced by toddlers and the causal factor was the first infection case and the immunity system process was not optimally formed naturally in this age.[5] The old age was also a risk factor of acute upper respiratory tract infection case, since when people got older, they have more biological changes which could increase vulnerability to several kinds of disease. The change would complicate the elderly people to cough effectively which caused the slower and less effective mucociliary cleansing and slowed down mucociliary recovery from the lesion, in short, the old age was also vulnerable to get exposed by acute upper respiratory tract infection.[16] The research finding showed that the percentage in urban and rural public health center in either the children age (78,1%) or elderly age (68,6%) were greater than the adolescent age (48%).

The nutritional status did not have a significant relation to the acute upper respiratory tract infection (URTI) in urban public health center (p = 0,094), but the nutritional status has a significant relation to the case of acute upper respiratory tract infection (URTI) in rural public health center (p = 0,006). The research has been done in German found no significant relation between nutritional status and case of upper respiratory tract infection (p = 0,064). Another research has been done by a number of universities in United States of America said no significant relation between BMI and case of upper respiratory tract infection. On the children, the risk factor of BMI did not affect the severity of upper respiratory tract infection, while on the adult age and obesity were related to the rise of upper respiratory tract infection severity (p = 0,02).[18] This result could be related to the different nutrient intake with nutritional status in urban and rural regions. The nutritional status on individual was depended on the nutrient intake and need, when the nutrient intake and need were balanced, it would produce a good nutritional status. The different need of nutrient intake on every individual was depended on the factors of age, gender, activity, body weight and height. Moreover, the nutritional status could be affected by primary factors as lack of family's food supply, poverty, lack of knowledge on the importance of nutrients, wrong eating habit and secondary factors as disturbance in the food digestion, absorption disorder, etc.[19] The anatomical change might affect the body immune and raise the possibility of infectious disease on the individual.[20]

In the urban public health center, this research did not find the research subjects with history of drug allergy, so the statistical analysis in this factor

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was not needed. While, in the rural public health center, this research has only found a patient who have drug allergy record, so the analysis was done on both groups of drug allergy record with upper respiratory tract infection case by exerting fischer's exact. The result of bivariate analysis referred that the history of drug allergy was not significantly related to the acute upper respiratory tract infection (URTI) (p = 1).

The research limitation was that this research employed secondary data and the research sample was taken through consecutive sampling technique. However, this technique had research limitation that it could be done by taking anyone the researcher has met during the research, so the result might bring bias to the data sampling. This research is benefition

## CONCLUSIONS

Based on the research has been done in both urban and rural public health centers of Semarang, this research concluded that the gender and drug allergy status were not the risk factors of acute upper respiratory tract infection (URTI) case in the urban and rural public health center of Semarang. The nutritional status was not the risk factor of acute upper respiratory tract infection (URTI) in the urban public health center, but it was the risk factor of acute URTI in the rural public health center of Semarang. The age was the risk factor of acute upper respiratory tract infection (URTI) in both urban and rural public health centers, Semarang.

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