International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Correlation Between Nutritional Status and Upper Respiratory Tract Infection on Toddler at UPTD Puskesmas II Dinas Kesehatan Kecamatan Denpasar Timur in October 2023: A Cross - Sectional Study

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Abstract: ***Background: Upper respiratory tract infection (URTI) is an inflammation or irritation of the upper respiratory tract without the signs and symptoms of pneumonia. This study aims to analyze the correlation between malnutrition and URTI occurrence. Methods: This study is an analytic study with cross - sectional study design. The study was performed in October 2023 in general polyclinic of UPTD Puskesmas II Dinas Kesehatan Kecamatan Denpasar Timur. Participants were toddlers in the age group of 13 - 59 months who were then classified to 2 groups, namely good and poor nutritional status groups according to World Health Organization (WHO) curve. Univariate analysis was conducted to identify the distribution of data regarding age group, gender, nutritional status, and URTI status. Meanwhile bivariate analysis was conductor to identify difference a between both groups with the respect of URTI occurrence using Fisher's exact test. Results: Thirty - five patients were recorded to suffer from URTI, while 25 other patients did not suffer from URTI. A total of 17 (44.8%) and 21 (55.2%) patients with good nutritional status did not suffer and suffered from URTI, respectively. While a total of 8 (36.4%) and 14 (63.6%) patients who were malnourished did not suffer and suffered from URTI, respectfully. Statistical analysis did not show significant difference between both groups in regards of URTI occurrence. Conclusion: There is no correlation between nutritional status and URTI occurrence. Further study to analyze other risk factors for URTI in toddlers is necessary.***

Keywords: upper respiratory tract infection, malnutrition

1. Background

Upper respiratory tract infection (URTI) is an inflammation or irritation of upper respiratory tract which is caused by pathogen, such as virus or bacteria, without the signs and symptoms of pneumonia which occurs in patients without chronic obstructive pulmonary disease (COPD). (1) This condition may involve various organs, namely nose, pharynx, larynx, or trachea. This disease typically manifests as dry or productive cough, rhinorrhea, fever, facial pain, headache, or odynophagia. Upper respiratory tract infection is most commonly caused by virus, for example rhinovirus, influenza virus, adenovirus, and respiratory syncitial virus (RSV). The most common bacterial etiology is *Streptococcus pyogenes*. (2) Although URTI is usually mild and self - limiting, URTI is one of the most common conditions found in healthcare facilities. Every year, it was estimated that around 1 billion cases of URTI occurred with 10 million visits to the healthcare facilities. Adults typically suffer from URTI twice to four times in a year, while children suffer from URTI six to ten times yearly. (3) This accounted for the loss of effective school days as much as 20 million days or effective working days of 10 million days which then accounted for increased economic burden. In Indonesia, epidemiological study in 2016 revealed URTI prevalence of 25% with the range of 17.5% to 41.4%. This case became the most common cause of mortality in toddlers, accounting for 32.10% of all - cause mortality. (4, 5)

Several URTI risk factors included underlying diseases such as asthma, suboptimal house ventilation system, smoking exposure, household with high occupancy density, and malnutrition or poor nutritional status. (6, 7) Malnutrition is a condition characterized by the imbalance of nutritional intake, which can be lack of nutrition or excessive nutritional balance. This condition is not to be underestimated as malnutrition is associated with reduced quality of life and lifespan and increased risk of various complications in the future. This study was conducted to analyze the relationship between nutritional status and URTI occurrence in *UPTD Puskesmas II Dinas Kesehatan Kecamatan* Denpasar Timur.

2. Methods

The study design utilized for this research was analytical model using cross - sectional method. Sampling technique applied for the study was non probability sampling with *consecutive* sampling technique. The study was performed in general polyclinic of *Unit Pelaksana Teknis Dinas* (UPTD) *Pusat Kesehatan Masyarakat* (Puskesmas) *II Dinas Kesehatan* (Dinkes) *Kecamatan* Denpasar Timur. Sampling was conducted from October 1st 2023 to October 31st 2023. The patients were classified to 2 groups, namely good nutritional status group and poor nutritional status group, based on World Health Organization (WHO) curve for weight for age. Good nutritional status was defined as weight for age between the 15th and 85th percentile of the curve. While poor nutritional status was defined as weight for age below 15th percentile or over 85th percentile. The inclusion criterion for the study was all pediatric patients admitted to general polyclinic in *Puskesmas Dinkes Kecamatan* Denpasar Timur aged 13 months to 59 months. Upper respiratory tract

infection was diagnosed through history taking and physical examination. Exclusion criteria included patients with pneumonia or URTI with underlying conditions such as bronchiale asthma.

Extracted data from the participants included age, gender, number of participants for each group, chief complaint, smoking exposure, duration of symptoms, vital signs, body weight, body height, abdominal circumference, body mass index (BMI), nutritional status, diagnosis, and treatment. Statistical analysis was performed using IBM Statistical Program for Social Science (SPSS) version 16.0. Univariate analysis aimed to identify the distribution and frequency of URTI occurrence and nutritional status variables. While bivariate analysis using Fisher's exact test was done to identify the correlation between nutritional status and URTI occurrence.

3. Results

Univariate Analysis

Univariate analysis regarding the participants' age showed that a total of 47 (78.3%) patients were classified to the age group of 13 - 36 months and 13 (21.7%) patients were classified to the age group of 37 - 59 months, therefore most of the patients were aged between 13 - 36 months. Univariate analysis on the distribution of sex showed that a total of 36 (60.0%) patients were male and 24 (40.0%) patients were female. Age and gender distributions were listed in Table 1.

Table 1: Participants Data Distribution for Age and Gender in General Polyclinic *Puskesmas* Denpasar Timur in October 2023

Variable	Category	Frequency	Percentage (%)
Age	13 - 36 months	47	78.3
	37 - 59 months	13	21.7
Gender	Male	36	60.0
	Female	24	40.0

The classification of patients' nutritional status was interpreted based on WHO weight - for - age curve. Univariate analysis of 60 patients revealed 22 (36.7%) study participants with poor nutritional status and 38 (63.3%) study participants with good nutritional status. Data distribution for nutritional status was listed in Table 2.

Table 2: Participants Data Distribution Based on Nutritional Status in UPTD *Puskesmas II Dinas Kesehatan Kecamatan* Denpasar Timur in October 2023

Nutritional Status	Frequency	Percentage (%)
Poor	22	36.7
Good	38	63.3
Total	60	100

Univariate analysis on URTI occurrence showed that a total of 35 (58.3%) patients suffered from URTI and 25 (41.7%) remaining patients did not suffer from URTI during the general polyclinic visit in *Puskesmas* Denpasar Timur. Upper respiratory tract infection characteristic distribution was shown in Table 3.

Table 3: Participants Data Distribution Based on URTI Occurrence in General Polyclinic of *UPTD Puskesmas II Dinas Kesehatan Kecamatan* Denpasar Timur in October 2023

URTI Characteristic	Frequency	Percentage (%)
ISPA	35	58.3
Non - ISPA	25	41.7
Total	60	100

Bivariate Analysis

In this study, a total of 17 (44.8%) patients with good nutritional status did not suffer from URTI and 21 (55.2%) patients with good nutritional status suffered from URTI. In the poor nutritional status group, a total of 8 (36.4%) patients did not suffer from URTI and 14 (63.6%) patients suffered from URTI. Statistical analysis using Fisher's exact test revealed p value of 0.052, which concluded that there was no significant difference between good nutritional status group and poor nutritional status group in regards of URTI occurrence.

Table 4: Correlation of Nutritional Status and URTI Occurrence in Toddlers in General Polyclinic Visit in *UPTD Puskesmas II Dinas Kesehatan Kecamatan* Denpasar Timur in October 2023

Parameter	Diagnosis				Total		P Value
Nutritional Status	Non URTI		URTI				
	N	%	N	%	N	%	
Good	17	44.8	21	55.2	38	100	0.052
Poor	8	36.4	14	63.6	22	100	
Total	25	41.7	35	58.3	60	100	

4. Discussion

To this date, many studies have been conducted to identify various risk factors for upper respiratory tract infection. External risk factors for URTI include smoking exposure, poor or dirty house ventilation system, high occupancy density in the household, lack of parents' knowledge, poor hand hygiene, and inappropriate mask utilization. While internal risk factors for URTI include history of prematurity, immunocompromised state, suboptimal exclusive breastfeeding, inadequate immunization, and poor nutritional status. (6–8)

In this study, there was no correlation between nutritional status and URTI occurrence in patients aged 13 to 59 months. Previous study conducted in Southeast Nigeria revealed similar URTI incidence in malnourished patients as in this study, which was 75.7%. (9) Cohort study in Phillipines reported a correlation between malnutrition with z score of ≤ - 2 with a more severe URTI occurrence. (10) While study in Bangladesh revealed that patients with respiratory tract infection with severe malnutrition had a greater risk of treatment failure (58%) and fatal outcome (21%). (11)

Theoretically, malnutrition may increase the risk of a person to suffer from URTI. Malnutrition and URTI have a bimodal relationship. Macronutrient functions as energy provider in the body metabolism and help provide substrates for immune cell activation. While micronutrient functions as immune system regulator. Nutrients such as zinc, vitamin D, and protein have anti - infection properties. (12) A study in Indonesia stated that zinc consumption with the dose of 10 mg

per day and vitamin A consumption with the dose of 200, 000 IU per day was proven to reduce the number of days a patient suffered from URTI (12% reduction with zinc, 20% reduction with the additional vitamin A). (13) Patients with malnutrition have deformed mucosal architecture, hence, the deteriorated defense mechanism against a pathogen. In the upper respiratory tract, immunoglobulin (Ig) A secretion as a response of mucosal immune system is reduced in malnutrition. Previous in vivo study on malnourished mice reported abnormal mucosal structures. Moreover, malnutrition is also associated with immune cell activation failure such as T cell and B cell and reduced production of proinflammatory mediators, namely interleukins (IL), prostaglandin (PGE), tumor necrosis factor (TNF), and complements, except for C4. (14–18)

Insignificant finding in this study might be caused by the presence of confounding factors which were involved in the course of URTI pathogenesis. There factors may include immunization history, breastfeeding history, immunocompromised state, smoking exposure, or high occupancy density.

5. Conclusion

Upper respiratory tract infection is one of the most common diseases with clinically relevant morbidity and burden. To conclude, there is no correlation between nutritional status and URTI occurrence. However, further study is necessary to analyze the relationship of other factors to URTI occurrence.

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