



RELATIONSHIP BETWEEN FREQUENCY OF FAST FOOD AND BEVERAGE CONSUMPTION AND TONSILLITIS IN CHILDREN

Mukhlis Imanto*, Roro Rukmi Windi Perdani, Oktadoni Saputra, Diyan Ekawati, Dustin Delano Pranata Sembiring

School of Medicine, Universitas Lampung, Jl. Prof. Dr. Ir. Sumantri Brojonegoro No.1, Bandar Lampung, Lampung 35141, Indonesia

*mukhlisimantokhlis@yahoo.co.id

ABSTRACT

Tonsillitis is an inflammation of the palatine tonsils commonly affecting children aged 5–15 years. One of the contributing risk factors is the frequent consumption of fast food and fast beverages. This study aimed to analyse the association between fast food and fast beverage consumption and the incidence of tonsillitis among children aged 5–15 years. An observational analytic study with a case–control design was conducted involving 52 respondents, consisting of 26 cases and 26 controls, selected using consecutive sampling. Data were collected from children aged 5–15 years attending the Otorhinolaryngology outpatient clinic at Advent Hospital. Fast food and fast beverage consumption was assessed using a Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ), followed by clinical diagnosis by a specialist. The Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) used to assess fast food and fast beverage consumption was tested for validity and reliability prior to data collection. Item validity was confirmed using correlation analysis with significance values < 0.05 , while reliability testing demonstrated satisfactory internal consistency, with Cronbach's alpha coefficients exceeding 0.70, indicating that the instrument was valid and reliable for measuring dietary consumption patterns. Consumption frequency was categorised as frequent (score \geq median) and infrequent/never (score $<$ median). Data analysis was performed using the Chi-square test. The study subjects consisted of 27 males (51.9%) and 25 females (48.1%). A total of 26 subjects (50.0%) were diagnosed with tonsillitis, while 26 subjects (50.0%) were non-tonsillitis. Frequent fast food consumption was reported in 25 subjects (48.1%), while frequent fast beverage consumption was reported in 23 subjects (44.2%). Fast food consumption more than twice daily showed a highly significant association with tonsillitis ($p = 0.000$). Similarly, fast beverage consumption was also significantly associated with tonsillitis ($p = 0.000$). A high frequency of fast food and fast beverage consumption (OR: 23.100 and 14.929, respectively) is significantly associated with the incidence of tonsillitis in children aged 5–15 years. Health education regarding healthy dietary patterns is essential to reduce the risk of tonsillitis in this age group.

Keywords: children; fast beverages; fast food; tonsillitis

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INTRODUCTION

Tonsillitis is an inflammatory process that occurs in the palatine tonsils and affects all ages, especially children. In 2013, the World Health Organisation recorded 287,000 cases of chronic tonsillitis in children under 15 years of age. A study conducted by (Rahayu et al., 2020) stated that there were 41.1% per 100 cases of tonsillitis in children aged 5-12 years at the Pertamina Bintang Amin Hospital in Bandar Lampung, ENT-KL polyclinic in 2020. (Alasmari et al., 2017; Rahayu et al., 2020; Zuhdi et al., 2020).

Risk factors for tonsillitis can be caused by several things, one of which is unhealthy eating habits. Mita (2017) stated that foods containing preservatives, flavour enhancers, acidic foods, foods with artificial sweeteners, fried foods, consuming cold water, and the habit of eating in random places are at risk of causing tonsillitis, where 72.5% of tonsillitis sufferers have risky eating habits. Fast food is food that does not require a long time to prepare. Examples of fast food that are well known to the public include pizza, hamburgers, nuggets, instant noodles, instant porridge, ice cream, fried

chicken, French fries, cornflakes, spaghetti, and snacks or light meals made from tubers, corn, and potatoes that come in packaged form.

Excessive consumption of instant drinks and cold water also causes stimulation and stretching of the epithelial cells in the tonsils, resulting in tonsil hypertrophy if exposed continuously. Eating oily foods can cause an itchy throat if consumed in large quantities and continuously due to the acrolein content in cooking oil. (Alfarisi et al., 2019). According to previous research conducted by Alfarisi et al. (2019), there is a relationship between eating habits and the risk of chronic tonsillitis in primary school children at SD N 2 Kemiling Permai Bandar Lampung with a p-value of 0.012 (<0.05). However, there has been no research on the types of food that can increase the risk of tonsillitis in children aged 5-15 years, so researchers are interested in studying examples of fast food that can increase the risk of tonsillitis infection at Advent Hospital Bandar Lampung (Alfarisi et al., 2019).

The problem that can be formulated is the relationship between fast food and beverages and tonsillitis infection in paediatric patients at Advent Hospital in Bandar Lampung. Meanwhile, the purpose of this study is to analyse the relationship between fast food and beverages and tonsillitis infection in paediatric patients at Advent Hospital in Bandar Lampung. This study specifically aims to determine the distribution and frequency of fast food eating and drinking habits among children who come to Advent Hospital Bandar Lampung, to determine the relationship between the frequency of fast food consumption and tonsillitis, and to determine the relationship between the frequency of fast drink consumption and tonsillitis. This study can be useful in providing information and knowledge about the relationship between the frequency of fast food and beverage consumption and tonsillitis, especially for mothers and children.

METHOD

This study is a comparative study with a case-control design, which is an observational study design that aims to assess the relationship between exposure to risk factors and the occurrence of disease. This study is retrospective in nature, beginning with the determination of subjects based on disease status, namely the case group (children with tonsillitis) and the control group (children without tonsillitis), followed by tracing their history of exposure to fast food and beverage consumption (Prasasty, 2023).

The study population consisted of all children aged 5–15 years who sought treatment at the ENT-KL Polyclinic of Advent Hospital in Bandar Lampung. The sample size was determined by calculating the minimum sample size for case-control studies based on the incidence proportion from previous studies. The incidence proportion of fast food and beverage consumption in children with tonsillitis was 36.8% and in children without tonsillitis was 63.2% (Alfarisi et al., 2019). Based on these calculations, the minimum sample size was 25.7 subjects for each group, rounded up to 26 subjects in the case group and 26 subjects in the control group, with a total sample of 52 children.

The sampling technique used consecutive sampling, whereby all subjects who met the inclusion criteria and did not meet the exclusion criteria were included in the study until the sample size was met. The inclusion criteria included children aged 5–15 years who were treated at the ENT-KL Polyclinic of Advent Hospital in Bandar Lampung, were willing to participate in the study with the consent of their parents or guardians, and had a diagnosis of tonsillitis or non-tonsillitis confirmed by an ENT-KL specialist. Exclusion criteria included children with a history of diseases that could affect the immune system, such as diabetes mellitus, autoimmune diseases, or other chronic infections, as well as children with non-tonsillitis throat complaints such as pharyngitis or laryngitis.

The independent variable in this study was the frequency of fast food and beverage consumption, while the dependent variable was the incidence of tonsillitis. Fast food and beverage consumption was measured using the Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) through interviews with subjects or parents/guardians. Consumption frequency was assessed based on scores, which were then categorised as frequent if the score was \geq median and infrequent if the score was $<$ median (Anindyawati, 2016). The diagnosis of tonsillitis was determined based on clinical examination by an ENT-KL specialist, which was recorded in the patient's medical records. The accuracy of dietary exposure assessment in this study was supported by prior validity and reliability testing of the Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ). Validity testing showed that all questionnaire items had significance values below 0.05, indicating that each item was able to measure the intended construct appropriately. Furthermore, reliability analysis yielded Cronbach's alpha values greater than 0.70 for both fast food and fast beverage consumption sections, demonstrating good internal consistency.

These findings indicate that the SQ-FFQ is a reliable and valid instrument for assessing the frequency of fast food and fast beverage consumption among children. The use of a validated and reliable questionnaire strengthens the credibility of the observed associations between dietary consumption patterns and the incidence of tonsillitis, and minimizes measurement bias in dietary assessment. Data collection was conducted through structured interviews using the SQ-FFQ questionnaire and recording clinical data from medical records. The data obtained was then analysed univariately to describe the characteristics of the research subjects and bivariate to assess the relationship between the frequency of consumption of fast food and beverages and the incidence of tonsillitis. The statistical test used was the Chi-square test with a statistical significance level set at $p < 0.05$. This study was conducted at the ENT-KL Polyclinic of Advent Hospital in Bandar Lampung over a period of six months, in accordance with the predetermined data collection period.

RESULT

Tabel 1.
Univariate Analysis of Research Subject Characteristics

Category	f	%
Age		
Children	29	55,8
Adolescents	23	44,2
Gender		
Male	27	51,9
Female	25	48,1
Tonsillitis		
Yes	26	50,0
No	26	50,0
Frequency of Fast Food Consumption		
Often	25	48,1
Rarely	27	51,9
Frequency of Fast Beverages Consumption		
Often	23	44,2
Rarely	28	55,8

This study involved 52 subjects aged 5–15 years, consisting of 26 children diagnosed with tonsillitis and 26 children without tonsillitis. The characteristics of the research subjects included age, gender, tonsillitis status, and frequency of consumption of fast food and beverages. Table 1 shows the characteristics of the research subjects based on age. Of the 52 research subjects, 29 respondents (55.8%) were children (aged 5–10 years) and 23 respondents (44.2%) were adolescents (aged 11–15 years). The distribution of gender according to Table 1 shows that out of 52 research subjects, there were 27 males (51.9%) and 25 females (48.1%). Furthermore, there were 26 research subjects (50.0%) diagnosed with tonsillitis and 26 research subjects (50.0%) diagnosed with conditions other

than tonsillitis. Furthermore, Table 1 shows the characteristics of research subjects who frequently consume fast food, numbering 25 (48.1%), and research subjects who rarely consume fast food, numbering 27 (51.9%). Finally, Table 1 shows the characteristics of research subjects who frequently consume fast food drinks, numbering 23 (44.2%), and research subjects who rarely consume fast food drinks, numbering 29 (55.8%).

Table 2 shows the results of bivariate analysis of tonsillitis incidence and fast food consumption frequency. The results show that 80.8% of children who frequently consume fast food experience tonsillitis, which is higher than the 15.4% of children who frequently consume fast food but do not experience tonsillitis. Among children with infrequent fast food consumption who did not experience tonsillitis, the rate was 84.6%, which was higher than that among children with frequent fast food consumption who experienced tonsillitis, which was 15.4%. The relationship between the frequency of fast food consumption and tonsillitis was analysed using the chi-square test, the results of which can be seen in Table 2. Based on the results of the bivariate test, a p-value of 0.000 was obtained, which means that H0 is rejected because $p < 0.05$, meaning that there is a significant relationship between the frequency of fast food consumption and tonsillitis in children. Based on Table 2, the OR value of 23.1 means that children who frequently consume fast food are 23.1 times more likely to experience tonsillitis than children who rarely consume fast food. These results indicate that frequent consumption of fast food may be associated with an increased risk of tonsillitis.

Table 2.
Bivariate Analysis of Fast Food Consumption Frequency and Tonsillitis

Fast Food Consumption Frequency	Tonsillitis				p value	OR (CI 95%)
	Yes		No			
	f	%	f	%		
Frequent	21	80,8	4	15,4	0,000	23,1 (6,84-151,53)
Rare	5	19,2	22	84,6		
Total	26	100	26	100		

Table 3 shows the results of the bivariate analysis of tonsillitis incidence and fast food consumption frequency. The results show that 73.1% of children who frequently consume fast food experience tonsillitis, which is higher than the 26.9% of children who do not consume fast food and do not experience tonsillitis. Among children with low frequency of fast food consumption who did not experience tonsillitis, the rate was 84.6%, which was higher than that among children with high frequency of fast food consumption who experienced tonsillitis, which was 15.4%. The relationship between the frequency of fast food consumption and tonsillitis was analysed using the chi-square test, the results of which can be seen in Table 3. Based on the results of the bivariate test, a p-value of 0.000 was obtained, which means that H0 is rejected because $p < 0.05$, meaning that there is a significant relationship between the frequency of fast food consumption and tonsillitis in children. Based on table 3, the OR value is 14.9, which means that children who frequently consume fast food are 14.9 times more likely to experience tonsillitis than children who rarely consume fast food. These results indicate that frequent consumption of fast food may be associated with an increased risk of tonsillitis.

Table 3.
Bivariate Analysis of Fast Beverages Frequency and Tonsillitis

Fast Beverage Consumption Frequency	Tonsilitis				p value	OR (CI 95%)
	Yes		No			
	f	%	f	%		
Frequent	19	73,1	4	15,4	0,000	14,9 (3,8-58,9)
Rare	7	26,9	22	84,6		
Total	26	100	26	100		

DISCUSSION

This study involved 52 research subjects. Based on the results of univariate analysis, the gender characteristics of the respondents showed an almost balanced distribution, with 27 males (51.9%) and 25 females (48.1%). This difference can be explained by differences in immune responses based on gender. The hormone oestrogen in women is known to increase the synthesis of IgG and IgA, which play an important role in enhancing the strength of the humoral and cellular immune systems. Conversely, males do not have oestrogen hormones, making them potentially more susceptible to infections, including tonsillitis. However, no studies have indicated that a particular gender affects the incidence of tonsillitis. This may be due to the influence of population in a population, namely the dominance of a particular gender in the incidence of chronic tonsillitis, both in males and females (Anderson and Paterek, 2023).

This study is in line with research conducted by Harrypana and Eka Putra (2019) at SD 1 Ubung Denpasar and SD 2 Abang Karangasem, which found that out of 40 respondents, 55% were male and 45% were female. The same thing was also found by (Triswanti et al., 2023) who conducted research at Abdul Moeloek Lampung Regional General Hospital with the findings that 57.6% of the 33 respondents were male and 42.4% were female. There are differences in the results obtained by Bintang et al (2022) at the ENT Clinic of H. Hanafi Muara Bungo Regional General Hospital from 37 respondents, where 59.4% were female and 40.6% were male (Harrypana and Eka Putra, 2019); (Triswanti et al., 2023); (Bintang et al., 2022).

The characteristics of the research subjects based on the frequency of fast food consumption showed that 25 people (48.1%) often consumed fast food, while 27 people (51.9%) rarely consumed fast food. These results indicate that almost half of the research subjects have a habit of frequently consuming fast food, although more than half tend to consume fast food less frequently. In addition, based on the frequency of fast food consumption, 23 people (44.2%) consumed fast food frequently, while 29 people (55.8%) consumed it infrequently. Based on the results of the frequency distribution of fast food and beverage consumption among the research subjects, most of the children in this study consumed fast food and beverages with a fairly high frequency.

According to consumption behaviour theory, individuals tend to choose foods that are easily accessible and quick to serve, especially among adolescents and children who have busy routines such as school and other activities. In addition, nutritional knowledge also plays a role in determining a person's eating habits. Those who have good knowledge of nutrition tend to be more selective in choosing foods (Harahap, 2023; Saleh and Astuti, 2020).

These results are in line with research conducted by Ariyana and Asthiningsih (2020) on students at Samarinda State High School, which found that of 311 respondents, 59.5% had a habit of consuming fast food infrequently, while the other 40.5% had a habit of consuming fast food frequently. However, there is a difference in the findings of Muhammad's (2022) study at the Batoh Health Centre in Banda Aceh City, with a total of 88 respondents, 52.3% of whom consumed fast food more often, while the other 47.4% consumed it less often. Fast food consumption is often influenced by factors such as accessibility, taste preferences, and busy lifestyles.

From the results of this study, it can be concluded that there is a balance in the consumption habits of fast food and beverages among the research subjects. Although nearly half of the subjects frequently consume fast food and beverages, more than half tend not to do so regularly.

The bivariate analysis results in Table 6 show that the frequency of fast food consumption and the incidence of tonsillitis show a significant relationship with a p-value of 0.000. Among subjects who frequently consume fast food, namely 48.1% of the total subjects, 40.4% experienced tonsillitis, while only 7.7% did not experience tonsillitis. On the other hand, among subjects who rarely

consumed fast food, which was 51.9% of the total subjects, only 9.6% of subjects experienced tonsillitis, while 42.3% did not experience tonsillitis.

Based on the total percentage of diagnoses, of the 100% of subjects with tonsillitis, the majority were subjects who frequently consumed fast food (80.8%), while the other 19.6% were subjects who rarely consumed fast food. On the other hand, of the 100% of subjects who were not diagnosed with tonsillitis, the majority were subjects who rarely consumed fast food (84.6%), while the remaining 15.4% were subjects who consumed fast food frequently. In this study, the types of fast food most frequently consumed by the subjects were fried chicken thighs, followed by fried nuggets, fried noodles, noodle soup, sausages, fried rice, meatballs, and so on.

Consuming fast food that contains a lot of flavour enhancers such as monosodium glutamate (MSG), preservatives, and oil can indirectly cause tonsil infections. Fast food is one of the exogenous factors that can affect the immune system. The pathogenesis of MSG-induced disorders is played by glutamate receptors. T lymphocytes express various types of glutamate receptors that function to control immune responses, activation, maturation, and apoptosis or cell death. Endothelial injury can occur due to continuous exposure to MSG and can result in a lack of blood cell and platelet absorption, decreased circulation, and thrombus formation. MSG can cause itching and pain in the throat when consumed in excess and trigger tonsil infections or tonsillitis. In addition to flavoured foods, foods with excessive oil content, when consumed continuously, can cause symptoms of tonsillitis. Oily foods have been shown to cause itching in the throat due to the presence of acrolein, which results from high-temperature heating of the oil and sticks to the throat (Bintang et al., 2022).

In addition, consumption of foods containing preservatives, flavourings, and artificial colourings can trigger oral cavity infections, which in turn can potentially cause inflammation of the palatine tonsils. One preservative that is often used is nitrite, which when exposed to certain conditions such as high temperatures or acidic environments, can react with amines to form nitrosamine compounds. These compounds are known to be potential carcinogens and can damage epithelial cells in the throat and tonsils, which then triggers an inflammatory reaction. Irritation caused by exposure to these preservatives results in increased production of pro-inflammatory cytokines such as IL-1 and TNF- α . Preservatives can also increase blood vessel permeability, worsen swelling and redness of the tonsils, and create an environment that supports the growth of bacteria such as *Streptococcus pyogenes* and *Staphylococcus aureus*, which can cause secondary infections and worsen inflammation, as described in studies conducted by Putri (2021) and Prasetya et al (2018). These findings confirm that consuming foods containing preservatives and flavour enhancers can increase the incidence of tonsillitis, consistent with previous findings on the adverse effects of unhealthy diets on throat health in children. (Bintang et al., 2022); (Putri, 2021); (Prasetya et al., 2018).

The bivariate analysis results of fast food consumption patterns in this study are in line with research conducted by Barasa et al. (2024), which states that there is a significant relationship ($p=0.02$) between fast food consumption habits and the incidence of tonsillitis. Their study emphasises the importance of diet in oral health and the risk of throat infections in children, focusing on how children's knowledge of fast food can affect the condition of throat infections, one of which is tonsillitis. A diet rich in sugar and simple carbohydrates can increase the risk of tooth decay and oral infections, which in turn can contribute to a high incidence of tonsillitis. Thus, the results of this study reaffirm that the habit of consuming fast food and beverages can contribute to an increase in the incidence of tonsillitis among children (Barasa et al., 2024).

In addition, research conducted by Wahyuni (2017) shows that unhealthy eating patterns contribute to an increase in the incidence of tonsillitis in children in Samarinda. From the results of the Chi-

Square test, a p-value of 0.041 was obtained, indicating a significant relationship between eating habits and tonsillitis symptoms in children. Children who frequently consume risky foods, such as fast food and cold drinks, experience tonsillitis symptoms more often. This confirms that eating behaviour greatly affects children's throat health (Wahyuni, 2017).

The bivariate analysis results in Table 7 show a significant relationship between the frequency of fast food consumption and the incidence of tonsillitis, with a p-value of 0.000. Among subjects who frequently consumed fast food, accounting for 44.2% of the total subjects, 36.5% experienced tonsillitis, while 7.7% did not. Meanwhile, among subjects who rarely consumed fast food drinks, accounting for 55.8% of the total subjects, only 13.5% of subjects experienced tonsillitis, while 42.3% of other subjects did not experience the infection.

Based on the total percentage of diagnoses, of the 100% of subjects diagnosed with tonsillitis, the majority were subjects who frequently consumed fast food (73.1%), while the other 26.9% were subjects who rarely consumed fast food. On the other hand, of the 100% of subjects who were not diagnosed with tonsillitis, the majority were subjects who rarely consumed fast food (84.6%), while the other 15.4% of subjects were those who consumed fast food frequently. The types of fast food drinks that were widely consumed by the subjects in this study consisted of ready-to-drink packaged milk, followed by bottled water, ready-to-drink tea, ice cream, and so on.

Excessive consumption of fast food drinks can certainly trigger tonsil infection (tonsillitis). Many fast drinks are served cold, which can stimulate and stretch the epithelial cells in the tonsils, eventually leading to tonsil hypertrophy. Cold drinks also cause vasoconstriction, which narrows the blood vessels and reduces the number of white blood cells, thereby burdening the immune system of the tonsils (Bintang et al., 2022).

This study shows that the consumption of fast food and beverages containing high levels of sugar, as we have investigated, can affect the incidence of tonsillitis in children. These findings are similar to a study conducted by Hashimi et al. (2022) on a mouse model that examined the effect of consuming water containing 50% sucrose on the colonisation of *Streptococcus pyogenes* (*S. pyogenes*) in the nasopharynx. In that study, mice given water with 50% sucrose experienced an increase in water consumption and a decrease in food consumption compared to the control group. Although there were no significant changes in weight gain or blood glucose levels, the sucrose-consuming group showed a significant increase in bacterial load in the nasopharynx during the first 3 days post-infection, which then became more heterogeneous in subsequent periods (Hashimi et al., 2022).

Research conducted by Hashimi et al. 2022 shows a correlation with this study that consumption of fast food and beverages rich in sugar can create an environment conducive to the growth of bacteria that cause infections, such as *S. pyogenes* in humans. In studies on rats, increased energy consumption due to consumption of water with 50% sucrose did not significantly affect weight gain or blood glucose levels, but it could affect overall body metabolism. This may be related to a decrease in the immune system, as the body expends more energy to metabolise foods high in sugar and may be more susceptible to infections, as seen in the group of rats fed sucrose. In children, continuous consumption of fast food and beverages has the potential to cause similar conditions, which ultimately increase their susceptibility to infections such as tonsillitis (Hashimi et al., 2022).

The results of this study are in line with research conducted by Sari (2014), who found that consumption of cold drinks was associated with the incidence of tonsillitis in children aged 5-6 years in the Bayat Klaten Community Health Centre working area (p value = 0.002). Excessive consumption of fast food drinks can certainly trigger tonsil infections (tonsillitis). Many fast-food beverages are served cold, which can stimulate and stretch the epithelial cells in the tonsils,

eventually leading to tonsil hypertrophy. Cold beverages also cause vasoconstriction, which narrows blood vessels and reduces the number of white blood cells, thereby burdening the immune function of the tonsils (Bintang et al., 2022).

CONCLUSION

This study shows that the frequency of fast food consumption is significantly associated with the incidence of tonsillitis in children aged 5–15 years who were treated at the ENT-KL Polyclinic of Advent Hospital in Bandar Lampung. Children who consume fast food more frequently have a higher risk of developing tonsillitis compared to children who rarely consume fast food. In addition, the frequency of fast food beverage consumption was also found to be significantly associated with the incidence of tonsillitis in children. Frequent consumption of fast food beverages increased the risk of tonsillitis compared to infrequent consumption of fast food beverages in this age group.

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