Jurnal Berkala Epidemiologi
Volume 12 No 3. September 2024. 248 – 254
p-ISSN: 2301-7171; e-ISSN: 2541-092X
DOI: 10.20473/jbe.v12i32024.248 – 254
https://e-journal.unair.ac.id/JBE/index
Email: jbe@fkm.unair.ac.id / jbepid@gmail.com

Jurnal Berkala
EPIDEMIOLOGI
PERIODIC EPIDEMIOLOGY JOURNAL

ORIGINAL ARTICLE

NUTRITIONAL STATUS AND NEW TUBERCULOSIS SUSPECTED INCIDENCE AMONG JUNIOR STUDENTS AT KEPUTIH PUBLIC HEALTH CENTER

Status Gizi dan Kejadian Dugaan Tuberculosis Baru pada Siswa Sekolah Menengah Pertama Puskesmas Keputih Surabaya

Fadel Thoriq Izza Nugrahedi[1], Abdullah Ghanynafi[1], A. A. Arjun Arge Wada[1], Siti Shofiya Novita Sari[2,3], Erni Astutik[4]

[1]Department of Epidemiology, Biostatistics, Population Studies, dan Health Promotion, Faculty of Public Health, Universitas Airlangga, Surabaya, 60115, Indonesia, fadel.thoriq.izza-2020@fkm.unair.ac.id, abdullah.ghanynafi-2020@fkm.unair.ac.id, a.a.arjun.arge.wada-2020@fkm.unair.ac.id
[2]Airlangga Disease Prevention and Research Center – One Health Collaborating Center, Indonesia
[3]Department of Epidemiology, Biostatistics, Population Studies, dan Health Promotion, Faculty of Public Health, Universitas Airlangga, Surabaya, 60115, Indonesia, siti-shofiya-n-s@fkm.unair.ac.id
[4]Department of Epidemiology, Biostatistics, Population Studies, dan Health Promotion, Faculty of Public Health, Universitas Airlangga, Surabaya, 60115, Indonesia, erniastutik@fkm.unair.ac.id
Corresponding Author: Erni Astutik, erniastutik@fkm.unair.ac.id, Department of Epidemiology, Biostatistics, Population Studies, dan Health Promotion, Faculty of Public Health, Universitas Airlangga, Surabaya, 60115, Indonesia

ARTICLE INFO

Article History:
Received, March, 5th, 2024
Revised form, May, 8th, 2024
Accepted, June, 13th, 2024
Published online, September, 15th, 2024

Keywords:
Tuberculosis;
Nutritional Status;
Students;
Suspect;
Lifestyle

Kata Kunci:
Tuberkulosis;
Status Gizi;
Siswa;
Suspek;
Pola Hidup

ABSTRACT

Background: Tuberculosis (TB) is an infectious disease caused by the Mycobacterium tuberculosis. The countries with the third highest TB cases worldwide are India, China, and Indonesia. A decrease in stamina will occur in a person suffering from tuberculosis. **Purpose:** This study was conducted to determine the relationship between nutritional status and suspected new TB cases in junior high school students in the working area of Puskesmas Keputih Surabaya. **Methods:** This study was conducted with a cross-sectional study design in the working area of Puskesmas Keputih in 2023. Secondary data was obtained from Keputih Health Centre in 2023. The research sample used a total sampling population. The association between nutritional status and suspected new TB cases in junior high school students was tested using the chi-square method. **Results:** A chi-square test was conducted on high school students and found no significant association between nutritional status (underweight and average weight) and TB screening or suspected new TB cases (PR = 0.68, p-value = 0.16). In addition, it was also found that there was no significant association between nutritional status (overweight and average weight) and TB screening or suspected new TB cases (PR = 1.01, p-value = 1.00). **Conclusion:** There was no significant association between nutritional status and the incidence of new suspected tuberculosis in junior high school students. This indicates that other risk factors also play an essential role in influencing a person's immune system.

How to Cite: Nugrahedi, F. T. I., Ghanynafi, A., Wada, A. A. A. A., Sari, S. S. N., & Astutik, E. (2024). Nutritional status and new tuberculosis suspected incidence among junior students at Keputih Public Health Center. *Jurnal Berkala Epidemiologi*, *12*(3), 248–254. https://dx.doi.org/10.20473/jbe.v12i32024.248–254

ABSTRAK

Latar Belakang: *Tuberkulosis (TB) merupakan penyakit menular yang disebabkan oleh kuman tuberkulosis (Mycobacterium tuberculosis). Negara dengan kasus TB tertinggi ketiga di dunia adalah India, Tiongkok, dan Indonesia. Penurunan daya tahan tubuh akan terjadi pada seseorang yang menderita tuberkulosis.* ***Tujuan:*** *Penelitian ini bertujuan untuk Mengidentifikasi hubungan status gizi dengan suspek kasus baru TB pada siswa sekolah menengah pertama di wilayah kerja Puskesmas Keputih Surabaya.* ***Metode:*** *Penelitian ini dilakukan dengan desain studi cross-sectional di wilayah kerja Puskesmas Keputih pada tahun 2023. Data sekunder diperoleh dari Puskesmas Keputih pada tahun 2023. Sampel penelitian menggunakan total sampling population. Dilakukan Uji korelasi pada status gizi terhadap suspek kasus baru TB pada siswa sekolah menengah pertama, menggunakan metode chi-square.* ***Hasil:*** *Penelitian yang sudah dilakukan pada siswa SMP dan sudah dilakukannya uji korelasi diitemukan hasil bahwa tidak ada hubungan yang signifikan antara status gizi (berat badan kurang dan normal) dengan skrining TB atau dugaan kasus TB baru (PR = 0,68, p-value = 0,16). Selain itu, didapatkan hasil juga bahwa tidak ada hubungan yang signifikan antara status gizi (kelebihan berat badan dan normal) dengan skrining TB atau dugaan kasus TB baru (PR = 1,01, p-value = 1,00).* ***Simpulan:*** *Dengan demikian, tidak terdapat korelasi yang signifikan antara status gizi dan kejadian dugaan tuberculosis baru pada siswa sekolah menengah pertama. Hal ini mengindikasikan bahwa faktor-faktor risiko lainnya juga berperan penting dalam mempengaruhi imun tubuh pada seseorang.*

INTRODUCTION

According to the WHO, definition of Tuberculosis (TB) is a highly contagious disease caused by Mycobacterium Tuberculosis. TB disease spreads and infects people of all ages, including children. Between 40% and 50% of the population in developing countries suffer from TB, with 500,000 pediatric TB cases per year (1). India has the highest TB burden in the world and nearly 40% of the population being infected with TB (2). The countries with the third highest TB cases worldwide are India, China, and Indonesia. The World Health Organization (WHO) data released on November 7, 2023, still placed Indonesia among the top two countries with the highest Tuberculosis (TB) cases worldwide. Based on Indonesian Ministry of Health data records, there were TB cases in 2023. There were 658,543 cases on November 3, 2023. Surabaya has the highest number of TB cases in East Java. The total number reached 10,741 cases in 2022. By March 2023, 1,691 TB cases had been identified against a case-finding target of 11,86 cases. The possibility of dangerous complications may cause death, and it occurs if treatment is not given immediately. Around 93 thousand people died of tuberculosis in Indonesia (3).

In terms of TB, this infectious disease is particularly threatening as it kills 1.2 million people every year worldwide and 93,000 annually in Indonesia alone. Therefore, to this day, efforts to tackle TB continue. Countries worldwide realize they cannot tackle these infectious diseases alone, so concerted state and non-state efforts must be made under the SDGs agenda and beyond. The UN established the Global Fund (GF) independent funding mechanism to raise global funds to fight AIDS, tuberculosis, and malaria. The GF is one form of cooperation in the health sector to tackle TB (4). Most tuberculosis germs usually infect the lung parenchyma and cause pulmonary tuberculosis. However, these bacteria can also infect the lymph nodes, bones, pleura, and other extra-pulmonary organs (5).

TB is a contagious infectious disease caused by the gram-positive bacterium, Mycobacterium tuberculosis, which is an obligate aerobe. The

disease usually affects the human lung organ (6). The disease is transmitted via airborne droplet nuclei from person to person and most commonly affects the lungs (7). A decrease in body immunity will occur in tuberculosis sufferers (8). Immunity is the body's ability to help function effectively for extended periods without becoming overly fatigued (9). Nutritional status is one of the factors influencing an individual's immune system and the health condition resulting from the balance between nutritional intake and bodily needs (10).

Diet is an attempt to regulate the amount and type of food consumed with an overview of information that includes maintaining health, nutritional status, and preventing or helping cure disease. Nutrient consumption is a direct factor affecting nutritional status (11). When entering adolescence, students are more concerned with physical appearance and are prone to nutritional problems. Poor food intake is a common cause of nutritional problems in adolescents. A balance between incoming nutrients is needed for optimal health (12). Adolescents need more nutrients than children, but they tend to have the wrong consumption patterns, which means they consume less than they need (13). Adolescents are vulnerable to physical changes and unhealthy eating patterns. This can be seen in adolescent behaviors that adolescents consider suitable, such as strict diets, skipping breakfast, and holding back hunger (14).

Knowledge about nutrition in adolescence is essential for adolescent growth and development. This is called balanced nutrition in Indonesia. "Balanced nutrition" is a term that refers to a variety of foods that contain various nutrients needed by the body in both quantity and quality. In addition to economic factors, the nutritional status of adolescents is also influenced by culture, diet, healthy and unhealthy food consumption habits and physical activity habits. A series of actions taken by adolescents to maintain nutritional balance, such as the consumption of carbohydrates, fats, proteins, vitamins, and minerals, is known as balanced nutrition habit behavior, which is used to determine the energy adequacy of each adolescent, average weight and height and good nutritional status can be considered to meet the increasing energy and protein needs during adolescence (15).

Nutritional status is the process by which the body commonly uses food consumed through digestion, absorption, transport, storage, metabolism, and excretion of unused substances to maintain life, growth, and normal function of the body's organs and produce energy. If the body's nutrient intake is not balanced, the body's metabolism may change to gluconeogenesis, which is the process of protein breakdown, to fulfill energy needs. In addition, protein deficiency will inhibit the formation of enzymes, immunoglobulins, and albumin. People are at risk of disease because their immune system is decreased, and their humoral and cellular immune response systems respond slowly to antigens. A person who is emaciated or has cachexia can be caused by excessive protein breakdown, leading to a decrease in protein reserves that can be seen in their muscles. The above description shows that malnutrition impacts body strength, stamina, endurance, and immune response to disease (16).

Meanwhile, indicators of nutritional status are visible signs that describe an individual's nutritional level. Therefore, researchers aim to investigate the relationship between nutritional status and suspected TB cases among junior high school students in the service area of Keputih Surabaya Community Health Center.

METHODS

This study employed a cross-sectional study design in junior high schools within the Keputih Surabaya Public Health Center service area in 2023. This research used secondary data from the Keputih Surabaya Public Health Center in 2023, which were data on the number of patients suspected of having TB in a certain period.

The population in this study were junior high school students within the service area of Keputih Surabaya Public Health Center. This study used secondary data obtained from the Keputih Puskesmas Surabaya. The respondents were 428 students from 4 schools in the working area of Keputih Puskesmas.

The variables in this study include nutritional status and TB suspects in junior high school students in the Keputih Puskesmas working area. A person's nutritional status is a condition caused by the balance between the intake of nutrients from food and the body's nutritional needs for metabolism. If a person's nutritional intake meets the body's needs, he will have a good nutritional status. A person can be said to be underweight if BMI <18.5, average weight is 18.5-22.9, and obesity >=23. TB suspects in students can be identified from interviews regarding close contact with TB patients, family history, TB symptoms such as cough and fever for more than 2 weeks; weight does not increase. It does not decrease for 2

consecutive months; there is a lump in the neck behind the ear, sweating at night, and the living environment.

Correlation testing on nutritional status with TB cases among junior high school students, using the chi-square method. It is considered to have a significant correlation if p<0.05. The measurement of the association is determined using PR (Prevalence Ratio), where the more significant the PR value, the stronger the relationship between the two variables. Data was analyzed using SPSS software.

This research has obtained an ethical clearance certificate from the Faculty of Public Health, Universitas Airlangga, with certificate number 218/EA/KEPK/2023.

RESULTS

Table 1 reports that 47.90% of the respondents were male 205 students and 52.10% of the respondents were females 223 students participated in the study.

Table 2 showed that PR (95% CI) = 0.68 (0.42 – 1.11). The chi-square test results indicate a p-value of 0.16, which is greater than 0.05. This means that there was no significant relationship between nutritional status (underweight and normal) and TB screening or suspected new TB cases. The Confidence Interval is 95%. Table 3 showed that PR (95%CI) = 1.01 (0.48-2.13) and the chi-square test results indicate a p- value of 1.00, which is greater than 0.05. This means that there was no significant relation between nutritional status (overweight and normal) and TB screening or suspected new TB case. The Confidence Interval is 95%.

Table 1
Characteristics of Sex

Sex	n	%
Male	205	47.90%
Female	223	52.10%
Total	428	100%

Table 2
The Comparison of Malnutrition Status and Normal Nutritional Status

Nutritional status		Suspected TB	Not suspected TB	Total
Underweight	n	26	188	214
	%	12.15	87.85	100.00
Normal	n	31	144	175
	%	17.71	82.29	100.00
PR (95%CI)		0.68 = (0.42 – 1.11)		
p-value		0.16		

Table 3
The Comparison of Overweight and Normal Nutritional Status

Nutritional status		Suspected TB	Not suspected TB	Total
Overweight	n	7	32	39
	%	17.95	82.05	100.00
Normal	n	31	144	175
	%	17.71	82.29	100.00
PR (95%CI)		1.01 (0.48-2.13)		
p-value		1.00		

DISCUSSION

Nutritional status is a measure used to assess a person's state of health regarding the intake and utilization of nutrients in the body. It is critical because it is related to productivity, intelligence, and creativity and can certainly affect the quality of human resources (HR). A person's nutritional status determines the problems that occur, which can become complex problems if not addressed immediately. Adolescents are the age group most vulnerable to nutritional problems (17).

The nutritional status of adolescents is influenced by the physical activities performed by adolescents today. Adolescents usually sit and do light activities such as writing during school study time (three to eight hours), playing on cell phones, watching TV, and sleeping (three to seven hours). Diet is an additional component that affects adolescent health. The diet of adolescents will determine the amount of nutrients required for their growth and development. A daily meal consisting of three food groups should be consumed three times a day under normal conditions to maintain nutrient balance. According to data from the Global Health Survey in 2015, adolescents' diets include frequent consumption of foods containing flavorings (75.70%), not always eating breakfast (65.20%), and mostly eating fewer vegetables and fruits (93.60%) (18).

Human food consumption behavior is influenced by adolescent life behavior. Psychological, physiological, social, knowledge, and behavioral changes in nutrition will lead to nutritional problems in adolescents (19). In terms of body size, adolescents of the same age often differ because they consume different amounts of energy each time. Energy consumption significantly affects body growth, and nutritional deficiencies can cause impairments in all adolescent functions (20). Unlike children's weight, adult height can no longer be normalized, which can increase or change quickly. This is because a person's height growth tends to stabilize after entering adulthood or after puberty has ended due to factors such as Epiphyseal Bone Closure and growth hormones, thyroid hormones, and sex hormones (testosterone and estrogen) that stabilize in adulthood and no longer drive height growth. Optimal height growth is still possible in children under five but less likely in school-aged children and adolescents (21).

The results showed no significant relationship between nutritional status and screening of suspected new TB cases in the Keputih Public Health Center area in 2023. These results are consistent with research conducted by Nisak et al (22) which supports the opinion that there is no statistically significant relationship between nutritional status and TB incidence. There is no significant relationship between nutritional status and TB incidence. Other factors, such as BCG immunization status, environmental exposure (e.g., living in a household with a family member who has TB), environmental hygiene, and housing density, are more likely to influence TB incidence than nutritional status (23).

However, the results of this study are not in line with research conducted by Girsang et al (24), which states that there is a relationship between nutritional status and TB incidence; this can be seen from the OR value > 1, the confidence interval does not include the number 1 and the p-value <0.05, so statistically in this study there is a strong relationship between nutritional status and TB incidence. Those who have poor nutritional status and those who have poor nutritional status are equally likely to suffer from TB, so there is a reciprocal relationship between nutritional status and TB incidence. Research conducted by Ernirita et al (25) also showed that nutritional status has a relationship with the incidence of TB, the results of the study obtained a p-value of 0.01 and an OR value of 8.23 (2.48-27.31) which indicates a relationship between nutritional status and the incidence of TB. Children with poor nutritional status are at 8.23 times the risk of developing TB because good nutritional status will increase the immune system and stamina of children so that they are less likely to suffer from TB. Research conducted by Rahmah et al (26) also showed a significant relationship between nutritional status and the incidence of pulmonary TB. The analysis results obtained the p-value = 0.000 with an OR value = 6.16. This type of research is descriptive-analytic. This study was conducted in the Kedaton Health Centre Bandar Lampung work area from September 2022 to March 2023. The samples used for the study were children or individuals who were willing to participate in the study. Poor or insufficient nutritional status can increase the risk of developing tuberculosis. Conversely, tuberculosis can cause poor nutritional status due to the disease process affecting the immune system (23). Tuberculosis and nutritional status are closely related; on the contrary, tuberculosis can cause malnutrition and weaken the immune system, making it susceptible to disease (27).

Policy Implication

Concerted efforts are needed to improve health or increase health monitoring programs in schools, especially those focusing on nutritional status and early detection of TB cases among children in junior high schools—paying more attention to other contributing factors that influence nutritional status and early detection of TB cases, such as Environment and Living Conditions, raising public awareness about TB and the importance of early

detection through counseling and campaigns, and providing training to health workers in schools and health centers on early detection and management of TB in children. This idea would then help develop clear protocols for detecting, reporting, and managing suspected TB cases in school settings. This involves local health workers and health centers. The policy can encourage evaluating and improving health information systems to ensure accurate and efficient data collection on nutritional status and TB cases among junior high school students.

Research Limitation

The results of the TB suspect screening have not yet been carried out further diagnosis by the Community Health Center regarding the TB case, so it cannot be ascertained whether the student is positive or negative for TB. However, this research helps increase students' self-awareness regarding TB disease.

CONCLUSION

This study found no association between nutritional status and the incidence of new TB suspects among junior high school students, so there are several important suggestions for future research. First, replication of the study with a more extensive and diverse population may improve the generalizability of the findings. Second, more accurate variables such as tuberculin tests, interferon-gamma release assays (IGRA), blood tests, or sputum examinations could be considered for TB suspects. Third, a more detailed evaluation of nutritional status, including specific nutritional deficiencies, may provide greater insight. Finally, studying the role of nutritional interventions in reducing TB risk in high-risk populations could have significant practical implications. By exploring these suggestions, future research may provide a more comprehensive understanding of the potential relationship between nutritional status and tuberculosis in adolescents.

CONFLICT OF INTEREST

There are no conflicts of interest in this paper.

AUTHOR CONTRIBUTIONS

FTIN: Conceptualization, methodology, data visualization, analysis, writing–original draft, writing–review, and editing. AG and AAAAW: Conceptualization and methodology SSNS: Manuscript review and Proofreading. EA: Editing, manuscript review and Proofreading, and final approval of this study

ACKNOWLEDGMENTS

We want to thank everyone who helped create this article, especially the supervisors.

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