Turkish Journal of Pediatric Disease

Original Article

Evaluation of awareness and knowledge levels of pediatric residents on tuberculosis

Ömer Güneş[1], Aslınur Özkaya Parlakay[1], Ahmet Yasin Güney[1], Fatih Üçkardeş[2], Saliha Kanık Yüksek[1], Belgin Gülhan

[1]Department of Pediatric Infectious Diseases, Ankara Bilkent City Hospital, Ankara, Türkiye, [2]Department of Biostatistics and Medical Informatics, Adıyaman University, Adıyaman, Türkiye

Corresponding Author: **Ömer Güneş** e-mail: dromergunes@gmail.com

Received : 23.12.2025, Accepted : 31.03.2026 DOI: 10.12956/TJPD.2026.1287

ABSTRACT

Objective: Data on pediatric residents' awareness and knowledge of childhood tuberculosis in Türkiye are limited. This study aimed to evaluate the awareness and knowledge levels of pediatric residents regarding childhood tuberculosis at Ankara City Hospital.

Materials and Methods: This cross-sectional study was conducted between August and September 2023 among pediatric residents at Ankara Bilkent City Hospital. A 15-item online multiple-choice questionnaire assessed knowledge related to epidemiology and prevention, clinical–laboratory–imaging evaluation, treatment, and prophylaxis of childhood tuberculosis. Incomplete or unsubmitted questionnaires were excluded from the analysis.

Results: A total of 172 pediatric residents participated in the study, of whom 72.7% were female. Eighty-six residents (50.0%) were classified as junior and 86 (50.0%) as senior. Senior residents demonstrated significantly higher correct response rates than junior residents regarding incorrect statements about BCG vaccination (53.5% vs. 38.4%, p=0.047), definition of close contact in tuberculosis (91.9% vs. 79.1% p=0.017), interpretation of abnormal PPD values (93.0% vs. 76.7%, p=0.003), microbiological diagnostic methods (80.2% vs. 58.1%, p=0.002), and typical radiographic findings in childhood pulmonary tuberculosis (89.5% vs. 74.4%, p=0.010) (p<0.050 for all). Correct response rates increased progressively with advancing residency year (X^2 : 37.295, df:1, p<0.001).

Conclusion: Senior pediatric residents demonstrated significantly higher knowledge levels regarding childhood tuberculosis compared with junior residents. These findings highlight the importance of structured and continuous educational programs beginning early in residency and reinforced throughout training. Given the endemic nature of tuberculosis in Türkiye, targeted and regularly updated educational interventions may improve early recognition, diagnostic accuracy, appropriate treatment, and overall clinical outcomes. Future multicenter studies incorporating key domains of tuberculosis knowledge—epidemiology and prevention, clinical–laboratory–imaging evaluation, and treatment and prophylaxis—may help identify regional gaps and guide standardized educational strategies.

Keywords: Attitudes, child, internship and residency, health knowledge, practice, surveys and questionnaires, tuberculosis

Introduction

Childhood tuberculosis (TB) remains an important global public health problem due to diagnostic challenges, limited bacteriological confirmation, and the relatively higher frequency of extrapulmonary involvement in young children (1–4). Children under five years of age are at increased risk for rapid progression to severe disease, including miliary TB and TB meningitis, and therefore pediatric cases serve as indicators of recent transmission within the community (1,2). Transmission in children most commonly occurs from an infectious adult household contact, making accurate identification of close contacts, appropriate contact evaluation, and risk-based management essential components of TB control (1). Diagnosis relies on the combined assessment of clinical findings, radiological features, and evidence of infection. The tuberculin skin test is performed using purified protein derivative (PPD), and

© 2026 Author(s). Published by Ankara Bilkent City Hospital, Children's Hospital. This is an open-access article distributed under the Creative Commons Attribution License (CC BY), which permits unrestricted use, distribution, and reproduction in any medium or format, provided the original work is properly cited.

throughout this manuscript, the term TST refers to PPD-based testing. Interpretation of these tests varies according to age, Bacillus Calmette–Guérin (BCG) vaccination status, and immunosuppression (1,2). Prolonged cough, unexplained fever, and weight loss or growth failure are the most common clinical manifestations, while unilateral hilar or mediastinal lymphadenopathy with ipsilateral parenchymal consolidation is the typical radiological finding (1,2). Given the paucibacillary nature of childhood TB, current guidelines recommend the combined use of smear microscopy, culture, and molecular tests such as Xpert MTB/RIF Ultra (1,2). Treatment is based on a standard six-month regimen, and successful outcomes depend on regular follow-up, early recognition of adverse drug effects, and appropriate preventive therapy for children with latent tuberculosis infection (LTBI) (1,2). Accurate knowledge of prophylaxis indications and risk-based management strategies is therefore essential in pediatric clinical practice. Despite the clinical importance of childhood TB, studies evaluating pediatric residents' knowledge and awareness remain scarce, with existing data largely derived from non-pediatric trainees or physicians from other specialties (5–8). This highlights a significant gap in the literature. The present study aimed to address this gap by comprehensively assessing pediatric residents' knowledge and awareness of childhood tuberculosis, including epidemiology, prevention, diagnosis, and treatment–prophylaxis practices, and to explore potential differences according to residency year and clinical exposure.

Materials and Methods

Study design and participants

This descriptive, cross-sectional study was carried out among pediatric residents with 0–48 months of training at Ankara Bilkent City Hospital, 172 pediatric residents in Türkiye during August–September 2023. The institution name has been anonymized to preserve the integrity of the double-blind peer-review process. Only residents who participated voluntarily and completed the entire questionnaire were included in the study. Those who declined participation or provided incomplete survey forms were excluded from the final analysis. All eligible residents during the study period were invited to participate, and no sampling method was applied.

Questionnaire

A 15-item, multiple-choice questionnaire was developed and distributed via Google Forms. The questionnaire consisted of three demographic items (age, year of residency, and type of institution) and 12 knowledge-based questions. The knowledge-based items assessed pediatric tuberculosis–related domains, including clinical manifestations, diagnostic approaches (laboratory and imaging findings), treatment protocols, and prophylactic practices. The questionnaire was developed by the authors based on current national and international tuberculosis guidelines and a comprehensive literature review. Content validity was evaluated by two pediatric infectious diseases specialists. The demographic items were not included in the knowledge score analysis; therefore, knowledge assessment tables begin with Question 4.

Procedures

Following administrative approval, the survey link was disseminated through official departmental communication channels and closed social media platforms used by pediatric residents. All eligible residents were invited to participate during the study period, and participation was entirely voluntary. Prior to accessing the questionnaire, participants were presented with an information and consent page outlining the study objectives, the voluntary nature of participation, and assurances of confidentiality. No personal identifiers were collected, and responses were recorded anonymously. Electronic informed consent was obtained before enrollment. To minimize response bias, correct answers were disclosed only after participants completed and submitted the questionnaire. Participants were allowed to complete the survey only once, and duplicate responses were restricted by the survey platform settings.

Classification of pediatric resident seniority

At the participating tertiary care university hospital, pediatric residents undergo a formal seniority examination at the 24th month of their training. Individuals who successfully pass this assessment are classified as senior pediatric residents. Accordingly, first- and second-year residents (0–24 months of training) are categorized as juniors, whereas those in their third and fourth years of training (25–48 months) are regarded as seniors. This classification was used to explore potential differences in tuberculosis-related knowledge according to clinical exposure and progression within the residency program.

Pediatric resident rotation framework

At the participating tertiary care university hospital, pediatric residents rotate systematically through both inpatient and outpatient services of the Pediatric Infectious Diseases Unit. Each of the two inpatient wards is staffed monthly by two senior and two junior residents. Additionally, two senior residents and one to two junior residents are assigned each month to the Pediatric Infectious Diseases outpatient clinics. This structured rotation model provides consistent exposure to the evaluation, management, and follow-up of pediatric infectious diseases—including tuberculosis—throughout the residency training period. The presence of both junior and senior residents within the same rotation framework enables progressive responsibility and cumulative clinical experience, which may influence tuberculosis-related knowledge and practical competence.

Statistical analysis

All statistical analyses were conducted using IBM SPSS Statistics for Windows, version 20.0 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized as frequencies and percentages, and comparisons were performed using the chi-square test or Fisher's exact test when appropriate. Trends between residency year and correct answer rates were assessed using the linear-by-linear association test. For all analyses, two-tailed tests were applied, and a p value of < 0.050 was considered statistically significant. To ensure 80% statistical power at a 95% confidence level—assuming an anticipated response rate of 80%—the required sample

size was calculated as 170 participants. The sample size calculation was performed using standard formulas for cross-sectional studies evaluating proportions.

Results

A total of 172 pediatric residents completed the survey, meeting the predetermined sample size requirement. Of the participants, 72.7% were female. Half of the respondents were junior residents (n = 86; 1st year: 42; 2nd year: 44), while the remaining half were senior residents (n = 86; 3rd year: 43, 4th year: 43). The distribution of participants across residency years was balanced, allowing for comparative analysis between junior and senior groups.

Responses to the survey questions related to epidemiology and prevention of tuberculosis in children

The knowledge levels of pediatric residents regarding epidemiology and prevention of childhood tuberculosis are presented in Table I. Senior residents demonstrated higher correct response rates than junior residents for questions related to BCG vaccination and the definition of close contact. For the item assessing identification of the incorrect statement about the BCG vaccine, 38.4% of junior residents answered correctly compared with 53.5% of senior residents (p=0.047). Similarly, in the question evaluating the definition of close contact with an infectious tuberculosis case, 79.1% of junior residents responded correctly versus 91.9% of senior residents (p=0.017). For the question assessing the most common source of tuberculosis transmission in children, correct responses were 89.5% among junior residents and 94.2% among senior residents; this difference was not statistically significant (p=0.265). Overall, statistically significant differences between junior and senior residents were observed in items related to BCG vaccination and close contact definition, whereas no significant difference was found for knowledge of the primary transmission source.

Responses to questions on clinical-laboratory-imaging findings

The responses of pediatric residents to clinical, laboratory, and imaging-based questions regarding childhood tuberculosis are presented in Table I. Across most items, senior residents demonstrated higher correct response rates than junior residents. For the question assessing abnormal thresholds in TST interpretation, 76.7% of junior residents answered correctly compared with 93.0% of senior residents

Table I: Comparison of the correct response rates of pediatric residents according to seniority status to the survey questions

	Total*	Junior*	Senior*	p†
Total number of participants	172	86	86	-
Epidemiology and prevention	79 (45.9)	33 (38.4)	46 (53.5)	0.047
Question 4: Which of the following statements about the BCG vaccine is incorrect?	147 (85.5)	68 (79.1)	79 (91.9)	0.017
Question 5: Screening is required for individuals who have been in contact with a contagious tuberculosis patient. Which of the following does not meet the definition of close contact?	158 (91.9)	77 (89.5)	81 (94.2)	0.265
Question 6: From which source is tuberculosis most commonly transmitted to children?	146 (84.9)	66 (76.7)	80 (93.0)	0.003
Clinical, laboratory, and imaging findings	141 (82.0)	66 (76.7)	75 (87.2)	0.074
Question 7: Which of the following represents abnormal values in the interpretation of the TST?	156 (90.7)	74 (86.0)	82 (95.3)	0.036
Question 8: Which of the following corresponds to the definition of latent tuberculosis infection?	72 (41.9)	30 (34.9)	42 (48.8)	0.064
Question 9: Which of the following corresponds to the definition of tuberculosis disease?	119 (69.2)	50 (58.1)	69 (80.2)	0.002
Question 10: Which of the following is not one of the most common symptoms of pulmonary tuberculosis in children?	141 (82.0)	64 (74.4)	77 (89.5)	0.010
Question 11: In microbiological diagnosis of tuberculosis, which of the following tests must be performed on specimens such as sputum, gastric aspirates, tissue samples, cerebrospinal fluid, urine, pleural fluid, ascites, or synovial fluid?				
Question 12:What is the most common radiographic finding in childhood pulmonary tuberculosis?				
Treatment and prophylaxis	30 (17.4)	9 (10.5)	21 (24.4)	0.016
Question 13: Which of the following statements regarding tuberculosis prophylaxis is incorrect?	142 (82.6)	67 (77.9)	75 (87.2)	0.108
Question 14: Which of the following statements regarding childhood tuberculosis prophylaxis is incorrect?	141 (82.0)	67 (77.9)	74 (86.0)	0.165
Question 15: What is the standard traditional 6-month treatment regimen for tuberculosis?	125 (72.7	57 (66.3)	68 (79.1)	0.060
Question 16: In a patient receiving tuberculosis treatment, in which of the following adverse events should treatment not be discontinued?				

**: n(%), †: Chi Squared test was used*

(p=0.003). For the item defining latent tuberculosis infection, correct response rates were 76.7% among junior residents and 87.2% among senior residents; this difference was not statistically significant (p=0.074). In the question evaluating clinical findings of childhood tuberculosis, correct response rates were 86.0% among junior residents and 95.3% among senior residents (p=0.036). For the identification of extrapulmonary involvement sites, 34.9% of junior residents responded correctly compared with 48.8% of senior residents (p=0.064). A statistically significant difference was observed in the question addressing appropriate microbiological diagnostic methods—combining acid-fast bacilli (AFB) staining, culture, and molecular testing—where correct response rates were 58.1% among junior residents and 80.2% among senior residents (p=0.002). Senior residents also demonstrated higher accuracy in recognizing characteristic radiological findings (89.5% vs. 74.4%; p=0.010). Statistically significant differences between groups were observed in TST interpretation, microbiological diagnostic methods, radiological findings, and clinical findings, whereas differences in latent tuberculosis infection definition and extrapulmonary involvement did not reach statistical significance.

Responses to questions on treatment and prophylaxis

The responses of pediatric residents to questions regarding tuberculosis treatment and prophylaxis are presented in Table I. Senior residents demonstrated higher correct response rates than junior residents across all items; however, a statistically significant difference was observed for only one question. For the item assessing identification of an incorrect statement regarding tuberculosis prophylaxis, the correct response rate was 10.5% among junior residents and 24.4% among senior residents (p=0.016). For the second question related to childhood tuberculosis prophylaxis, correct response rates were 77.9% among junior residents and 87.2% among senior residents; this difference was not statistically significant (p=0.108). In the question evaluating knowledge of the conventional six-month tuberculosis treatment regimen, correct response rates were 77.9% among junior residents and 86.0% among senior residents (p=0.165). Regarding the question on which adverse effect during tuberculosis treatment does not require treatment discontinuation, correct response rates were 66.3% among junior residents and 79.1% among senior residents (p=0.060). A statistically significant difference between junior and senior residents was observed only for the item concerning identification of an incorrect statement about tuberculosis prophylaxis.

Trend by residency year

Figure 1 illustrates the correct response rates of pediatric residents to questions related to clinical findings, diagnostic evaluation, treatment, and prophylaxis of tuberculosis, stratified by seniority level. Senior residents achieved higher correct response rates than junior residents across all question categories. The differences were most pronounced in items related to diagnostic evaluation, including TST interpretation, microbiological diagnostic methods, and recognition of radiological findings. Similar patterns were observed in treatment and prophylaxis items. Figure 1 presents the distribution of correct response rates according

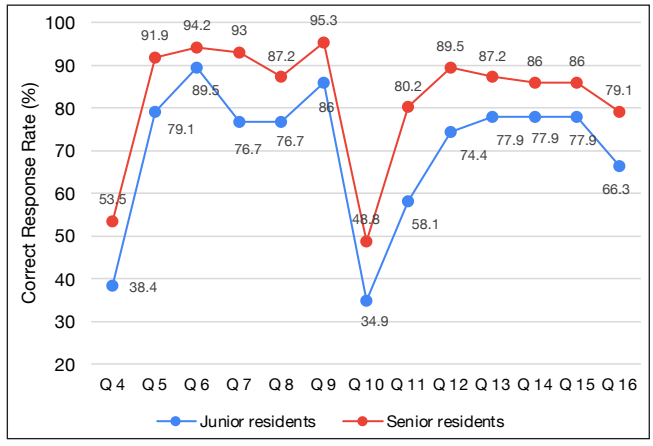


Figure 1: Comparison of correct response rates between junior and senior pediatric residents across survey questions.

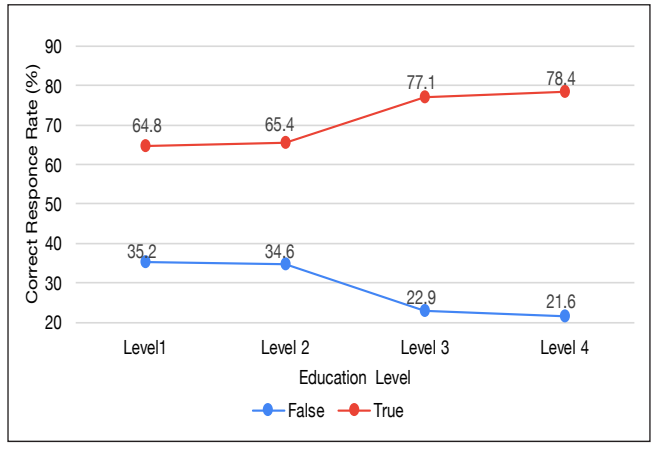


Figure 2: Linear-by-linear relationship between postgraduate year of pediatric residency and response accuracy.

to residency seniority without adjustment for additional variables.

Figure 2 demonstrates the relationship between postgraduate year of training and rates of correct and incorrect responses. According to the linear-by-linear association analysis, correct response rates were 64.8% and 65.4% among first- and second-year residents, respectively, increasing to 77.1% in third-year residents and 78.4% in fourth-year residents (p<0.001). Correspondingly, incorrect response rates decreased with advancing year of training. The linear-by-linear association test confirmed a statistically significant upward trend in correct response rates across residency years.

Discussion

This study provides a comprehensive evaluation of pediatric residents' knowledge and awareness regarding childhood tuberculosis across the domains of epidemiology and prevention, clinical–laboratory–imaging assessment, and treatment–prophylaxis practices. The findings reveal a consistent increase in correct response rates with advancing residency year, with senior residents outperforming junior residents in most knowledge domains. The differences were

particularly evident in areas requiring clinical judgment, such as interpretation of TST results, selection of appropriate microbiological diagnostic methods, and recognition of radiological findings. These results suggest that progressive clinical exposure and cumulative hands-on experience during residency contribute substantially to competency development in tuberculosis management. However, the presence of measurable knowledge gaps—especially among junior residents—indicates that reliance solely on experiential learning may be insufficient. For a disease that remains epidemiologically relevant and diagnostically complex, early incorporation of structured, competency-based tuberculosis education into residency curricula may help ensure more uniform knowledge acquisition across training levels.

Knowledge related to the epidemiology and prevention of childhood tuberculosis has been shown to vary according to level of training and clinical background. In Türkiye, one of the few studies focusing specifically on pediatric residents is that of Kara et al. (5), which identified substantial gaps in knowledge regarding national TB burden, BCG vaccination practices, and contact management; notably, post-BCG TST threshold interpretation was particularly problematic. Similarly, Akaslan Kara et al. (6) reported that even among pediatric infectious diseases physicians, although epidemiological awareness was relatively higher, deficiencies persisted in key preventive domains such as isolation measures and duration of infectiousness. Comparable patterns have been described in non-pediatric physician populations. Chida et al. (8) reported inconsistencies between theoretical knowledge and practical application in TB transmission dynamics and contact evaluation among internal medicine residents. Among primary healthcare providers, Aydemir et al. (9) and Kılıç et al. (10) demonstrated marked variability in knowledge related to transmission chains, contact tracing, and BCG-related preventive strategies. Ngo et al. (11) further highlighted inadequate screening of high-risk contacts and insufficient implementation of preventive strategies in private healthcare settings. Studies conducted among medical interns and students have likewise documented insufficient knowledge in prevention and prophylaxis domains (12–14). Moreover, investigations from low- and middle-income countries consistently report limited understanding of child contact management and preventive therapy indications despite recognition of household transmission as a key source (15–17). Within this broader literature, our findings align with prior evidence demonstrating variability in preventive knowledge across training levels. The higher performance of senior residents suggests that epidemiology- and prevention-related competencies may develop progressively through clinical exposure and cumulative patient contact. However, the persistence of knowledge gaps in foundational preventive topics—particularly BCG-related decision-making and close contact definitions—indicates that experiential learning alone may not ensure uniform competency acquisition. These findings support the integration of structured, curriculum-based tuberculosis education early in pediatric residency training to reinforce core preventive principles.

The existing literature indicates that while the clinical manifestations of childhood tuberculosis are generally well recognized, important gaps persist in key components of diagnostic algorithms, particularly in the interpretation of TST/IGRA results, microbiological confirmation strategies, and radiological evaluation. In the study conducted by Kara et al. among pediatric residents, recognition of clinical symptoms was high; however, interpretation of TST positivity thresholds was notably limited (5). Similarly, Akaslan Kara et al. reported relatively strong knowledge of conventional diagnostic tools such as mycobacterial culture and acid-fast bacilli smear among pediatric infectious diseases physicians, yet deficiencies were observed in more nuanced areas such as IGRA indications, highlighting heterogeneity within diagnostic competencies (6). International findings parallel these observations. Chida et al. (8) demonstrated suboptimal knowledge among internal medicine residents regarding the combined use of nucleic acid amplification tests (NAATs) and integrated diagnostic interpretation. Studies among medical interns and students likewise showed that, although recognition of clinical symptoms was adequate, interpretation of immunological tests and radiological findings represented consistent areas of weakness (12–14). In concordance with this body of evidence, our findings suggest that knowledge related to clinical presentation is comparatively well established across training levels, whereas more complex diagnostic reasoning—such as appropriate integration of microbiological tests and interpretation of radiological features—varies according to residency seniority. The stronger performance observed among senior residents may reflect cumulative clinical exposure and repeated engagement with diagnostic decision-making processes. However, the persistence of variability in algorithm-based diagnostic knowledge underscores the need for structured, guideline-oriented educational reinforcement rather than reliance solely on experiential learning.

Knowledge related to the treatment and prophylaxis of childhood tuberculosis has consistently been identified as a vulnerable domain across different physician groups. In Türkiye, Kara et al.(5) reported that although pediatric residents were generally familiar with first-line prophylactic agents and the standard duration of active tuberculosis treatment, more nuanced aspects —such as prophylaxis indications and management in special clinical scenarios— remained insufficiently understood. Similarly, Akaslan Kara et al. (6) observed relatively high familiarity with conventional treatment regimens among pediatric infectious diseases physicians, but heterogeneous knowledge regarding latent tuberculosis infection (LTBI) prophylaxis and alternative regimens. Comparable patterns were described by Altındiş et al. (7), who noted that while core treatment principles were recognized, gaps persisted in prophylaxis indications and follow-up strategies. International data reinforce these findings. Joshi et al. (18) demonstrated that healthcare workers' knowledge scores for treatment and prophylaxis were lower than those for epidemiology, particularly regarding identification of pediatric populations eligible for LTBI therapy. Studies by Vukugah et al. (16) and Kaumba et al. (17) similarly reported limited accuracy in recognizing preventive therapy indications, with improvement observed primarily among clinicians with greater tuberculosis-related clinical exposure. Among medical interns and students, treatment-related knowledge has also been shown to lag behind recognition

of clinical manifestations (19). In Indonesia, Main et al. (20) documented substantial deficiencies in understanding treatment duration and prophylaxis strategies among healthcare workers, including physicians. In alignment with this body of evidence, our findings indicate that while familiarity with the conventional six-month treatment regimen is relatively well established, knowledge gaps become more apparent in algorithm-based decision-making areas such as prophylaxis indications, duration of preventive therapy, and interpretation of adverse effects that do not necessitate treatment discontinuation. The comparatively stronger performance of senior residents suggests progressive knowledge acquisition through cumulative clinical exposure; however, the persistence of variability across training levels highlights that experiential learning alone may not be sufficient to ensure consistent competency in preventive decision-making. Given that preventive therapy plays a central role in interrupting transmission and reducing progression to active disease in high-risk pediatric populations, deficiencies in prophylaxis-related knowledge carry important public health implications. These findings support the need for structured, guideline-based, and case-oriented educational interventions—implemented early and reinforced longitudinally throughout residency—to standardize treatment–prophylaxis competencies in pediatric training programs.

Progression through residency is generally associated with increasing clinical responsibility and cumulative patient exposure, factors that may influence tuberculosis-related knowledge acquisition. The literature suggests that although both theoretical understanding and clinical competence tend to improve over time, such gains often occur through experiential learning rather than through formally structured curricula. Chida et al. (8) demonstrated that diagnostic knowledge among internal medicine residents improved with seniority, particularly in the application of diagnostic algorithms. Similarly, Vukugah et al. (16) reported higher diagnostic and treatment-related knowledge scores among clinicians with longer experience in tuberculosis-focused units. Joshi et al. (18) also observed progressive improvement across training years, while identifying notable deficiencies during the early stages of residency. Consistent with these reports, our findings demonstrate a statistically significant upward trend in correct response rates across residency years. This progressive pattern was particularly evident in domains requiring algorithm-based reasoning, including diagnostic integration, treatment selection, and prophylaxis decision-making. However, the presence of measurable knowledge variability in the early years of training suggests that experiential exposure alone may not ensure uniform competency acquisition. Taken together, these findings highlight the importance of complementing clinical exposure with structured, guideline-oriented educational strategies. Early integration of case-based learning, standardized teaching sessions on contact management and prophylaxis, and periodic reinforcement of diagnostic algorithms may facilitate more consistent knowledge development throughout residency. While seniority-related improvement is evident, systematic curricular design appears essential to minimize early-stage knowledge gaps and promote standardized competency in childhood tuberculosis management.

Limitations

This study has several limitations. First, the sample was drawn from pediatric residents at a single tertiary care institution, which may limit the generalizability of the findings to other training settings. Second, the cross-sectional design precludes assessment of causality between clinical exposure and knowledge acquisition. Additionally, the use of an online questionnaire introduces the possibility that respondents may have accessed external resources while completing the survey, potentially inflating correct response rates. Furthermore, knowledge was assessed using a structured questionnaire rather than direct observation of clinical practice; therefore, actual decision-making behaviors in real clinical settings may differ from self-reported knowledge levels. Despite these limitations, the study provides a focused evaluation of tuberculosis-related knowledge across different stages of pediatric residency training and offers insight into areas requiring targeted educational reinforcement.

Conclusion

In conclusion, this study demonstrates a clear association between residency seniority and tuberculosis-related knowledge among pediatric residents. Higher levels of competency were observed in senior trainees, particularly in domains requiring integrated diagnostic reasoning and prophylaxis decision-making. The progressive pattern across training years suggests that cumulative clinical exposure contributes to knowledge development; however, variability in early training stages indicates that experiential learning alone may not ensure standardized competency. These findings underscore the importance of incorporating structured, competency-based tuberculosis education into pediatric residency curricula from the early phases of training. In the context of Türkiye's ongoing tuberculosis burden and the inherent diagnostic complexity of pediatric cases, systematic reinforcement of guideline-based diagnostic and prophylaxis algorithms may support earlier recognition, more accurate clinical decision-making, and improved patient care outcomes. Future multicenter studies with larger and more diverse training settings are needed to validate these findings and to inform national strategies for strengthening pediatric tuberculosis education.

Ethics committee approval

This study was conducted in accordance with the Helsinki Declaration Principles. The study was approved by Ankara Bilkent City Hospital (16.08.2023, reference number: E2-23-4863).

Contribution of the authors

Concept: ÖG, AÖP; Design: ÖG, AÖP; Data Collection or Processing: AYG, SKY, BG; Analysis or Interpretation: FÜ, AYG; Database and Informatics Support: FÜ, AYG; Literature Search: ÖG, AYG, SKY, BG; Writing – Original Draft: ÖG, AÖP, AYG; Writing – Review & Editing: ÖG, AÖP, AYG, FÜ, BG, SKY

Source of funding

The authors declare the study received no funding.

Conflict of interest

The authors declare that there is no conflict of interest.

References

1. T.C. Sağlık Bakanlığı Halk Sağlığı Genel Müdürlüğü. Tüberküloz Tanı ve Tedavi Rehberi. 2. Baskı. Ankara: T.C. Sağlık Bakanlığı; 2019. ISBN: 978-975-590-717-8.
2. American Academy of Pediatrics. Tuberculosis. In: Kimberlin DW, Banerjee R, Barnett ED, Lynfield R, Sawyer MH, editors. Red Book: 2024–2027 Report of the Committee on Infectious Diseases. 33rd ed. Itasca (IL): American Academy of Pediatrics; 2024. p. 888–920.
3. Maphalle LNF, Michniak-Kohn BB, Ogunrombi MO, Adeleke OA. Pediatric tuberculosis management: a global challenge or breakthrough? Children (Basel). 2022;9(8):1120. https://doi.org/10.3390/children9081120.
4. WHO operational handbook on tuberculosis. Module 5: management of tuberculosis in children and adolescents. Geneva: World Health Organization; 2022. https://www.who.int/publications/i/item/9789240046832 (Accessed on May 23, 2023).
5. Kara A, Doğar Ö, Kanık Yüksek S, Apa H, Bayram N, Güneş T, et al. The evaluation of awareness level and knowledge about tuberculosis among pediatric residents. J Behcet Uz Child Hosp. 2015;5(1):48–53. https://doi.org/10.5222/buchd.2015.048
6. Akaslan-Kara A, Arıkan K, Böncüoğlu E, Kıymet E, Şahinkaya Ş, Bayram N, et al. Evaluation of Approaches and Knowledge Levels of Pediatric Infectious Diseases Physicians in Diagnosis and Treatment of Tuberculosis. J Behcet Uz Child Hosp. 2021;11(1):66-72. https://doi.org/10.5222/buchd.2021.25483
7. Altındiş M, Karacaer Z, Kaygusuz S, Aslan FG, Altındiş S. Evaluation of the approaches and knowledge level of tuberculosis diagnosis and treatment of infectious disease research assistants and specialist physicians. Tuberk Toraks. 2017;65(4):301-7. https://doi.org/10.5578/tt.66329.
8. Chida N, Brown C, Mathad J, Carpenter K, Nelson G, Schechter MC, et al. Internal medicine residents' knowledge and practice of pulmonary tuberculosis diagnosis. Open Forum Infect Dis. 2018;5(7):ofy152. https://doi.org/10.1093/ofid/ofy152
9. Aydemir Y. Knowledge Level of Family Physicians about Tuberculosis and their Attitudes and Views Regarding their Willingness to Work at a Tuberculosis Dispensary. Turk Thorac J. 2015;16(4):166-71. https://doi.org/10.5152/ttd.2015.4664.
10. Kılıç E, Akova İ, Hasdemir Ö. Assessment of Tuberculosis-Relation Information Level of Primary Healthcare Providers (Sivas). STED. 2021;30(1):36–42. https://doi.org/10.17942/sted.770287
11. Ngo DM, Doan NB, Tran SN, Hoang LB, Nguyen HB, Nguyen VD. Practice regarding tuberculosis care among physicians at private facilities: a cross-sectional study from Vietnam. PLoS One. 2023;18(4):e0284603. https://doi.org/10.1371/journal.pone.0284603
12. Berg-Johnsen A, Hådem SO, Tamrakar D, Harstad I. A questionnaire of knowledge, attitude and practices on tuberculosis among medical interns in Nepal. J Clin Tuberc Other Mycobact Dis. 2020;20:100173. https://doi.org/10.1016/j.jctube.2020.100173
13. Ancy AV, Thangaraj P, Hemalatha K, Bethubarani M. Effect of an e-learning tool on knowledge of recent Revised National Tuberculosis Control Programme guidelines among Medical Interns. J Educ Health Promot. 2020;9:257. https://doi.org/10.4103/jehp.jehp_744_19.
14. Ou Y, Luo Z, Mou J, Ming H, Wang X, Yan S, Tan A. Knowledge and determinants regarding tuberculosis among medical students in Hunan, China: a cross-sectional study. BMC Public Health. 2018;18(1):730. https://doi.org/10.1186/s12889-018-5636-x.
15. Sima BT, Belachew T, Abebe F. Health care providers' knowledge, attitude and perceived stigma regarding tuberculosis in a pastoralist community in Ethiopia: a cross-sectional study. BMC Health Serv Res. 2019;19(1):19. https://doi.org/10.1186/s12913-018-3815-1.
16. Vukugah TA, Akoku DA, Tchoupa MM, Lambert E. Knowledge, Attitude, and Practice on Pediatric Tuberculosis Management among Healthcare Workers in the Centre Region of Cameroon: A Cross-Sectional Study. J Trop Med. 2022;2022:4482131. https://doi.org/10.1155/2022/4482131.
17. Kaumba PC, Siameka D, Kagujje M, Chungu C, Nyangu S, Sanjase N, et al. Knowledge, attitudes, and practices towards childhood tuberculosis among healthcare workers at two primary health facilities in Lusaka, Zambia. PLoS One. 2024;19(3):e0287876. https://doi.org/10.1371/journal.pone.0287876
18. Joshi B, Font H, Wobudeya E, Nanfuka M, Kobusingye A, Mwanga-Amumpaire J, et al. Knowledge, attitudes and practices on childhood TB among healthcare workers. Int J Tuberc Lung Dis. 2022;26(3):243-51. https://doi.org/10.5588/ijtld.21.0317.
19. Acharya PR, D'Souza M, Sahoo RC. Tuberculosis knowledge and attitude in aspiring doctors and nurses - Is it time for our TB teaching methods to evolve? Indian J Tuberc. 2017;64(1):20-25. https://doi.org/10.1016/j.ijtb.2016.11.003.
20. Main S, Dwihardiani B, Hidayat A, Khodijah S, Greig J, Chan G, et al. Knowledge and attitudes towards TB among healthcare workers in Yogyakarta, Indonesia. Public Health Action. 2022;12(3):133-40. https://doi.org/10.5588/pha.22.0017.