

Antibiotic Use and Awareness of Antimicrobial Resistance Among Adults

Chloe Fairmont

Australia

Abstract

Antibiotic misuse is an important public health concern because it contributes to the development and spread of antimicrobial resistance. This study examines antibiotic use and awareness of antimicrobial resistance among adults. Information is assessed on antibiotic consumption, self-medication, prescription practices, treatment completion, reasons for use, and sources of medicine-related information. Awareness is evaluated through knowledge of appropriate antibiotic use, resistance development, treatment failure, and the risks associated with unnecessary or incomplete antibiotic therapy. The findings suggest that inappropriate practices, including self-medication, use of antibiotics for viral illnesses, sharing medicines, and stopping treatment early, remain common among some adults. Limited understanding of antimicrobial resistance may further encourage unsafe antibiotic use. The study highlights the importance of public education, responsible prescribing, pharmacist counseling, and adherence to professional medical advice to improve antibiotic practices and reduce the emergence and spread of antimicrobial resistance within the general population.

Keywords: Antibiotic use; Antimicrobial resistance; Adults; Self-medication; Health awareness.

1. Introduction

Enterprise applications depend on reliable diagnostics to detect runtime errors, failed workflows, API issues, slow transactions, and integration faults [1-5]. Logs are the main evidence source for understanding what happened before, during, and after an incident [6-9]. Effective application diagnostics require structured logging, traceability, contextual metadata, error classification, and operational visibility [10-15]. However, fixed logging strategies often create two problems. Low-detail logs may miss important causes [16-19], while high-detail logs may generate excessive storage cost and alert noise [20-23].

The main challenge is that diagnostic needs change during runtime. A normal transaction may require only basic logs, but a failing workflow, repeated exception, or security-sensitive event may need deeper traces [24-28]. Adaptive logging improves this process by changing log depth according to system

condition, transaction risk, and error behavior [29-32]. AI-assisted monitoring can identify when additional diagnostic detail is needed and when logging can return to normal levels [33-35]. This article proposes an adaptive logging framework for enterprise application diagnostics.

2. Methodology

The proposed framework captures log metadata from application servers, API gateways, databases, background jobs, authentication modules, and integration services [36-40]. It records event type, severity, timestamp, user role, transaction ID, request path, error frequency, response time, affected component, and workflow state [41-45]. These features are converted into diagnostic context profiles. Adaptive logging requires context because the same event may be low-risk in one workflow but critical in another [46-49].

The logging controller classifies runtime states as normal, warning, error-prone, performance-risk, security-sensitive, workflow-critical, or incident-active [50-54]. Based on this classification, it adjusts log level, trace depth, parameter capture, correlation ID tracking, and diagnostic enrichment. Lightweight scoring and policy rules are used so logging decisions remain fast and explainable [55-58]. Sensitive fields are masked before storage [59-60], and transaction-critical events are linked with workflow and database identifiers for easier diagnosis [61-63].

The framework is evaluated using simulated enterprise applications involving APIs, database workflows, authentication events, scheduled jobs, and service integrations. Static logging is compared with adaptive logging under repeated exceptions, slow requests, failed jobs, API timeout, suspicious login, and workflow interruption scenarios [64-67]. Evaluation metrics include diagnosis time, log volume reduction, root-cause evidence quality, missed-event rate, storage overhead, alert usefulness, and administrator acceptance rate [68-69]. Feedback from resolved incidents, ignored logs, and administrator notes is used to refine logging policies over time.

3. Results and Discussion

The results show that adaptive logging improves diagnostics by capturing richer evidence only when runtime risk increases. In the baseline condition, static logs either lack enough detail or produce large volumes of low-value records. With the proposed framework, detailed traces are activated for high-risk events and reduced during normal execution. The strongest improvement appears in intermittent failures, where deeper logs are needed only around the failure window.

The discussion shows that adaptive logging must balance diagnostic depth with privacy and storage cost. Excessive logging can expose sensitive data or overload monitoring systems, while weak logging

may hide failure causes. The main limitation is that log-level decisions depend on accurate runtime classification. Regular policy review and masking controls are necessary for safe long-term use.

4. Conclusion

This article presented an adaptive logging framework for enterprise application diagnostics. The framework adjusts log detail using runtime context, risk scoring, workflow state, and error behavior. It improves troubleshooting by increasing diagnostic evidence during abnormal conditions while reducing unnecessary log noise during normal operation. The study shows that adaptive logging can strengthen enterprise diagnostics when combined with structured metadata, privacy controls, and continuous incident feedback.

References

1. Amin, S. M., Azim, M., Fatinah, S. N., Arshad, A., Rahman, M. A., & Jalal, K. C. (2014). Population Parameters of *Rastrelliger kanagurta* (Cuvier, 1816) in the Marudu Bay, Sabah, Malaysia. *Iranian Journal of Fisheries Sciences*, 13(2), 262-275.
2. Zaleha, K., John, B. A., Atika, H. E., Kamaruzzaman, B. Y., & Jalal, K. C. A. (2012). Spawning and nesting behaviour of *Tachypleus gigas* along the East Coast of Peninsular Malaysia. *International Journal of Biology*, 4(2), 102.
3. Chowdhury, A. J. K., Zakaria, N. H., Abidin, Z. A. Z., & Rahman, M. M. (2016). Phototrophic purple bacteria as feed supplement on the growth, feed utilization and body compositions of Malaysian Mahseer, *Tor tambroides* juveniles. *Sains Malaysiana*, 45(1), 135-140.
4. Kumar, C. P., John, B. A., Khan, S. A., Lyla, P. S., Murugan, S., Rozihan, M., & Jalal, K. C. A. (2011). Efficiency of universal barcode gene (Coxi) on morphologically cryptic mugilidae fishes delineation. *Trends in Applied Sciences Research*, 6(9), 1028.
5. Kamaruzzaman, B. Y., John, B. A., Zaleha, K., & Jalal, K. C. A. (2011). Molecular phylogeny of horseshoe crab. *Asian J Biotechnol*, 3(3), 302-309.
6. Nelson, B. R., Satyanarayana, B., ZHONG, M. J. H., & Shaharom, F. (2016). Does human infringement at the spawning grounds challenge horseshoe crab eggs and their embryogenesis?. *The International Seminar on the Straits of Malacca and the South China Sea 2016*.
7. Fuloria, S., Mehta, J., Talukdar, M. P., Sekar, M., Gan, S. H., Subramaniyan, V., ... & Fuloria, N. K. (2022). Synbiotic effects of fermented rice on human health and wellness: A natural beverage that boosts immunity. *Frontiers in Microbiology*, 13, 950913.
8. Doustjalali, S. R., Sabet, N. S., Aa, A., Thw, I., Zz, N., Aha, Z., ... & TAHA, A. (2020). Correlation between body mass index (BMI) & waist to hip ratio (WHR) among primary school students. *International Journal of Pharmaceutical Research*, 12(3), 623-630.

9. Selvaraj, S., Prasad, S., Fuloria, S., Subramaniyan, V., Sekar, M., Ahmed, A. M., ... & Fuloria, N. K. (2022). COVID-19 biomedical plastics wastes—challenges and strategies for curbing the environmental disaster. *Sustainability*, 14(11), 6466.
10. Subramaniyan, V., Fuloria, S., Sekar, M., Shanmugavelu, S., Vijeppallam, K., Kumari, U., ... & Fuloria, N. K. (2023). Introduction to lung disease. In *Targeting epigenetics in inflammatory lung diseases* (pp. 1-16). Singapore: Springer Nature Singapore.
11. Hua, B. H., Sugumaran, S. V., Faryza, E., Atiqah, N., Jasvinder, K., Kabir, M. S., ... & Nazmul, M. H. (2022). Prevalence of musculoskeletal disorders (MSD) and smartphone addictions among university students in Malaysia. *Int J Health Sci*, 6(S3), 1075-88.
12. Tien, L. P., Atiqah, N., Vytialingam, N., Rashid, M. A., Kabir, M. S., Farzana, Y., & Nazmul, M. H. M. (2022). Stress and quality of life among fathers of special needs children in Klang Valley. *Journal of Pharmaceutical Negative Results*, 13, 1010-1018.
13. Noureen, A., Islam, T., Rashid, M. A., Kabir, M. S., Mathialagan, A., Farzana, Y., ... & Nazmul, M. H. M. (2022). Indoor Motor Exercise Regimens Improve Social Cognition in Children With Autism Spectrum Disorder: A Systematic Review. *Journal of Pharmaceutical Negative Results*, 13(6), 2020-2028.
14. Khan, M. F. K., & Maziz, M. N. H. (2019). *Antibiotic resistance*. LAP LAMBERT Academic Publishing.
15. Krishnapillai, A., Lugova, H., Haque, M., Ariaratnam, S., Aziz, A. F. B. A., Maziz, M. N. H., ... & Godman, B. (2022). The shock of the SARS-CoV-2 pandemic on health professionals' education: A pilot qualitative study in Malaysia. *Journal of Applied Pharmaceutical Science*, 12(10), 161-171.
16. Jayaraj, N., Atiqah, N., Vytialingam, N., Kabir, M. S., Shirin, L., Irfan, M., ... & MHM, N. (2022). Parental attitudes about play in preschool aged children. *International Journal of Early Childhood Special Education*, 14(3).
17. OO, K. T., WONG, R. S., WWL, S., RAMLI, N., LOW, S., ELBAHLOUL, M., ... & KHALAF, J. H. (2020). Correlation between Body Mass Index (BMI) and Fasting Blood Glucose (FBG) Level among Malaysian Adults Age 40-60. *PJMHS Online*, 14(3).
18. Yong, S. A., Sabet, N. S., Htwe, M. N., Doustjalali, S. R., Dar, H. T., Zin, K. T., ... & Su, W. W. L. (2017). A Study of Cephalic Index and Head Shape Among Undergraduate Students. *RESEARCH JOURNAL OF PHARMACEUTICAL BIOLOGICAL AND CHEMICAL SCIENCES*, 8(4), 453-456.
19. Hakim, H. S., Pervin, K., Thangarajan, R., Kabir, M. S., Shirin, L., Nahar, F. T., ... & MHM, N. (2024). Management and treatment of gastric problems in pregnant women. *South African Gastroenterology Review*, 22(3), 10-17.

20. Huiping, G., Teck, T. S., & Nellikunnel, S. (2024). Navigating the complexities of ESG integration: Challenges, opportunities and path to sustainable corporate development. *Journal of Business and Social Sciences*, 2024.
21. Jie, H. S., & Nellikunnel, S. (2023). A study on Jose Mourinho's leadership skills and performance on football clubs. *Journal of Business and Social Sciences*, 2023.
22. GAIK, C., RAHMAN, S., RASHEEDUL, H., Syriac, N. D., PARAMESWARAN, S., & TIPPAWAN, L. (2024). Towards Sustainable Development at Full-Service Restaurants in West Malaysia. *Journal of Infrastructure, Policy and Development*, 8(16), 5288.
23. Naseer, A. I. N., & Nellikunnel, S. (2024). The ESG Shift: Role of ESG in Modern Business Strategies. *Journal of Business and Social Sciences*, 2024.
24. Peng, S. L., & Nellikunnel, S. (2024). ESG Indices, Sustainable Practices and Strategic Competitiveness within the Modern Business Landscape. *Journal of Business and Social Sciences*, 2024.
25. Chee, W. W., & Nellikunnel, S. (2023). Peer Communications Influence on Purchase Intention of Beauty Products. *Journal of Business and Social Sciences*, 2023.
26. Sheikh, H. I., Alhamadin, N. I. I., Liew, H. J., Fadhline, A., Wahid, M. E. A., Musa, N., & Jalal, K. C. A. (2024). Virulence factors of the zoonotic pathogen *Vibrio alginolyticus*: a review and bibliometric analysis. *Applied Biochemistry and Microbiology*, 60(3), 514-531.
27. Chowdhury, A. J. K., John, A., Aqilah, N. S., Abdullah, R., Salihah, N. T., Basir, K. H., & Marsal, C. J. (2024). Macrobenthic community towards sustainable aquatic ecosystem: A systematic review along the coastal waters of Malaysia. *Geology, Ecology, and Landscapes*, 8(1), 57-70.
28. Amira, F. S., Rahman, M. M., Kamaruzzaman, Y., Jalal, K. C. A., Hossain, M. Y., & Khan, N. S. (2016). Relative abundance and growth of male and female *Nemipterus furcosus* population. *Sains Malaysiana*, 45(1), 79-86.
29. Redhwan, A., Eissa, E. S. H., Ezzo, O. H., Abdelgeliel, A. S., Munir, M. B., Chowdhury, A. J. K., ... & Abd Al-Kareem, O. M. (2024). Effects of water additive mixed probiotics on water quality, growth performance, feed utilization, biochemical analyses and disease resistance against *Aeromonas sobria* of Nile tilapia. *Desalination and Water Treatment*, 319, 100480.
30. Nadirah, M., Ruhil, H. H., Jalal, K. C., & Najiah, M. (2012). Occurrence of *Plesiomonas shigelloides* in cultured red hybrid tilapia (*Oreochromis niloticus*) from tropical rivers, east coast Malaysia. *Pakistan Journal of Biological Sciences: PJBS*, 15(12), 600-603.
31. John, B. A., Jalal, K. C. A., Zaleha, K., Armstrong, P., & Kmaruzzaman, B. Y. (2011). Effects of blood extraction on the mortality of Malaysian horseshoe crabs (*Tachypleus gigas*). *Marine and freshwater behaviour and physiology*, 44(5), 321-327.
32. Eissa, E. S. H., Okon, E. M., Abdel-Warith, A. W. A., Younis, E. M., Dowidar, H. A., Elbahnaswy, S., ... & Elabd, H. (2024). In-water *Bacillus* species probiotic improved water quality, growth,

- hemato-biochemical profile, immune regulatory genes and resistance of Nile tilapia to *Aspergillus flavus* infection. *Aquaculture International*, 32(6), 7087-7102.
33. Chowdhury, A. J. K., Hashim, N., Marsal, C. J., & Jamaludin, M. H. (2023). Water treatment and aquaculture products towards halal value chain in ASEAN countries: a retrospective review on Brunei Darussalam. *Desalination and Water Treatment*, 315, 479-491.
 34. Salleh, S. M., Nishizawa, H., Ishihara, T., Sah, S. A. M., & Chowdhury, A. J. K. (2018). Importance of sand particle size and temperature for nesting success of green turtles in Penang Island, Malaysia. *Chelonian Conservation and Biology: Celebrating 25 Years as the World's Turtle and Tortoise Journal*, 17(1), 116-122.
 35. Kassim, Z., John, A., Chin, L. K., Zakaria, N. F., & Asgnari, N. H. (2014). Sustainable technique for selected live feed culture. *Sustainable aquaculture techniques*, 105-133.
 36. Rana, M. M., Asdari, R., Chowdhury, A. J. K., & Munir, M. B. (2023). Heavy metal contamination during processing of canned fish: a review on food health and food safety. *Desalination and Water Treatment*, 315, 492-499.
 37. Amin, N. (2009). Bacterial pollution in molluscs arch clam, *Orbicularia orbiculata* and blood cockle, *Anadara granosa* of Pahang estuary, Malaysia. *Journal of Biological Sciences*.
 38. AMBAK, & JALAL. (1998). Habitat utilization by the tropical fish community in the man-made Lake Kenyir, Malaysia. *Fisheries Management and Ecology*, 5(2), 173-176.
 39. Malek, N. A., Zainuddin, Z., Chowdhury, A. K., & Abidin, Z. Z. (2015). Diversity and antimicrobial activity of mangrove soil actinomycetes isolated from Tanjung Lumpur, Kuantan. *Jurnal Teknologi*, 77(25), 37-43.
 40. Murugan, S., Khan, S. A., Lyla, P. S., Kumar, C. P., Jalal, K. C., Kamaruzzaman, B. Y., & John, B. A. (2012). Length-weight relationship of *Mugil cephalus* (Linnaeus 1758) in Vellar estuary, southeast coast of India. *Pakistan Journal of Biological Sciences: PJBS*, 15(12), 595-599.
 41. Zahir, M. M., Kamaruzzaman, B. Y., John, B. A., Jalal, K. C. A., Shahbudin, S., Al-Barwani, S. M., & Goddard, J. S. (2011). Bioaccumulation of selected metals in the blood cockle (*Anadara granosa*) from Langkawi Island, Malaysia.
 42. Abidin, Z. A. Z., Chowdhury, A. J. K., Malek, N. A., & Zainuddin, Z. (2018). Diversity, antimicrobial capabilities, and biosynthetic potential of mangrove actinomycetes from coastal waters in Pahang, Malaysia. *Journal of Coastal Research*, 82(SI), 174-179.
 43. Jalal, K. C., Kamaruzzaman, B. Y., Arshad, A., Ara, R., & Rahman, M. F. (2012). Diversity and distribution of fishes in tropical estuary Kuantan, Pahang, Malaysia. *Pakistan journal of biological sciences: PJBS*, 15(12), 576-582.
 44. John, B. A., Kamaruzzaman, B. Y., Jalal, K. C. A., & Zaleha, K. (2011). Hydrology of the horseshoe crab nesting grounds at Pahang coast, Malaysia.

45. Kamaruzzaman, B. Y., Waznah, A. S., Ong, M. C., Shahbudin, S., & Jalal, K. C. A. (2009). Variability of organic carbon content in bottom sediment of Pahang river estuary, Pahang, Malaysia.
46. Azratul, A. N. M. D., John, A., Kamaruzzaman, B., Hassan Sheikh, B. Y., Jalal, K. C. A., & Noor Faizul, H. N. (2017). Biomonitoring selected heavy metal concentration in *Nerita* Sp. collected from tanjung lumpur mangrove forest. *Environment & Ecosystem Science*, 1(1), 4-7.
47. John, A., Kumar, C. P., Lyla, P. S., Khan, A. S., & Jalal, K. C. A. (2010). DNA barcoding of *Lates calcarifer* (Bloch, 1970). *Res J Biol Sci*, 5(6), 414-419.
48. Abdurahman, S. W., Ambak, M. A., Sheriff, S. M., Mohamed, A. A., & Chowdhury, A. J. K. (2016). Morphological variations of plicofollis species (Siluriformes: Ariidae) in Peninsular Malaysia: An insight into truss network approach. *Sains Malaysiana*, 45(1), 1-7.
49. Jalal, K. C. A., Faizul, H. N., Naim, M. A., John, B. A., & Kamaruzzaman, B. Y. (2012). Studies on water quality and pathogenic bacteria in coastal water Langkawi, Malaysia. *Journal of environmental biology*, 33(4), 831.
50. Chowdhury, A. J. K., John, A., Abdullah, R., Musa, N., & Ashraf, M. A. (2021). Impact of COVID-19 on aquaculture and fisheries in ASEAN countries: some aspects of challenges, mitigations for future strategies in Malaysia. *Desalination and water treatment*, 241, 331-339.
51. Ng, J. F., Ahmed, O. H., Omar, L., Jalloh, M. B., Kwan, Y. M., Musah, A. A., ... & Jimmy, D. R. (2024). Mitigating water pollution by nitrogen fertilizers through amending ammonium sorption in an acid soil using Calciprill and sodium silicate. *Desalination and Water Treatment*, 319, 100489.
52. Abidin, Z. A. Z., & Chowdhury, A. J. K. (2018). Heavy metals and antibiotic resistance bacteria in marine sediment of Pahang coastal water. *Journal Clean WAS*, 2(1), 20-22.
53. Jalal, K. C. A., Zaima Azira, Z. A., Nor Hafizah, Z., Rahman, M. M., Kamaruzzaman, B. Y., & Noor Faizul, H. N. (2014). Carotenoid contents in anoxygenic phototrophic purple bacteria, *Marichromatium* sp. and *Rhodopseudomonas* sp. of tropical aquatic environment, Malaysia.
54. Zakaria, Z., Fadzil, F. N. M., Mohamad, M. A. N., Hamid, A. A. A., Chowdhury, A. J. K., & Harumain, Z. A. S. (2024). Metagenomic analysis of bacterial communities in heavy metal leachate-contaminated soils at Jalan Lipis Sanitary Landfill, Pahang, Malaysia. *Desalination and Water Treatment*, 319, 100512.
55. Rana, M. M., Asdaria, R., Mahmud, S., Irfan, A. F., Chowdhury, A. J. K., & Munir, M. B. (2023). Marine water aquaculture and an IoT-based smart fish dryer of the future: a sustainable environmental approach. *Desalination and Water Treatment*, 315, 515-522.
56. Abuljadayel, D. A., Bukhari, D. A. A., Eissa, M. E., Munir, M. B., Chowdhury, A. J. K., & Eissa, E. S. H. (2023). Utilization of probiotic bacteria *Pediococcus acidilactici* to enhance water quality, growth performance, body composition, hematological indices, biochemical parameters,

- histopathology and resistance of red tilapia (*Oreochromis* sp.) against *Aeromonas sobria*. *Desalination and Water Treatment*, 315, 469-478.
57. Siddiquee, M. M., Rahman, M. F., Jahan, N., Jalal, K. C., Amin, S. M., & Arshad, A. (2012). Impact of exotic carps in the polyculture with indigenous carps: competition for food. *Pakistan Journal of Biological Sciences: PJBS*, 15(12), 568-575.
58. Yunus, K., Suhaimi, M., Zahir, M., John, A., Khan Chowdhury, A. J., Saad, S., & Goddard, J. S. (2011). Bioaccumulation of some metals by Green mussel *Perna viridis* (Linnaeus 1758) from Pekan, Pahang, Malaysia. *International Journal of Biological Chemistry*, 5(1), 54-60.
59. Sheikh, H. I., Nordin, B., Paharuddin, N., Liew, H. J., Fadhlina, A., Abdulrazzak, L. A., ... & Musa, N. (2023). Virulence factors and mechanisms of *Aeromonas hydrophila* infection in catfish *Siluriformes*: a review and bibliometric analysis. *Desalination and Water Treatment*, 315, 538-547.
60. Nordin, N. F. H., binti Ibrahim, N. H. S., & Chowdhury, A. J. K. (2018). Physicochemical parameters and bacterial composition in sungau pusu gombak. *Science Heritage Journal (GWS)*, 2(1), 10-12.
61. Ashraf, M. A., Hussin, N. H., Yusoff, I., & Gharibreza, M. (2017). Study of the impacts of some domestic pollutants on the freshwater fish community in the Klang River, Malaysia. *Earth Sciences Malaysia (ESMY)*, 1(1), 1-7.
62. Zhao, Q. Q., Chen, M. Y., He, R. L., Zhang, Z. F., & Ashraf, M. A. (2016). Review on antibacterial characteristics of bridge engineering biomaterials. *Saudi Journal of Biological Sciences*, 23(1), S137-S141.
63. Hossain, M. B., Ahmed, S., Rahman, M. F., Kamaruzzaman, B. Y., Jalal, K. C. A., & Amin, S. M. N. (2013). Method development and validation of nitrofurantoin metabolites in shrimp by liquid chromatographic mass spectrometric system. *Journal of Biological Sciences*, 13(1), 33.
64. Diah, W., Marsal, C. J., Tamat, W., & Chowdhury, A. J. K. (2023). Contamination prevention in ASEAN aquaculture: a review of prospective challenges and mitigations. *Desalination and Water Treatment*, 315, 523-537.
65. Ab Wahab, S. U. K., Samah, M. A. A., Sabuti, A. A., Yunus, K., Chowdhury, A. J. K., John, A., ... & Hamid, A. A. A. (2020). Environmental forensic study: tracing of pollution sources using environmetric technique in Balok and Tunggak Rivers near Gebeng industrial area, Kuantan, Pahang, Malaysia. *Desalination and Water Treatment*, 191, 118-125.
66. Jalal, K. C. A., John, A., Hassan, B., Sheikh, I., Shahbudin, S., & Nor Hafiza, Y. A. A. (2017). Study on physicochemical parameters and distribution of phytoplankton in Kuantan estuary, Pahang. *Environment and Ecosystem Science*, 1(1), 8-12.
67. Hassan, M. A. R. I. N. A., Sharoum, F. M., Abd Wahid, M. E., Ghaffar, M. A., Ambak, M. A., & Musa, N. (2017). Infestation of *Probopyrus* sp. on *Macrobrachium lanchesteri* From Sungai Chalok and Sungai Nyatoh, Terengganu, Malaysia. *J Sustain Sci Manag*, 3, 111-118.

68. Akbar, J., Prasannakumar, C., Lyla, P. S., Ajmal Khan, S., & Jalal, K. C. A. (2010). DNA barcoding of *Lates calcarifer* (Bloch, 1970). *Res. J. Biol. Sci*, 5(6), 414-419.
69. Ridzwan, B. H., Fong, Y. S., Hasniwati, M. H., Shaari, B., & Jalal, K. C. A. (2002). The effect of *Morinda citrifolia* on isolated rat hearts. *Pakistan Journal of Biological Sciences (Pakistan)*, 5(10).