

Rational Antibiotic Usage of International University Students Who Educates in the Field of Health

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Abstract – The study sample comprised 184 international students enrolled at Necmettin Erbakan University across the Faculties of Medicine, Dentistry, Nursing, and the Nezahat Keleşoğlu Faculty of Health Sciences. Among the participants, 55.4% were female, 45.1% were first-year students, and 42.9% were studying in the Faculty of Medicine. A total of 78.3% of the students reported a moderate level of academic achievement, while 16.3% came from families with low income levels. The mean knowledge and attitude scores were 11.60 ± 2.43 and 40.65 ± 4.93 , respectively. Academic achievement and family income levels were found to have a statistically significant effect on mean knowledge scores ($p < 0.05$). Similarly, academic achievement and faculty of study significantly affected mean attitude scores ($p < 0.05$). Although 46.2% of students had previously received education about rational antibiotic use (RAU), this did not translate into higher knowledge or attitude scores. A positive, statistically significant, moderate correlation was identified between knowledge and attitude scores. Overall, the study contributed to raising awareness about RAU among international students from diverse backgrounds.

Keywords – Rational Antibiotic Use, Knowledge, Attitude

1. Introduction

Antibiotics, regarded as one of the most pivotal medical breakthroughs of the 20th century, are pharmacological agents that exert their effects by inhibiting the growth of or directly eliminating pathogenic microorganisms, and they remain essential components in the treatment and prevention of infectious diseases within modern clinical practice. These drugs have saved millions of lives and prevented the spread of infectious diseases [1,2]. However, “antibiotic resistance” emerged almost simultaneously with the discovery of antibiotics. Resistance to these drugs occurs due to their widespread use in the community, prescription for wrong indications, preference for broad-spectrum drugs, inadequate dosage and duration of use, and inadequate hygiene conditions [3,4]. As a result of resistance development, hospital stays are prolonged and treatment costs increase [5]. Resistance is a global health problem and almost all existing antibiotics have developed resistance [6].

Antibiotics are the most widely consumed and misused group of drugs in our country [7,8]. Excessive and irrational use of antibiotics is the main cause of resistance development, which is now a major cause of global morbidity and mortality [9]. In Turkey, important steps have been taken in the fight against antibiotic resistance in recent years [10]. However, further progress is needed. On this basis, measures taken in Turkey to limit antibiotic consumption include monitoring and reporting of antibiotic prescribing in primary health care, trainings for physicians and the public, media activities, various publications and legal regulations limiting the sale of antibiotics without a prescription [9].

One of the most important examples of irrational drug use is the unnecessary use of antibiotics. However, antibiotics, which are of great importance in terms of public health, are among the most commonly prescribed drug groups in Turkey as in the whole world [7]. The need for antibiotics necessitates their rational use and healthcare

professionals have a great responsibility in this regard. Thus the health and economic consequences of antibiotic resistance are severe.

In this study, it was aimed to evaluate the knowledge and attitudes toward RAU of international students studying in health-related fields at our university, who will be the health professionals of the future and to raise awareness on this issue.

2. Methodology

The study is a descriptive and cross-sectional study involving international university students studying in health-related fields. The population of the study consisted of 184 international students studying at Necmettin Erbakan University Faculty of Medicine, Faculty of Dentistry, Faculty of Nursing and Nezahat Keleşoğlu Faculty of Health Sciences in the 2022-2023 academic year. Students who gave consent to participate in the study were included. The ethics committee approval of the study was obtained by the Necmettin Erbakan University Medical Faculty Non-Pharmaceutical and Medical Device Research Ethics Committee with the decision numbered 4211 on 03.03.2023. Following the approval of the Ethics Committee, the necessary permissions were obtained from the Dean's Offices of the Faculty of Medicine, Faculty of Dentistry, Faculty of Nursing and Nezahat Keleşoğlu Faculty of Health Sciences.

The questionnaire form to be used in the research was developed as a result of literature review and pilot study and consists of three sections. The first part of the form includes information about the participants, the second part includes statements aimed at determining students' level of knowledge about RAU and the third part includes statements aimed at determining students' attitudes towards RAU. Second part consists of 20 true or false statements, 11 statements were prepared as true and 9 as false statements. Correct answers given by individuals were evaluated as 1 point and incorrect

answers as 0 points. In third part, 3 points were evaluated as "correct", 2 points "sometimes" and 1 point "wrong" answer in the answers given to the section consisting of 20 statements that they could answer using the options "yes", "sometimes" and "no". The questionnaires took approximately 15 minutes to fill.

2.1. Statistical analysis

Continuous variables were expressed as mean \pm standard deviation, categorical data, number and percentage. One-way analysis of variance (Post-hoc: LSD) was used in the comparisons between three groups that were found to be compatible with normal distribution, and Student's T test was used in the analyzes between two groups. The linear relationship (correlation) between RAU knowledge scores and attitude scores was analyzed with Pearson Correlation test. Data was analysed using SPSS 27. Statistical significance level was accepted as $p < 0.05$.

3. Results

A total of 184 volunteer students participated in the study,

representing a wide range of nationalities, including Afghanistan, Germany, Albania, Austria, Azerbaijan, Benin, Chad, Indonesia, Palestine, France, Iraq, Iran, Qatar, Kazakhstan, Kenya, Kosovo, Egypt, Mongolia, Norway, Russia, Serbia, Somalia, Sudan, Saudi Arabia, Syria, Tunisia, Uganda, Ukraine, Jordan, and Zambia. Among the participants, 55.4% were female and 44.6% were male.

Regarding academic distribution, 42.9% of the participants were enrolled in the Faculty of Medicine, 16.3% in the Faculty of Dentistry, 20.7% in the Faculty of Nursing, and 20.1% in the Faculty of Health Sciences.

In terms of socioeconomic background, 76.1% of participants reported that their families had a medium income level. Additionally, 78.3% stated that they had a medium level of academic achievement. Notably, 53.8% of the respondents indicated that they had not received any prior education related to RAU. When asked about their primary sources of information on the topic, 51.1% cited healthcare professionals, while 16.8% identified mass media as their main source Table 1.

Table 1. Sociodemographic and clinical characteristics of the participants

| | | N | % |
|---|-----------------|-----|------|
| Age (years) | ≤ 20 | 78 | 42,4 |
| | 21-25 | 83 | 45,1 |
| | > 25 | 23 | 12,5 |
| Gender | Female | 102 | 55,4 |
| | Male | 82 | 44,6 |
| Faculty of study | Medicine | 79 | 42,9 |
| | Dentistry | 30 | 16,3 |
| | Nursing | 38 | 20,7 |
| | Health Sciences | 37 | 20,1 |
| Class of study | 1 | 83 | 45,1 |
| | 2 | 48 | 26,1 |
| | 3 | 24 | 13,0 |
| | 4 | 22 | 12,0 |
| | 5 | 3 | 1,6 |
| | 6 | 4 | 2,1 |
| Country region | Africa | 20 | 10,9 |
| | Europe | 17 | 9,2 |
| | Balkans | 5 | 2,7 |
| | Caucasus | 8 | 4,3 |
| | Central Asia | 70 | 38,0 |
| | Middle East | 64 | 34,8 |
| Time lived in Turkey | 1-5 years | 81 | 44,0 |
| | 6-10 years | 103 | 56,0 |
| Family type | Nuclear family | 124 | 67,4 |
| | Joint family | 60 | 32,6 |
| Number of siblings | ≤ 3 | 84 | 45,7 |
| | > 3 | 100 | 54,3 |
| Family income level | Low | 30 | 16,3 |
| | Middle | 140 | 76,1 |
| | High | 14 | 7,6 |
| Monthly net income including scholarships | < 1500 | 70 | 38,0 |
| | 1500-3000 | 75 | 40,8 |
| | > 3000 | 39 | 21,2 |

| | | | |
|--|--------------------------|-----|------|
| Place of residence | Village/ town | 16 | 8,7 |
| | District | 35 | 29,9 |
| | City | 113 | 61,4 |
| Status of achievement | Failed | 10 | 5,4 |
| | Moderate | 144 | 78,3 |
| | Successful | 30 | 16,3 |
| Chronic disease | Present | 169 | 91,8 |
| | Absent | 15 | 8,2 |
| Has he/she received any information about the rational use of antibiotics? | Yes | 85 | 46,2 |
| | No | 99 | 53,8 |
| If he/she received information from who or where did he/she get information? | Health personnel | 94 | 51,1 |
| | Mass communication tools | 31 | 16,8 |
| Total | | 184 | 100 |

Table 2. Comparison of rational antibiotic use knowledge and attitudes scores of participants according to sociodemographic and clinical characteristics

| | | Knowledge | | Attitudes | |
|---|-----------------|------------|----------|------------|----------|
| | | (Mean±SD) | <i>p</i> | (Mean±SD) | <i>p</i> |
| Age (years) | ≤20 | 11,79±2,02 | 0.469* | 40,76±5,06 | 0.924* |
| | 21-25 | 11,57±2,62 | | 40,63±4,57 | |
| | >25 | 11,08±2,98 | | 40,30±5,87 | |
| Gender | Female | 11,52±2,60 | 0.581** | 40,49±4,73 | 0.621** |
| | Male | 11,71±2,21 | | 40,85±5,20 | |
| Faculty of study | Medicine | 11,37±2,21 | 0.573* | 40,05±5,23 | 0.035* |
| | Dentistry | 11,50±2,43 | | 42,23±4,78 | |
| | Nursing | 12,02±2,81 | | 41,81±3,49 | |
| | Health Sciences | 11,75±2,51 | | 39,45±5,25 | |
| Class of study | 1 | 11,83±1,93 | 0.893* | 41,43±5,07 | 0.291* |
| | 2 | 11,43±3,00 | | 40,25±5,31 | |
| | 3 | 11,37±2,37 | | 40,83±3,67 | |
| | 4 | 11,59±3,18 | | 38,90±4,49 | |
| | 5 | 11,33±0,57 | | 40,00±5,29 | |
| | 6 | 10,75±0,50 | | 38,25±4,99 | |
| Country region | Africa | 11,65±1,84 | 0.163* | 40,30±3,77 | 0.617* |
| | Europe | 11,17±1,62 | | 40,41±3,12 | |
| | Balkans | 12,40±4,56 | | 40,00±2,73 | |
| | Caucasus | 11,75±1,90 | | 40,12±2,03 | |
| | Central Asia | 12,14±2,16 | | 41,51±5,71 | |
| | Middle East | 11,04±2,81 | | 40,00±5,08 | |
| Time lived in Turkey | 1-5 years | 11,74±2,88 | 0.183* | 40,61±4,62 | 0.044* |
| | 6-10 years | 11,82±1,75 | | 41,62±4,84 | |
| Family type | Nuclear family | 11,72±2,17 | 0.350** | 40,17±4,31 | 0.060** |
| | Joint family | 11,36±2,91 | | 41,63±5,93 | |
| Number of siblings | ≤3 | 11,82±2,48 | 0.279** | 40,41±4,78 | 0.554** |
| | >3 | 11,43±2,39 | | 40,85±5,07 | |
| Family income level | Low | 12,40±2,73 | 0,045* | 40,86±4,08 | 0,657* |
| | Middle | 11,55±2,40 | | 40,72±5,20 | |
| | High | 10,50±1,50 | | 39,50±3,85 | |
| Monthly net income including scholarships | <1500 | 11,62±2,79 | 0.938* | 41,31±5,60 | 0.373* |
| | 1500-3000 | 11,64±2,38 | | 40,22±4,76 | |
| | >3000 | 11,55±1,84 | | 40,31±3,89 | |
| Place of residence | Village/ town | 11,18±4,57 | 0.442* | 42,06±8,29 | 0.343* |
| | District | 11,36±2,07 | | 40,05±4,24 | |
| | City | 11,78±2,17 | | 40,74±4,63 | |

| | | | | | |
|--|--------------------------|------------|---------|------------|---------|
| Status of achievement | Failed | 9,70±3,68 | 0.036* | 37,30±6,96 | 0.044* |
| | Moderate | 11,74±2,44 | | 40,82±4,65 | |
| | Successful | 11,60±1,56 | | 40,93±5,27 | |
| Chronic disease | Present | 11,60±2,49 | 0.924** | 40,68±5,03 | 0.795** |
| | Absent | 11,66±1,63 | | 40,33±3,81 | |
| Has he/she received any information about the rational use of antibiotics? | Yes | 11,77±2,70 | 0.372* | 40,06±5,13 | 0.379* |
| | No | 11,43±2,15 | | 40,30±4,28 | |
| If he/she received information from who or where did he/she get information? | Health personnel | 11,65±2,11 | 0.467* | 41,14±4,54 | 0.374* |
| | Mass communication tools | 11,12±2,81 | | 40,25±5,65 | |

Table 3. Comparison of rational antibiotic use knowledge and attitude scores according to faculty and grades

| Faculty of study | Class of study | Knowledge | | Attitudes | |
|----------------------------|----------------|------------|----------|------------|----------|
| | | (Mean±SD) | <i>P</i> | (Mean±SD) | <i>p</i> |
| Faculty of medicine | 1 | 11,85±1,83 | 0.390* | 40,80±5,37 | 0.649* |
| | 2 | 10,52±2,97 | | 39,00±6,26 | |
| | 2 | 11,42±2,37 | | 41,42±2,50 | |
| | 4 | 11,50±1,64 | | 38,50±2,58 | |
| | 5 | 11,50±0,70 | | 37,00±1,41 | |
| | 6 | 10,66±0,57 | | 39,33±5,50 | |
| Faculty of dentistry | 1 | 11,75±2,93 | 0.925* | 43,43±5,47 | 0.145* |
| | 2 | 11,00±1,89 | | 42,66±2,06 | |
| | 3 | 11,20±1,48 | | 37,80±3,11 | |
| | 4 | 11,66±2,51 | | 42,33±4,04 | |
| Faculty of nursing | 1 | 11,76±1,39 | 0.066* | 41,70±3,33 | 0.799* |
| | 2 | 13,58±3,31 | | 42,50±3,94 | |
| | 3 | 11,16±3,81 | | 41,50±4,03 | |
| | 4 | 9,00±1,73 | | 40,33±2,08 | |
| Faculty of health sciences | 1 | 12,00±1,33 | 0.898* | 40,30±5,41 | 0.395* |
| | 2 | 11,00±2,00 | | 38,55±4,97 | |
| | 3 | 11,66±1,63 | | 42,00±4,33 | |
| | 4 | 12,40±4,14 | | 37,70±5,69 | |

The mean knowledge score of the students regarding RAU was 11.60 ± 2.43 , with scores ranging from 0 to 20. The mean attitude score was 40.65 ± 4.93 , with a range of 20 to 60. Notably, the knowledge scores of students classified as unsuccessful (9.70 ± 3.68) were significantly lower than those of intermediate (11.74 ± 2.44) and successful students (11.60 ± 1.56), with p-values of 0.010 and 0.032, respectively.

The knowledge scores of students from low-income families (12.40 ± 2.73) were significantly higher than those

of students from high-income families (10.50 ± 1.50) ($p = 0.016$). No significant differences in knowledge scores were observed according to age, gender, faculty, academic year, region of family residence, duration of living in Turkey, family type, number of siblings, monthly net income including scholarships, place of residence, presence of chronic disease, or source of education ($p > 0.05$) (Table 2). The attitude scores of students from the Faculty of Dentistry (42.23 ± 4.78) were significantly higher than those of students from the Faculty of Medicine (40.05 ± 5.23) and the Faculty of Health Sciences

(39.45 ± 5.25), with p-values of 0.038 and 0.021, respectively (Table 3). Additionally, students from the Faculty of Nursing (41.81 ± 3.49) had significantly higher attitude scores compared to those from the Faculty of Health Sciences (39.45 ± 5.25) ($p = 0.037$).

Furthermore, the attitude scores of students who reported low academic achievement (37.30 ± 6.96) were significantly lower than those of students with average (40.82 ± 4.65) and high academic achievement (40.93 ± 5.27), with p-values of 0.029 and 0.044, respectively.

No statistically significant differences were observed in attitude scores based on participants' age, gender, grade level, region of family origin, family type, number of siblings, family income level, monthly net income including scholarships, place of residence, presence of chronic disease, or the source of education received ($p > 0.05$) (Table 2). However, a positive, statistically significant, moderate correlation was found between RAU knowledge scores and attitude scores ($r = 0.323$, $p < 0.001$).

4. Discussion

In the present study, the mean score of participants' responses to knowledge statements regarding RAU was 11.60 ± 2.43 , while the mean score for attitude statements was 40.65 ± 4.93 . Consistent with existing literature, no statistically significant differences were observed between gender and both knowledge and attitude levels among the students. Similarly, a recent study conducted with medical students in Sri Lanka reported no significant association between gender and attitude scores [11]. Likewise, Rábano-Blanco et al. [12] found no relationship between gender and knowledge levels among nursing faculty students in Spain.

No significant differences were found between age and knowledge or attitude levels in this study. In parallel, Sunusi et al. [13] reported no significant relationship between age and knowledge or attitude levels among medical faculty students in Sudan. Similarly, Al-Salih et al. [14] observed comparable findings in nursing and dentistry students at Babylon University in Iraq.

In this study, no significant difference was observed between participants' faculties and their knowledge scores. This finding may be attributed to the fact that all participants were enrolled in health-related fields of study.

The attitude scores of students from the Faculty of Dentistry (42.23 ± 4.78) were found to be significantly higher than those of students from the Faculty of Medicine (40.05 ± 5.23) and the Faculty of Health Sciences (39.45 ± 5.25). Additionally, students from the Faculty of Nursing (41.81 ± 3.49) demonstrated significantly higher attitude scores compared to those from the Faculty of Health Sciences (39.45 ± 5.25). This result may be attributed to the inclusion of pharmacology courses in the curricula of dentistry, medicine, and nursing faculties. Antibiotics have extensive applications in dentistry, and recent initiatives to promote the rational use of these drugs within dental practice have increased awareness and knowledge among students.

Considering that students in advanced grades are exposed to more theoretical and practical information, it would be expected that their knowledge and attitude scores would be higher. However, in our study, no statistically significant differences were found between knowledge and attitude scores and the participants' academic year. Supporting these findings, Yılmaz and Yorguner [15] recently conducted a study with pharmacy faculty students and found no significant differences between students' academic years and their knowledge and attitude scores. Similarly, Jayawardhana et al. [11] reported no significant difference in attitude scores among medical students across different grade levels.

Although sociocultural factors, education level, and economic status influence the frequency of antibiotic consumption, our study found that participants with low family income levels (12.40 ± 2.73) had significantly higher knowledge scores than those with high family income levels (10.50 ± 1.50). This finding may be attributed to the high education levels of university students from low-income families. It is encouraging that individuals from low-income families demonstrated a high level of knowledge regarding rational drug use. Similarly, Hu et al. [16] reported in a study with Chinese medical students that students from families with higher incomes and parents with higher education levels had higher rates of self-initiated antibiotic use, and those from urban families tended to stock more antibiotics.

No significant differences were found between the region of the students' family residence, family type, or number of siblings and their knowledge and attitude scores. Consistent with these findings, Assar et al. [17] reported no significant differences in knowledge and attitude levels regarding antimicrobial resistance among medical students from different geographic regions in Egypt. Similarly, a study investigating mothers' attitudes toward antibiotic use in their children found no statistically significant association between family type and mothers' knowledge and attitudes about antibiotics and their use.

In accordance with the literature, the knowledge scores of students with unsuccessful course status (9.70 ± 3.68) were found to be significantly lower than those of intermediate and successful students (11.74 ± 2.44 and 11.60 ± 1.56 , respectively). Similarly, Horvat et al. [18], in a study conducted among medical, dental, and veterinary students in Serbia, reported that participants with an average course grade of 8 or higher possessed more than three times greater adequate knowledge about antibiotics compared to those with lower grades.

In this study, 46.2% of the participants reported having received training on RAU. Among them, 51.1% indicated that the source of their RAU training was health personnel, while 16.8% cited mass media as the source. The majority of participants were medical students, with pharmacology courses delivered theoretically in the third year and rational drug use education provided both theoretically and practically in the fourth year of medical school. Indeed, physicians, pharmacists, nurses, and other healthcare professionals play a critical role in raising awareness and educating the public on the rational use of medicines.

Self-medication with antibiotics is a global issue that

contributes significantly to the rise of antibiotic resistance. More than half of the antibiotics worldwide are accessible without a prescription, and studies involving university students have shown that self-medication with antibiotics is prevalent. In this study, 60% of the students reported that leftover antibiotics should be kept at home. Nisabwe et al. [19] conducted a study with medical, dental, and pharmacy students at the University of Rwanda and found that 80% of participants did not store leftover antibiotics for future use; however, 49% were able to obtain antibiotics without a prescription. The prohibition of over-the-counter antibiotic sales in our country may explain the tendency to keep antibiotics in reserve.

The prescription of antibiotics by physicians at the request of patients is a significant contributor to the growing problem of antibiotic resistance [20]. In the present study, 43.4% of students reported having asked doctors to prescribe antibiotics. In contrast, a study by Hu et al. [16] involving Chinese medical students found that only 15% of participants had made such requests. The higher rate observed in our study may be attributed to the prohibition of over-the-counter antibiotic sales in our country, which may encourage patients to actively seek prescriptions from healthcare providers.

It is important to emphasize that antibiotic treatment should not be discontinued once symptoms subside, as doing so can contribute to antibiotic resistance. In our study, 91.3% of students agreed with the statement, "Antibiotics are effective if used according to the instructions for use." However, 39.1% reported stopping their antibiotic treatment when their symptoms decreased or disappeared. Similarly, Zaidi et al. [21] found that while 71.2% of health sciences university students acknowledged that incomplete antibiotic courses reduce drug efficacy, 55% still admitted to discontinuing antibiotics once they felt better. These findings highlight a concerning gap between knowledge and behavior, suggesting that awareness alone may not be sufficient to ensure appropriate antibiotic use.

In the current study, the majority of participants (82.1%) stated that common colds, influenza, and flu can be cured without the use of antibiotics. It is encouraging that students demonstrated awareness of this important issue. Similarly, Shah et al. [22] reported that 54% of students from both the Faculty of Medicine and non-medical faculties at Kathmandu University, Nepal, knew that antibiotics should not be used for viral infections [23]. In contrast, 48% of students from medical and other faculties at Ajman University in the United Arab Emirates believed that antibiotics are appropriate for treating viral infections. The fact that all participants in the present study were health-related students, some of whom had completed pharmacology courses, may explain their higher level of knowledge on this subject.

Furthermore, a significant moderate positive correlation was observed between RAU knowledge scores and attitude scores, indicating that as knowledge increases, attitude scores also improve. Based on this finding, it can be concluded that higher knowledge positively influences attitudes toward rational antibiotic use.

5. Conclusion

Since the participants of this study include physicians, dentists, nurses, and other healthcare professionals who will be involved in every stage of patient care, they hold a significant responsibility as role models in promoting rational antibiotic use. To prevent both individual and community-level antimicrobial resistance, it is crucial to raise awareness about RAU among students from diverse countries who will serve across all levels of healthcare. The findings of this study may provide a valuable foundation for future research involving a larger and more diverse sample of participants.

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References

- [1] R.Fernandes, P. Amador and C. Prudêncio. β -Lactams. Reviews in Medical Microbiology. 2013, vol 24, pp.7–17.
- [2] C. Moser, C.J. Lerche, K.Thomsen, T. Hartvig, J. Schierbeck, P.O. and Jensen PØ. Antibiotic therapy as personalized medicine – general considerations and complicating factors. APMIS. 2019, vol 127, pp. 61–371.
- [3] R. Cantón, M. Akova, K. Langfeld, D. Torumkuney. Relevance of the Consensus Principles for Appropriate Antibiotic Prescribing in 2022. Journal of Antimicrobial Chemotherapy. 2022;vol. 77:pp. 2–9.
- [4] E. Christaki, M. Marcou and A.Tofarides. Antimicrobial Resistance in Bacteria: Mechanisms, Evolution, and Persistence. J Mol Evol. 2020, vol.88, pp. 26–40.
- [5] C.A.D. Burnham, J. Leeds, P. Nordmann., J. O'Grady and J. Patel. Diagnosing antimicrobial resistance. Nat Rev Microbiol. 2017, vol.15, pp. 697–703.
- [6] E.M. Darby, E.Trampari, P. Siasat, M.S.Gaya, I. Alav and M.A.Webber Molecular mechanisms of antibiotic resistance revisited. Nat Rev Microbiol. 2023;21:280–295.
- [7] K.P. Gurkan. The Effect of Health Literacy Level of Parents with 0-12 Years-Old Children on Perceptions of Rational Antibiotic Use. EHD 2023, vol.16, pp. 460-472.
- [8] F. Isli, M. Aksoy, S.E. Aydingoz and E. Kadi.. Antibiotic Prescription Pattern of Family Physicians Across Turkey: A Cross-Sectional Analysis Through The Prescription Information System Abstract. Turkish Journal of Family Medicine and Primary Care. 2020, vol.14, pp. 87–95.
- [9] M. Aksoy, F. Isli F, E. Kadi, D.Varimli, H. Gursoz and T Tolunay T. Evaluation of more than one billion outpatient prescriptions and eight-year trend showing a remarkable reduction in antibiotic prescription in Turkey: A success model of governmental interventions at national level. Pharmacoepidemiol Drug Saf. 2021;vol. 30, pp.1242–1249.
- [10] B. Isler, S. Keske, M. Aksoy, O.K. Azap, M. Yilmaz and S.S.Yavuz. Antibiotic overconsumption and resistance in Turkey. Clinical Microbiology and Infection. 2019; vol. 25, pp. 651–653.
- [11] Y. Jayawardhana, A. Premaratne, S. Kalpani, S. Jayasundara, G. Jayawardhane, and C.G. Jayawarna. Investigating the drivers for antibiotic use and misuse amongst medical undergraduates—perspectives from a Sri Lankan medical school. PLOS Global Public Health. 2023, vol.3, pp. 1-12.
- [12] A. Rábano-Blanco, E.M. Domínguez-Martís, D.G. Mosteiro-Miguéns, M. Freire-Garabal and S. Novio. Nursing Students' Knowledge and Awareness of Antibiotic Use, Resistance and

- Stewardship: A Descriptive Cross-Sectional Study. *Antibiotics*. 2019, vol. 8, pp.203.
- [13] L.S.A. Sunusi, M.M. Awad, N.M. Hassan and C.A.Isa. Assessment of knowledge and attitude toward antibiotic use and resistance among students of International University of Africa, medical complex, Sudan. *Glob Drugs Ther*. 2019, vol. 4, pp. 1-6.
- [14] S.S.H. Al-Salih, A. N.K.K Hindi and Z.K. Hasan. Knowledge and Attitudes regarding Antibiotic Use and Resistance among Nursing and Dentistry Students in Babylon University/Iraq. *Indian Journal of Forensic Medicine & Toxicology*. 2019, vol.13,pp.1145.
- [15] Z. Yılmaz, Z.G. Yorguner. Pharmacy students' knowledge and attitudes towards antibiotic use: A cross-sectional study. *Journal of Research in Pharmacy*. 2023;vol. 27(5), pp.2106–2114.
- [16] Y. Hu, X. J.D. Wang, P. Tucker, P. Little, M. Moore and K. Fukuda. Knowledge, Attitude, and Practice with Respect to Antibiotic Use among Chinese Medical Students: A Multicentre Cross-Sectional Study. *Int J Environ Res Public Health*. 2018,vol.15, pp.1165.
- [17] A. Assar, M.I. Abdelraoof,, M.Abdel-Maboud, K.H. Shaker, A., Menshawy and A.H. Swelam. Knowledge, attitudes, and practices of Egypt's future physicians towards antimicrobial resistance (KAP-AMR study): a multicenter cross-sectional study. *Environmental Science and Pollution Research*. 2020, vol.27, pp.21292–21298.
- [18] O. Horvat, A.T. Petrović, M. Paut Kusturica, D. Bukumirić, B. Jovančević and Z. Kovačević. Survey of the Knowledge, Attitudes and Practice towards Antibiotic Use among Prospective Antibiotic Prescribers in Serbia. *Antibiotics*. 2022, vol.11, pp.1084..
- [19] I. Nisabwe, H. Brice, M.C. Umuhire, O. Gwira, J.D.D. Harelimana and Z.Nzeyimana Knowledge and attitudes towards antibiotic use and resistance among undergraduate healthcare students at University of Rwanda. *J Pharm Policy Pract*. 2020, pp.7.
- [20] C.C. Butler, S. Rollnick, R. Pill, F. Maggs-Rapport and N.Stott. Understanding the culture of prescribing: qualitative study of general practitioners' and patients' perceptions of antibiotics for sore throats. *BMJ*. 1998 vol.317, pp. 637–642.
- [21] S.F. Zaidi, R. Alotaibi, A. Nagro, M. Alsalmi, H. Almansouri and M.A. Khan MA, Aknowledge and Attitude Towards Antibiotic Usage: A Questionnaire-Based Survey Among Pre-Professional Students at King Saud bin Abdulaziz University for Health Sciences on Jeddah Campus, Saudi Arabia. *Pharmacy*. 2020, vol.8:pp.5.
- [22] P. Shah, R.Shrestha, Z. Mao, Y. Chen and P. Koju Knowledge, attitude, and practice associated with antibiotic use among university students: a survey in Nepal. *International Journal of Environmental Research and Public Health*. 2019, vol.16, pp.3996.
- [23] A. Jairoun, N. Hassan, A. Ali, O. Jairoun and M. Shahwan. Knowledge, attitude and practice of antibiotic use among university students: a cross sectional study in UAE. *BMC Public Health*. 2019, vol. 19, pp.518.