Apr 2026 | Volume 14 / Issue 1 | e-ISSN 3062-3650 | www.yeditepejhs.org

YEDİTEPE JOURNAL OF HEALTH SCIENCES

Gustav Klimt
"Hygieia" (Detail from Medicine), 1901 / Oil on Canvas

Apr 2026 | Volume 14 / Issue 1 | e-ISSN 3062-3650

YEDİTEPE JOURNAL OF HEALTH SCIENCES

Owner

Mehmet Durman
Rector, Yeditepe University, Istanbul

Editor-in-Chief

Gülderen Yanıkkaya Demirel
Yeditepe University, Faculty of Medicine, Department of Immunology, Istanbul
gulderen.ydemirel@yeditepe.edu.tr
ORCID ID: 0000-0001-5775-491X

Assistant Editors

Çetin Taş
Yeditepe University, Department of Pharmaceutical Technology, Istanbul
ORCID ID: 0000-0001-9004-3239

Burcu Gemici Başol
Yeditepe University, Department of Physiology, Istanbul
ORCID ID: 0000-0003-2201-1555

Associate Editors

David O. Carpenter
State University of New York, School of Public Health, Institute of Health & Environment, Albany, New York
ORCID ID: 0000-0003-4841-394X

H. Fahrettin Keleştemur
Yeditepe University, Faculty of Medicine, Department of Clinical Endocrinology & Metabolism, Istanbul
ORCID ID: 0000-0002-2861-4683

Naim Khan
University of Burgundy, Physiologie de Nutrition & Toxicologie, Dijon, France

Alex Verkhratsky
University of Manchester, Institute of Neuroscience, Manchester, UK
ORCID ID: 0000-0003-2592-9898

Bayram Yılmaz
Dokuz Eylül University, Faculty of Medicine, İzmir
ORCID ID: 0000-0002-2674-6535

Language Editor

Filiz Esra Önen Bayram
Yeditepe University, Faculty of Pharmacy, Department of Pharmaceutical Chemistry, Istanbul
ORCID ID: 0000-0002-7634-3777

Statistical Editor

Elif Çiğdem Keleş
Yeditepe University, Faculty of Medicine, Department of Biostatistics and Medical Informatics, Istanbul
ORCID ID: 0000-0002-2479-1236

Gülçin Tuğcu
Yeditepe University, Faculty of Pharmacy, Department of Pharmaceutical Toxicology, Istanbul
ORCID ID: 0000-0002-9750-6563

Publication and Design

DOC Design and Informatics Co. Ltd.
E-mail: info@dotdoc.com.tr
Web page: www.dotdoc.com.tr

Publishing Coordinator

Gizem Pakdil

Design Lead

Ali Pekşen

Software

Asım Demirağ

Informatics

Nuh Naci Kişnişci

Graphic Design

A. Manikanndaprabhu

Apr 2026 | Volume 14 / Issue 1 | e-ISSN 3062-3650

YEDİTEPE JOURNAL OF
HEALTH SCIENCES

EDITORIAL BOARD

Meriç Köksal Akkoç
Yeditepe University, Faculty of Pharmacy,
Department of Pharmaceutical Chemistry, Istanbul
ORCID ID: 0000-0001-7662-9364

Pavle Andjus
Belgrade University, Faculty of Biology, Serbia
ORCID ID: 0000-0002-8468-0513

Faik Altıntaş
Yeditepe University, Faculty of Medicine,
Department of Orthopaedics and Traumatology,
Istanbul
ORCID ID: 0000-0002-5242-250X

N. Erkut Attar
Yeditepe University, Faculty of Medicine,
Department of Obstetrics & Gynecology, Istanbul
ORCID ID: 0000-0002-8459-2538

Rükset Attar
Yeditepe University, Faculty of Medicine,
Department of Obstetrics & Gynecology, Istanbul
ORCID ID: 0000-0001-8770-9562

Ahmet Aydın
Yeditepe University, Faculty of Pharmacy,
Department of Pharmaceutical Toxicology, Istanbul
ORCID ID: 0000-0003-3499-6435

Soner Doğan
Yeditepe University, Faculty of Medicine,
Department of Medical Biology, Istanbul
ORCID ID: 0000-0002-7762-8109

Mehmet Ziya Doymaz
Bezmi Alem Vakıf University, Faculty of Medicine,
Department of Medical Microbiology, Istanbul
ORCID ID: 0000-0003-2066-0252

Sina Ercan
Yeditepe University, Faculty of Medicine,
Department of Thoracic Surgery, Istanbul
ORCID ID: 0000-0001-6319-4357

Özcan Gökçe
Yeditepe University, Faculty of Medicine,
Department of General Surgery, Istanbul
ORCID ID: 0000-0002-2986-000X

Gülçin Kantarcı
Yeditepe University, Faculty of Medicine,
Department of Nephrology, Istanbul
ORCID ID: 0000-0002-5350-9797

Hasan Kırmızıbekmez
Yeditepe University, Faculty of Pharmacy,
Department of Pharmacognosy, Istanbul
ORCID ID: 0000-0002-6118-8225

Özge Köner
Yeditepe University, Faculty of Medicine,
Department of Anesthesiology and Reanimation,
Istanbul
ORCID ID: 0000-0002-5618-2216

Fatma Savran Oğuz
Istanbul University, Istanbul Faculty of Medicine,
Department of Medical Biology
0000-0002-6018-8936

Yaşar Küçükardalı
Yeditepe University, Faculty of Medicine,
Department of Internal Medicine, Istanbul
ORCID ID: 0000-0002-8719-8886

Derya Özsavcı
Marmara University, Faculty of Pharmacy,
Department of Biochemistry, Istanbul
ORCID ID: 0000-0002-9587-5138

Serdar Öztezcan
Yeditepe University, Faculty of Medicine,
Department of Biochemistry, Istanbul
ORCID ID: 0000-0002-5756-4435

Ferhan Sağın
Ege University, Faculty of Medicine, Department of
Biochemistry, Izmir
ORCID ID: 0000-0003-1309-6788

M. Aydın Sav
Yeditepe University, Faculty of Medicine, Faculty of
Medicine, Department of Pathology, Istanbul
ORCID ID: 0000-0002-7326-7801

Özlem Tanrıöver
Marmara University, Medical Education Depart-
ment, Istanbul
ORCID ID: 0000-0003-0251-3451

Haluk Topaloğlu
Yeditepe University, Faculty of Medicine, Department of Pediatric Neurology, Istanbul
ORCID ID: 0000-0002-3545-3830

Sibel Temur
Yeditepe University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Istanbul
ORCID ID: 0000-0002-4494-2265

Uğur Türe
Yeditepe University, Faculty of Medicine, Department of Neurosurgery, Istanbul
ORCID ID: 0000-0002-7449-6171

Hatice Türe
Yeditepe University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Istanbul
ORCID ID: 0000-0003-3185-1150

Emel Ulupınar
Eskişehir Osmangazi University, Faculty of Medicine, Department of Anatomy, Eskişehir
ORCID ID: 0000-0001-9684-5937

Tayfun Uzbay
Üsküdar University, Faculty of Medicine, Department of Pharmacology, Istanbul
ORCID ID: 0000-0002-9784-5637

Faruk Yencilek
Yeditepe University, Faculty of Medicine, Department of Urology, Istanbul
ORCID ID: 0000-0003-2911-1276

Apr 2026 | Volume 14 / Issue 1 | e-ISSN 3062-3650

YEDİTEPE JOURNAL OF
HEALTH SCIENCES

CONTENT

EDITORIAL

1 **Moving Forward: The First Issue of 2026 and the Iconic Symbol of Hygieia**
Gülderen Yanıkkaya Demirel

RESEARCH ARTICLE

2 **Pregnancy-Related Hematocrit Changes and Malaria-Associated Anemia with ABO/Rh Blood Group Distribution in Nigerian Women**
Jimoh Muideen Adewale, Olawumi Hannah Oluwayemisi, Olawuyi Abdullahi Olaleye, Gbadebo Maroof Oyeniyi, Muhibi Mutmainnah

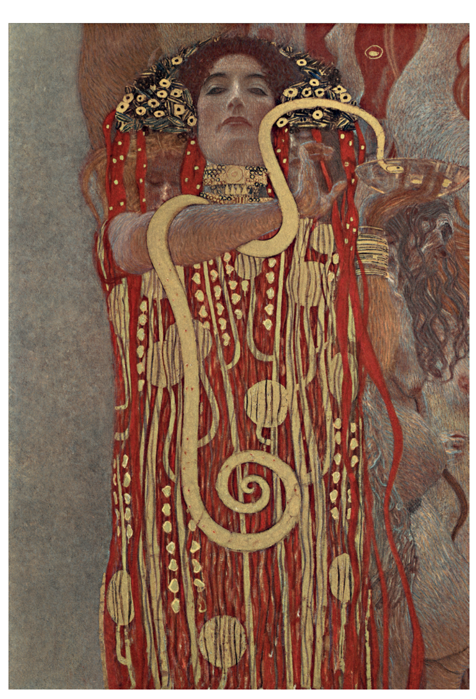
10 **Evaluation of Empathy and Ethical Perception Among First-Year Medical Students: A Cross-Sectional Study**
Rumeysa Demirci, Şevval Esma Atay, Hatice Özkan, Salih Akbaş, Zeynep Kolatan, Özlem Tanrıöver

18 **Improving Peer Mentoring Competence Through Peer Mentor Training: A Quasi-Experimental Study**
Feyza Şule Aslan, Şükrü Toprak Durukan, Çağrı Gürpınar, Firuze Bihter Batur, Fatma Nur Çatarmut, Ecem Tat, Doğa Akkuş, Kayra Danışman, Muhammed Enes Kızıldil, Elif Berfin Sezik, Elif Şükran İşler, Alihan Akdağ, Özlem Tanrıöver

Apr 2026 | Volume 14 / Issue 1 | e-ISSN 3062-3650

YEDİTEPE JOURNAL OF
HEALTH SCIENCES

COVER IMAGES



Gustav Klimt
"Hygieia" (Detail from Medicine), 1901
/ Oil on Canv

Rights: Public domain.

Source: Wikimedia Commons;
Munch Museum, Oslo.

EDITORIAL | Yeditepe Journal of Health Sciences, 14(1):1

Moving Forward: The First Issue of 2026 and the Iconic Symbol of Hygieia

Dear Colleagues,

I am very pleased to present the first issue of the *Yeditepe Journal of Health Sciences* in 2026, in the second year of the rebirth of our journal.

There are three research articles in this issue, one article comes all the way from Nigeria, and we are grateful to authors for sending their articles to our journal (Jimoh et al.). It is about the hematocrit levels and blood types in pregnant women for predicting the malaria which is an important health issue in the region. Other two articles are published as outcomes of the student research projects in relation to peer mentoring trainings (Aslan et al.), empathy and ethical perception of first-year medical students (Demirci et al.).

The cover image for this issue features *Hygieia*, painted by Gustav Klimt (1862–1918). Created between 1900 and 1907, this work formed part of the ceiling fresco *Medicine*, commissioned by the art committee of the Ministry of Education for the assembly hall of the University of Vienna. In Greek mythology, Hygieia was the daughter of Asclepius and was regarded as the goddess of hygiene, health, cleanliness, and sanitation. In Klimt's depiction, she appears as a figure of purification and healing, holding the Aesculapian snake in her left hand and the cup of Lethe in her right—symbols that remain associated with pharmacy today. Unlike the other figures in the *Medicine* panel, which represent disease and death, *Hygieia* embodies the protective aspect of medical science. Her calm yet powerful presence, combined with her direct gaze, reinforces this role. In this context, she is not portrayed as a femme fatale but rather aligns with the traditional representation of women as caretakers. Unfortunately, this powerful ceiling painting was destroyed in a fire at Immendorf Castle in 1945 during World War II. Only black-and-white photographs and detailed studies have survived to the present day.

Please note that as stated previously, our goal is to achieve inclusion in internationally recognized high-impact databases. By aligning our rigorous standards with global indexing requirements, we are not only pursuing indexation for our journal but also reaffirming our commitment to advancing global health. We sincerely thank all authors and reviewers who contributed to this issue. While we anticipate an increase in submissions following indexation, we rely on continued support to reach this goal and therefore encourage further contributions from authors and reviewers across all institutions.

Stay healthy and happy,

Gülderen Yanıkkaya Demirel
Editor-in-Chief

Published April 29, 2026 **Correspondence** Gülderen Yanıkkaya Demirel **DOI** 10.36519/yjhs.2026.1146

Suggested Citation Demirel GY. Moving forward: The first issue of 2026 and th eiconic symbol of hygieia.Yeditepe JHS. 2026;1:1

E-mail gulderen.ydemirel@yeditepe.edu.tr

This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.

RESEARCH ARTICLE | Yeditepe Journal of Health Sciences, 14(1):2–9

Pregnancy-Related Hematocrit Changes and Malaria-Associated Anemia with ABO/Rh Blood Group Distribution in Nigerian Women

Jimoh Muideen Adewale[1], Olawumi Hannah Oluwayemisi[2], Olawuyi Abdullahi Olaleye[4], Gbadebo Maroof Oyeniyi[2], Muhibi Mutmainnah[3]

[1] Department of Prosthetics and Orthotics, Federal University of Health Sciences Faculty of Allied Health Sciences, Ila-Orangun, Nigeria; [2] Department of Haematology, University of Ilorin Faculty of Basic Clinical Science, Ilorin, Nigeria; [3] Department of Haematology and Blood Transfusion Science, University of Ilesa Faculty of Medical Laboratory Science, Ilesa, Nigeria; [4] Department of Medical Laboratory Science, Faculty of Allied Health Sciences, Federal University of Health Sciences Ila-Orangun, Nigeria.

Abstract

Objective: Pregnancy is associated with physiological hematologic changes that may be exacerbated by endemic infections such as malaria in sub-Saharan Africa. This study evaluated hematocrit levels, malaria history, and ABO/Rh blood group distribution among Nigerian women.

Materials and Methods: A cross-sectional study was conducted among 45 pregnant women, stratified by trimester, and 45 age-matched nonpregnant controls attending a tertiary hospital in North-Central Nigeria. Hematocrit was measured using an automated hematology analyzer, while ABO and Rh blood groups were determined using standard serological techniques. Malaria exposure within the preceding 12 months was assessed using a structured questionnaire; among pregnant women, malaria infection within the preceding 12 months was additionally confirmed by microscopy or hospital records. Associations were examined using independent t-tests, one-way analysis of variance (ANOVA), and chi-square tests, with statistical significance set at $p<0.05$.

Results: Mean hematocrit was significantly lower among pregnant women compared with nonpregnant controls (33.14% ± 2.86% vs 34.36% ± 2.99%; $p=0.020$). Hematocrit values did not differ significantly across pregnancy trimesters ($p=0.742$). A history of confirmed malaria infection within the preceding 12 months was associated with a reduction in hematocrit among pregnant women (32.26% ± 2.85% vs 34.22% ± 2.49%; $p=0.020$). Blood group O positive was the most prevalent phenotype (33.3%), and ABO/Rh distribution did not differ significantly between pregnant and nonpregnant women.

Conclusion: Pregnancy in this Nigerian population was associated with a modest but physiologically appropriate reduction in hematocrit, while recent malaria infection produced an additional, clinically important decline. The observed ABO/Rh distribution follows expected regional patterns.

Keywords: Hematocrit, pregnancy, anemia, ABO blood group, Rh blood group, malaria, Nigeria

Received January 4, 2026 **Accepted** March 8, 2026 **Published** April 29, 2026 **DOI** 10.36519/yjhs.2026.990

Suggested Citation Jimoh MA, Oluwayemisi OH, Olawuyi OA, Oyeniyi GM, Mutmainnah M. Pregnancy-related hematocrit changes and malaria-associated anemia with ABO/Rh blood group distribution in Nigerian women. Yeditepe JHS. 2026;14(1):2–9.

Correspondence Olawuyi Abdullahi Olaleye **E-mail** olawuyiabdul@gmail.com

This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.

INTRODUCTION

Pregnancy induces substantial hematological and hemodynamic adaptations required to support maternal and fetal oxygen demands (1). An expansion of plasma volume greater than the increase in red blood cell mass results in dilutional reductions in hematocrit and hemoglobin concentrations, commonly referred to as the "physiological anemia of pregnancy" (2,3). Although adaptive, this process may be exacerbated by nutritional deficiencies and infections, leading to clinically significant anemia.

Anemia in pregnancy remains a major public health concern in sub-Saharan Africa and is associated with adverse outcomes including preterm birth, low birth weight, small-for-gestational-age infants, and increased maternal mortality (4,5). In Nigeria, malaria continues to be a major contributor to anemia during pregnancy through mechanisms such as hemolysis and suppression of erythropoiesis (6,7).

In addition to hematological indices, the distribution of ABO and Rh blood groups has important clinical implications in obstetric practice (8). Understanding population-specific blood group patterns is essential for effective blood donor recruitment, transfusion preparedness, and prevention of hemolytic disease of the newborn (9). Despite these implications, data from North-Central Nigeria remain limited, particularly regarding the interaction between pregnancy-related hematocrit changes, malaria exposure, and ABO/Rh blood group distribution.

Therefore, this study aimed to compare hematocrit levels between pregnant women and age-matched nonpregnant controls, evaluate the effect of recent confirmed malaria infection on hematocrit in both pregnant and nonpregnant women, and describe the ABO and Rh blood group distribution in this population to support antenatal transfusion preparedness and local blood stock planning.

MATERIALS AND METHODS

Study Design and Setting

This cross-sectional analytical study was carried out at the antenatal clinic of the University of Ilorin Teaching Hospital (UITH) in Ilorin, Kwara State, North-Central Nigeria.

Ethical approval was obtained from the Institutional Review Board of the University of Ilorin Teaching Hospital (approval no.: UITH/CAT/189/VOL.17A/537). Written informed consent was obtained from all participants, and confidentiality was maintained using unique study identifiers.

Study Population and Sample Size

The study population comprised 45 pregnant women, stratified equally by gestational age into three trimester-based groups (15 women per trimester), and 45 age-matched nonpregnant women recruited from the community and hospital staff as controls. Pregnant participants were enrolled consecutively during routine antenatal clinic visits using a convenience sampling method, based on eligibility and willingness to participate within the study period. The final sample size was determined by feasibility within the study period, with equal trimester allocation to ensure internal comparability. Similar sample sizes have been employed in hospital-based hematological studies in comparable settings and have been shown to be sufficient for detecting clinically meaningful differences in hematocrit levels (10,11).

Eligibility Criteria

Eligible participants were pregnant women aged 18–45 years with confirmed viable singleton pregnancies. Controls were nonpregnant women aged 18–45 years with no pregnancy in the preceding 12 months. Participants with active systemic infection, known hemoglobinopathies, chronic medical conditions affecting hematological parameters, recent blood transfusion (within three months), hematological malignancy, or current use of antiretroviral or immunosuppressive therapy were excluded.

Data Collection

Trained research assistants administered a structured questionnaire to obtain sociodemographic characteristics, obstetric history, current pregnancy details, iron supplementation, bed net use, and self-reported malaria history within the preceding 12 months. Among pregnant women, recent malaria infection was further ascertained by review of hospital records and peripheral blood smear microscopy performed at or around the time of recruitment. For nonpregnant controls, malaria exposure within the past 12 months was based on self-reported episodes that had been previously confirmed by microscopy or hospital diagnosis; no additional parasitological testing was performed at enrollment.

Laboratory Procedures

Venous blood samples (5 mL) were collected aseptically from the antecubital vein into EDTA K_3 tube (3 mL) for hematocrit measurement and plain tube (2 mL) for blood grouping. Hematocrit was measured using an automated hematology analyzer (Sysmex XN-350; Sysmex Corporation, Kobe, Japan). ABO and Rh blood groups were determined using standard tube and tile agglutination methods with commercially prepared antisera. All samples were processed within 4 hours of collection and stored

at room temperature (20–25°C) prior to analysis.

Statistical Analysis

Data were analyzed using SPSS version 22.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized as means ± standard deviation (SD) and compared between groups using independent t-tests. Categorical variables were summarized as frequencies and percentages and compared using chi-square tests. All statistical tests were two-tailed, and *p*<0.05 was considered statistically significant.

RESULTS

Sociodemographic Characteristics

A total of 45 pregnant women were enrolled. The majority were aged 26–35 years (80.0%), and most had at least secondary education, with 60.0% having completed university education (Table 1). Mean hematocrit values did not differ significantly across age groups, occupational categories, or educational levels (all *p*>0.05; Table 1).

Hematocrit Levels by Pregnancy Status

Mean hematocrit was significantly lower among pregnant women compared with nonpregnant controls (33.14% ± 2.86% vs. 34.36% ± 2.99%; mean difference, 1.22%; 95% confidence interval [CI], 0.08–2.36; *p*=0.020) (Table 2). This finding indicates a modest but statistically significant reduction in hematocrit associated with pregnancy.

Obstetric, Nutritional, and Clinical Variables in Pregnant Women

Obstetric assessment showed that 44.4% of pregnant participants were *primigravida*, 35.6% *multigravida*, and 20.0% grand *multigravida* (Table 3). A history of miscarriage or abortion was reported by 22.2% and 84.4% reported iron supplementation, while 57.8% reported insecticide-treated bed net use (Table 3).

Mean hematocrit did not differ significantly by gestational trimester, gravidity status, history of miscarriage, iron supplementation, or bed net use (all *p*>0.05). In contrast, a history of malaria infection within the preceding 12 months was associated with significantly lower hematocrit: women with malaria history had a mean hematocrit of 32.26% ± 2.85%, compared with 34.22% ± 2.49% among those without such history (mean difference 1.96%; 95% CI, 0.29–3.63; *p*=0.020), corresponding to an approximately 5.7% relative reduction (Table 3).

Hematocrit Levels by Malaria History in Pregnant and

Table 1. Sociodemographic characteristics and hematocrit levels among pregnant women (n=45).

Characteristics	Category	n (%)	Mean hematocrit ± SD (%)	*p*-value*
Age (years)	18–25	7 (15.6)	31.96 ± 3.79	0.284
	26–35	36 (80.0)	33.46 ± 2.53	
	36–45	2 (4.4)	31.25 ± 2.84	
Occupation	Employed	20 (44.4)	32.80 ± 2.44	0.552
	Unemployed	7 (15.6)	34.50 ± 2.15	
	Self-employed	13 (28.9)	33.15 ± 2.48	
	Student	5 (11.1)	32.48 ± 5.53	
Educational level	Primary	2 (4.4)	29.60 ± 0.42	0.301
	Secondary	13 (28.9)	33.04 ± 2.18	
	Graduate	27 (60.0)	33.25 ± 2.99	
	Postgraduate	3 (6,7)	34.08 ± 3.31	

SD: Standard deviation.
**p*-values from one-way ANOVA.

Table 2. Comparison of hematocrit levels between pregnant and non-pregnant women.

Group	Mean hematocrit (%) ± SD	Mean difference (95% CI)	*p*-value*
Pregnant (n=45)	33.14 ± 2.86	1.22 (0.08–2.36)	0.020
Non-pregnant (n=45)	34.36 ± 2.99	–	–

SD: Standard deviation, **CI:** Confidence interval.
*Independent samples t-test.

Table 3. Hematocrit levels in relation to obstetric, nutritional, and clinical variables (n=45).

Characteristics	Category	n (%)	Mean hematocrit ± SD (%)	*p*-value*
Gestational trimester	1st trimester	15 (33.3)	33.17 ± 2.59	0.742
	2nd trimester	15 (33.3)	33.51 ± 2.88	
	3rd trimester	15 (33.3)	32.70 ± 3.15	
Gravidity	*Primigravida*	20 (44.4)	33.17 ± 2.59	0.170
	Multigravida	16 (35.6)	33.51 ± 2.88	
	Grand multigravida	9 (20.0)	32.72 ± 3.11	
History of miscarriage	Yes	10 (22.2)	32.79 ± 2.59	0.674
	No	35 (77.8)	33.23 ± 2.93	
Iron supplementation	Yes	38 (84.4)	33.13 ± 2.91	0.988
	No	7 (15.6)	33.11 ± 2.64	
Bed-net use	Yes	26 (57.8)	33.06 ± 2.72	0.855
	No	19 (42.2)	33.22 ± 3.06	
Malaria history (past 12 months)	Yes	25 (55.6)	32.26 ± 2.85	0.020*
	No	20 (44.4)	34.22 ± 2.49	

SD: Standard deviation.
*p=0.020 indicates statistical significance; p-values from independent t-tests or one-way ANOVA as appropriate.

Nonpregnant Controls

Among pregnant women, 25 (55.6%) reported at least one microscopy- or hospital-confirmed malaria episode within the preceding 12 months, whereas 20 (44.4%) reported no malaria episode in that period (Table 4). Among nonpregnant controls, 9 (20.0%) reported at least one confirmed malaria episode in the past 12 months, while 36 (80.0%) reported no malaria episode.

Pregnant women with recent malaria had lower mean hematocrit than those without such history (32.26% ± 2.85% vs. 34.22% ± 2.49%), consistent with the pattern

observed in Table 3. In nonpregnant controls, mean hematocrit was slightly lower in women with prior malaria compared with those without (33.9% ± 3.1% vs. 34.6% ± 2.9%), but this difference was small and not statistically significant (Table 4).

ABO and Rh Blood Group Distribution

Blood group O positive (O+) was the most prevalent phenotype among pregnant women (33.3%), followed by B positive (24.4%) and AB positive (24.4%), whereas A positive was less common (15.6%) and O negative was rare (2.2%) (Table 5). ABO and Rh distributions were similar between pregnant and nonpregnant women, with no statistically significant difference observed (χ^2=2.14; p=0.143) (Table 5). The observed distribution is consistent with reported frequencies in Nigerian and West African populations. It is noted, however, that in this cohort AB positive (24.4%) was more prevalent than A positive (15.6%), which diverges from the typical West African ranking where group A (20–27%) exceeds group AB (1–5%) (12–14). This observed pattern is retained as reported from the data and is discussed in context.

DISCUSSION

This study demonstrates a modest but statistically significant reduction in hematocrit among pregnant women compared with age-matched nonpregnant controls, consistent with physiological hemodilution during pregnancy (1,15). The magnitude of this difference aligns with the expected dilutional fall in hematocrit that accompanies plasma volume expansion in normal gestation (3,11,16). The absence of significant variation in hematocrit across trimesters suggests that hematological adaptations occur relatively early and then stabilize in the absence of additional pathological stressors.

Table 4. Hematocrit levels by malaria history in pregnant women (n=45) and non-pregnant controls (n=45).

Group	Malaria history (past 12 months) *	n	Mean hematocrit ± SD (%)
Pregnant women	Yes	25	32.26 ± 2.85
Pregnant women	No	20	34.22 ± 2.49
Non-pregnant controls	Yes	9	33.9 ± 3.1
Non-pregnant controls	No	36	34.6 ± 2.9

SD: Standard deviation.
*Malaria history based on microscopy- or hospital-confirmed episodes.

Table 5. ABO and Rh blood group distribution in pregnant women (n=45) and non-pregnant controls (n=45).

Blood group	Pregnant (n=45) n (%)	Control (n=45) n (%)	Total (n=90) n (%)	*p*-value
A+	7 (15.6)	9 (20.0)	16 (17.8)	χ^2=2.14; p=0.143
B+	11 (24.4)	12 (26.7)	23 (25.6)	
AB+	11 (24.4)	5 (11.1)	16 (17.8)	
O+	15 (33.3)	18 (40.0)	33 (36.7)	
O–	1 (2.2)	1 (2.2)	2 (2.2)	
Total	**45 (100)**	**45 (100)**	**90 (100)**	

The mean hematocrit of 33.14% observed in this cohort is slightly higher than values reported in some Nigerian studies, where anemia prevalence among pregnant women ranges from 35% to 76.5% (17,18). This comparatively better profile may reflect the urban tertiary-care setting, greater uptake of iron supplementation, relatively better nutrition, and the exclusion of women with significant chronic comorbidities. Nonetheless, the observed reduction in hematocrit relative to nonpregnant controls underscores the continuing burden of pregnancy-related anemia in this context and its potential contribution to adverse obstetric outcomes described previously.

Age, occupation, and educational level were not significantly associated with hematocrit among pregnant women, in contrast to reports linking older maternal age, low educational attainment, and lower socioeconomic status with increased anemia risk (19,20). The lack of strong sociodemographic gradients may reflect relatively uniform access to antenatal care and supplementation in this population, as well as the limited power to detect modest differences. Variability across studies highlights the need for larger, population-based investigations to better delineate demographic and socioeconomic determinants of hematological status in pregnancy.

Malaria infection emerged as the principal clinical determinant of hematocrit reduction among pregnant women. Those with a recent microscopy- or hospital-confirmed malaria episode within the preceding 12 months had an almost 2% absolute and approximately 5.7% relative reduction in hematocrit compared with women without such history, a difference that is both statistically and clinically important (6,7). This finding is consistent with established mechanisms of malaria-associated anemia, including hemolysis of parasitized and nonparasitized erythrocytes, splenic sequestration, and inflammatory suppression of erythropoiesis (6,7,21,22). Similar patterns reported from other malaria-endemic settings reinforce malaria as a major modifiable contributor to anemia during pregnancy (22,23). The smaller, nonsignificant difference in hematocrit by malaria history among nonpregnant controls suggests that the physiological milieu of pregnancy amplifies the hematological impact of malaria.

Despite high reported uptake of iron supplementation, no significant association was observed between self-reported iron use and hematocrit levels. This may reflect adequate baseline iron status in some women, variable adherence to prescribed supplements, and the counteracting effects of concurrent infection and inflammation, particularly malaria (24). Evidence from other settings indicates that hematological responses to iron-folate supplementation can be delayed or blunted in the presence of infection and may require prolonged, well-supervised therapy to produce measurable improvements (2,24). The absence of direct measurements of iron indices, vitamin B12 and folate concentrations, inflammatory markers, and renal and hepatic function parameters in the present study limits more detailed mechanistic interpretation.

The ABO and Rh blood group distribution in this cohort closely mirrors previously described Nigerian and West African patterns, with a predominance of blood group O and low prevalence of Rh-negative phenotypes, and no meaningful differences between pregnant and nonpregnant women (12–14,25). These findings have practical implications for obstetric transfusion services, supporting planning for adequate stocks of group O blood and reinforcing the need for systematic antenatal Rh typing and targeted anti-D immunoprophylaxis to prevent alloimmunization and hemolytic disease of the fetus and newborn (12,25,26).

This study has limitations. Its cross-sectional design precludes causal inference regarding temporal relationships among pregnancy, malaria infection, and changes in hematocrit. Malaria in pregnant women was confirmed by microscopy at or around recruitment, whereas malaria status in nonpregnant controls was based on recalled, previously confirmed episodes without contemporaneous testing, which may have introduced misclassification and residual confounding. Iron indices, vitamin B12 and folate levels, inflammatory markers, and renal and hepatic function tests were not measured, as these investigations were not included in the original study protocol; therefore, baseline profiles for these parameters could not be generated for either group, which limits the ability to distinguish physiological hemodilution from anemia driven by nutritional deficiencies or chronic inflammation. The modest sample size, particularly within malaria-exposed subgroups, may also have reduced power to detect smaller differences and constrained multivariable modelling.

CONCLUSION

Pregnancy in this Nigerian cohort was associated with a modest, physiologically appropriate reduction in hematocrit, which was further worsened by malaria infection within the preceding 12 months. ABO and Rh distributions mirrored regional patterns, supporting antenatal transfusion planning and targeted Rh prophylaxis in malaria-endemic settings. These findings underscore the need to strengthen integrated malaria prevention strategies during antenatal care, alongside routine hematological monitoring. Health facilities should apply locally generated blood group distribution data to optimize obstetric transfusion preparedness. Future multicenter studies with standardized parasitological confirmation and comprehensive nutritional indices are warranted to better distinguish physiological hemodilution from pathology-driven anemia.

Ethical Approval: This study was approved by the Institutional Review Board of the University of Ilorin Teaching Hospital on February 5, 2025, with decision no. UITH/CAT/189/VOL.17A/537.

Informed Consent: Written informed consent was obtained from all participants.

Peer-review: Externally peer-reviewed

Author Contributions: Concept – J.M.A., O.H.O.; Design – J.M.A., O.A.O., O.H.O.; Supervision – O.H.O.; Fundings – O.A.O., J.M.A., G.M.O., M.M.; Materials – J.M.A., O.H.O., G.M.O.; Data Collection and/or Processing – J.M.A., O.H.O.; Analysis and/or Interpretation – O.A.O., J.M.A., O.H.O., G.M.O., M.M.; Literature Review – O.A.O., J.M.A., O.H.O., G.M.O., M.M.; Writer – O.A.O., J.M.A., O.H.O., G.M.O., M.M.; Critical Reviews – O.A.O., J.M.A., O.H.O., G.M.O., M.M.

Conflict of Interest: The authors declare no conflict of interest.

Financial Disclosure: The authors declare that this study has received no financial support.

Acknowledgements: The authors gratefully acknowledge all participants, and the staff of the Haematology Laboratory and Gynaecology Clinic of the UITH.

REFERENCES

1 Paradkar MN, Mejia I, Abraheem R, Marroquín León E, Firdous A, Barroso MJ, et al. Assessing the impact of hematological changes in pregnancy on maternal and fetal death: a narrative review. Cureus. 2024;16(8):e66982. [CrossRef]

2 Obianeli C, Afifi K, Stanworth S, Churchill D. Iron deficiency anaemia in pregnancy: a narrative review from a clinical perspective. Diagnostics (Basel). 2024;14(20):2306. [CrossRef]

3 So H, Kwon K, Jung S, Kim K. Physiological changes and trimester-specific reference intervals for complete blood count parameters in Korean pregnant women. Medicina (Kaunas). 2025;61(9):1665. [CrossRef]

4 Araujo Costa E, de Paula Ayres-Silva J. Global profile of anemia during pregnancy versus country income overview: 19 years estimative (2000–2019). Ann Hematol. 2023;102(8):2025–31. [CrossRef]

5 Obeagu GU, Obeagu EI. Complications of anemia in pregnancy: An updated overview for healthcare professionals. Medicine (Baltimore). 2025;104(35):e44246. [CrossRef]

6 Reddy V, Weiss DJ, Rozier J, Ter Kuile FO, Dellicour S. Global estimates of the number of pregnancies at risk of malaria from 2007 to 2020: a demographic study. Lancet Glob Health. 2023;11(1):e40–7. [CrossRef]

7 World Health Organization. WHO global anaemia estimates, 2025 edition [Internet]. Geneva: World Health Organization; 2025. [cited January 4, 2026]. Available from: https://www.who.int/data/gho/data/themes/topics/anaemia_in_women_and_children

8 Al-Kuran O, Al-Mehaisen L, Qasem R, Alhajji S, Al-Abdulrahman N, Alfuzai S, et al. Distribution of ABO and Rh blood groups among pregnant women attending the obstetrics and gynecology clinic at the Jordan University Hospital. Sci Rep. 2023;13(1):13196. [CrossRef]

9 Bilal JA, Malik EE, Al-Nafeesah A, Adam I. Global prevalence of congenital malaria: A systematic review and meta-analysis. Eur J Obstet Gynecol Reprod Biol. 2020;252:534–42. [CrossRef]

10 Dim C, Ugwu E, Dim N, Anyaehie U. Hematocrit, anemia, and arm preference for blood sample collection: a cross-sectional study of pregnant women in Enugu, South-Eastern, Nigeria. Ann Med Health Sci Res. 2015;5(1):36–41. [CrossRef]

11 Aguree S, Gernand AD. Plasma volume expansion across healthy pregnancy: a systematic review and meta-analysis of longitudinal studies. BMC Pregnancy Childbirth. 2019;19(1):508. [CrossRef]

12 Anyiam AF, Arinze-Anyiam OC, Irondi EA, Obeagu EI. Distribution of ABO and rhesus blood grouping with HIV infection among blood donors in Ekiti State Nigeria. Medicine (Baltimore). 2023;102(47):e36342. [CrossRef]

13 Wekere FCC, Okagua KE, Nwadiuto I, Gbeneol PK, Ordu LS, Ofori SA, et al. Distribution of ABO and Rhesus D blood groups among pregnant women in a tertiary hospital in Rivers State, Southern Nigeria. Cross Curr Int J Med Biosci. 2024;6(1):1–5. [CrossRef]

14 Abriba SP, Nongsat T, Osadolor HB, Toyrila J. ABO and Rhesus D blood group distribution among pregnant women attending Federal Medical Centre, Keffi, Nigeria. Sokoto J Med Lab Sci. 2025;10(2):1–7.

15 Costantine MM. Physiologic and pharmacokinetic changes in pregnancy. Front Pharmacol. 2014;5:65. [CrossRef]

16 Zade M. Prevalence and complications of anemia across pregnancy trimesters: a cohort study. J Intern Med Pharmacol. 2024;1(4):19–21. [CrossRef]

17 Idowu OA, Mafiana CF, Dapo S. Anaemia in pregnancy: a survey of pregnant women in Abeokuta, Nigeria. Afr Health Sci. 2005;5(4):295–9. [CrossRef]

18 Okunade KS, Olowoselu FO, Oyedeji OA, Oshodi YA, Ugwu AO, Olumodeji AM, et al. Prevalence and determinants of moderate-to-severe anaemia in the third trimester of pregnancy: a multicenter cross-sectional study in Lagos, Nigeria. Sci Rep. 2024;14(1):11411. [CrossRef]

19 Ullah A, Sohaib M, Saeed F, Iqbal S. Prevalence of anemia and associated risk factors among pregnant women in Lahore, Pakistan. Women Health. 2019;59(6):660–71. [CrossRef]

20 Jufar AH, Zewde T. Prevalence of anemia among pregnant women attending antenatal care at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. J Hematol Thromb Dis. 2014;2:125. [CrossRef]

21 Chaparro CM, Suchdev PS. Anemia epidemiology, pathophysiology, and etiology in low- and middle-income countries. Ann N Y Acad Sci. 2019;1450(1):15–31. [CrossRef]

22 Zakama AK, Ozarslan N, Gaw SL. Placental malaria. Curr Trop Med Rep. 2020;7(4):162–71. [CrossRef]

23 Omole O, Ezirim EO, Akwuruoha EM, Onyemereze CO, Abali IO, Onyekachi N, et al. Prevalence, knowledge and prevention of malaria among pregnant women attending antenatal care at a teaching hospital in Southern Nigeria. J Gynecol Reprod Health. 2024;8(2):1–10.

24 Belay E, Endrias A, Alem B, Endris K. Hematological responses to iron-folate supplementation and its determinants in pregnant women attending antenatal cares in Mekelle City, Ethiopia. PLoS One. 2018;13(10):e0204791. Erratum in: PLoS One. 2019;14(2):e0212713. [CrossRef]

25 Anifowoshe AT, Owolodun OA, Akinseye KM, Iyiola OA, Oyeyemi BF. Gene frequencies of ABO and Rh blood groups in Nigeria: a review. Egypt J Med Hum Genet. 2017;18:205–10.

26 Maruta MB, Tesfaye K, Birhanu E, Yigazu N, Yuya M, Debella A, et al. Prevalence and determinants of RH alloimmunization in Rh-negative women in teaching hospitals of Addis Ababa, Ethiopia: a hospital-based cross-sectional study. Front Glob Womens Health. 2023;4:1167736. [CrossRef]

RESEARCH ARTICLE | Yeditepe Journal of Health Sciences, 14(1):10−7

Evaluation of Empathy and Ethical Perception Among First-Year Medical Students: A Cross-Sectional Study

Rumeysa Demirci[1], Şevval Esma Atay[1], Hatice Özkan[1], Salih Akbaş[1], Zeynep Kolatan[1], Ahmet Lütfullah Coşkun[1], Özlem Tanrıöver[2]

[1] Marmara University Faculty of Medicine, İstanbul, Türkiye; [2] Department of Medical Education, Marmara University Faculty of Medicine, Istanbul, Türkiye.

Abstract

Objective: In the early stages of medical education, establishing ethical values and an empathetic approach is essential for medical practice. This study aimed to evaluate the relationship between empathy levels and ethical perceptions among first-year medical students at a medical faculty in Türkiye and to determine the significance of this relationship while controlling for demographic variables.

Materials and Methods: This cross-sectional study was conducted using an online questionnaire including sociodemographic questions and two standardized measurement tools: the Toronto Empathy Scale (Cronbach's alpha=0.73) and the Approaches to Ethical Issues in Healthcare Scale (Cronbach's alpha=0.80). Data were analyzed using Jamovi version 2.6.44 with multiple linear regression, analysis of variance (ANOVA), Kruskal-Wallis, Mann-Whitney U, and Pearson correlation analyses. Statistical significance was set at $p<0.05$.

Results: A total of 104 students participated in the study. After data cleaning, 92 participants were included in the final analysis. Among them, 51 (55.4%) were female and 39 (42.4%) were male. A significant positive relationship was found between empathy levels and ethical perception ($r=0.444$, $p<0.001$). This relationship remained significant after controlling for demographic variables such as age, gender, number of siblings, place of birth, and housing status. Gender and family educational background had a significant effect on empathy levels, whereas no significant differences were found between empathy or ethical perception and the number of siblings, place of birth, or housing status ($p>0.05$).

Conclusion: Our findings reveal a substantial, positive association between empathy and the ability to perceive moral issues. We suggest that strengthening empathy education in the early stages of medical training may support the development of ethical values.

Keywords: Empathy, ethics, medical students, regression analysis

Received March 16, 2026 **Accepted** April 20, 2026 **Published** April 29, 2026 **DOI** 10.36519/yjhs.2026.1097

Suggested Citation Demirci R, Atay ŞE, Özkan H, Akbaş S, Kolatan Z, Coşkun AL, Tanrıöver Ö. Evaluation of empathy and ethical perception among first-year medical students: a cross-sectional study. Yeditepe J Health Sci. 2026;14(1):10−7.

Correspondence Rumeysa Demirci **E-mail** rumeysademirci.0515@gmail.com

This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.

INTRODUCTION

Medical education not only equips students with academic knowledge and practical skills but also emphasizes the importance of human values and virtues in professional life. Among these values, empathy and ethical perception are considered essential for establishing healthy physician-patient relationships and maintaining positive professional interactions.

Empathy can be defined as the ability to understand another person's feelings and communicate that understanding effectively. In the literature, empathy is described as a multidimensional construct consisting of cognitive and emotional components. According to Preston et al. (1), cognitive empathy refers to understanding another individual's situation, whereas emotional empathy involves emotionally responding to another person's experiences. In healthcare settings, empathy is often described as clinical empathy, a predominantly cognitive ability that enables physicians to understand patients' experiences, concerns, and perspectives and communicate this understanding effectively. Research suggests that individuals with higher levels of empathy are more likely to demonstrate altruistic behavior and a stronger motivation to help others (2). This characteristic can support physicians in addressing patients' problems more effectively. However, empathy levels may vary depending on individual, social, and educational factors and may change over time (3). Recent longitudinal and cross-sectional studies highlight that this change often manifests as a measurable decline in empathy scores, particularly as students transition from the pre-clinical phase to the clinical phase of their education (4). Therefore, various educational approaches have been developed to improve empathy skills, including structured empathy training and communication skills programs. For example, Ko et al. (5) reported that fourth-year nursing students showed significant empathic improvements after an eight-month empathy training program, and it was observed that the experimental group maintained and even enhanced these improvements at the four-week follow-up assessment.

Ethics, on the other hand, concerns the behaviors and actions individuals perform within a social context and the mental processes that guide these behaviors (6). Physicians frequently encounter ethical dilemmas related to diagnosis, treatment, and patient rights throughout their professional careers. Ethical perception is therefore considered a crucial competence that enables professionals to recognize ethical problems and make appropriate decisions during their work (7). Previous studies also indicate a strong relationship between empathy and ethical sensitivity, suggesting that empathy plays an important role in morality-based decision-making processes (8). A study conducted among Chinese nursing students reported a significant and direct relationship between empathy and moral sensitivity. The possibility that moral sensitivity can be developed through empathy contributes to the broader idea that ethical perception of medical problems can be shaped by empathic skills (9).

In today's rapidly changing healthcare environment, physicians increasingly interact with patients from diverse cultural, religious, and social backgrounds, which requires them to address complex ethical challenges (10). Furthermore, advancing healthcare technologies introduce new ethical dilemmas. These include doctors being held accountable for outcomes despite being unable to comprehend the "black box" nature of artificial intelligence, as well as the emergence of the "problem of many hands," where accountability becomes blurred due to the involvement of numerous actors in the technology's development. Additionally, nurses are left to navigate expanding medical decision-making roles in tele-monitoring processes without adequate support (11). This highlights the need for new frameworks that emphasize a collective understanding of responsibility. Such frameworks must center on the moral virtues of both practicing healthcare professionals and the medical students who are entangled in today's circumstances as they train to become the future doctors. Empathy may play a critical role in helping medical students evaluate ethical dilemmas and make appropriate decisions on current conflicts. However, most existing studies examine empathy and ethical perception separately, and research investigating their relationship, particularly among first-year medical students, remains limited. Therefore, this study aimed to evaluate the relationship between empathy levels and ethical perception among first-year medical students at a medical faculty in Türkiye. Additionally, the study examined whether demographic factors such as gender, age, living conditions, and parental education levels were associated with empathy levels and whether the relationship between empathy and ethical perception persists after adjusting these variables.

MATERIALS AND METHODS

This cross-sectional study was conducted among 247 first-year medical students at a medical faculty in Türkiye. Participation was voluntary, and 104 students who completed the online survey administered via Google Forms were enrolled. The first section of the survey included sociodemographic questions such as age, gender, parental education level, place of residence, number of siblings, housing status, and place of birth.

Parental education levels were categorized into three groups based on the classification system used by the

Turkish Statistical Institute (TÜİK). “Low education” included individuals who were illiterate, literate without formal schooling, or primary school graduates. “Moderate education” included individuals with middle school and high school education. “High education” included individuals with tertiary education (associate degree, bachelor’s degree, or postgraduate education).

During data cleaning, 12 participants were excluded due to incomplete questionnaires or inconsistent responses. These responses were considered likely to affect the reliability and validity of the results.

In the second section, students’ empathy and ethical perception levels were assessed using the Toronto Empathy Scale (TES) and the Approaches to Ethical Issues in Healthcare Scale.

The Toronto Empathy Scale was developed by Spreng et al. (12), and its Turkish validity and reliability were established by Totan et al. (13). The scale consists of 13 items measuring cognitive and emotional empathy. It uses a 5-point Likert-type rating (1, not at all; 5, completely) with a maximum score of 65; higher scores indicate higher empathy levels. The Cronbach’s alpha value for the Turkish version was 0.73.

The Approaches to Ethical Issues in Healthcare Scale was developed by Kurt et al. (14) to evaluate ethical perception among medical students. It consists of 13 items rated on a 5-point Likert scale (1, least important/unimportant; 5, most important) with a maximum score of 65. The scale includes three subdimensions: perception of fundamental principles of medical ethics, values and standards in medical ethics, and rules and written ethical codes. The Cronbach’s alpha value was 0.805.

Potential sources of bias were considered in the study design. Since participation was voluntary, selection bias may have occurred. In addition, as the data were collected through self-reported questionnaires, response bias is possible. To reduce bias, validated standardized scales were used and the survey was conducted anonymously.

The study was approved by the Marmara University Faculty of Medicine Ethics Committee on March 21, 2025, with decision no. 09.2025.25-0256.

Statistical Analysis

Data were analyzed using jamovi software version 2.6.44 (The jamovi project, Sydney, Australia). Descriptive statistics were presented as frequency (n) and percentage (%). Outliers were removed using the interquartile range (IQR) boxplot method. Normality of continuous variables was assessed using the Shapiro-Wilk test. For comparisons between two groups, the Independent Samples *t* test was used for normally distributed data and the Mann-Whitney *U* test for asymmetrically distributed data. For comparisons of three or more groups, Welch analysis of variance (ANOVA) and Kruskal-Wallis tests were applied, followed by post hoc analysis where necessary. The relationship between empathy (dependent variable) and ethical perception (main independent variable) was analyzed using Pearson correlation. Multiple regression analysis was performed to evaluate the combined effects of demographic factors. A correlation coefficient of $r > 0.4$ and a significance level of $p < 0.05$ were accepted.

Initially, univariate analyses were conducted to identify variables associated with the outcome. Variables considered relevant were then included in the multiple regression model.

Multicollinearity was assessed using variance inflation factor (VIF), and all VIF values were below 2, indicating no significant multicollinearity among the independent variables.

RESULTS

The mean age of participants was 19 ± 0.88 years (range, 17–21+ years) (Table 1). Among the students, 55.4% (n=51) were female and 42.4% (n=39) were male, and 2 (2.2%) did not specify sex. More than half (55.4%, n=51) had siblings. Most mothers (77%, n=70) and fathers (87.0%, n=80) had a high level of education (high school or higher). Additionally, 78.3% (n=72) of participants were born and raised in metropolitan cities. During medical education, students lived in family homes (31.5%, n=29), dormitories (54.3%, n=50), rented apartments alone (9.8%, n=9), or with roommates (4.3%, n=4).

Participants’ mean empathy score was 52.8 ± 6.10, indicating a high level of empathy, while the mean ethical perception score was 51.1 ± 6.57. Since both variables followed a normal distribution, Pearson’s correlation analysis was performed and revealed a significant positive relationship between empathy and ethical perception ($r=0.444$, $p<0.001$), confirming the main hypothesis of the study.

The mean empathy scores among participants were 55.2 ± 5.47 for female students and 49.8 ± 5.73 for male students. The differences in mean empathy scores between sexes were found to be statistically significant ($p<0.001$), indicating that female participants demonstrated higher empathy scores than male participants (Table 2).

Analysis of the relationship between participants’ mothers’ and fathers’ educational levels and their empathy scores showed that fathers’ educational levels followed a

Table 1. Sociodemographic characteristics of the participants.

Variable	Category	n (%)
Age, years	17	3 (3.3)
	18	22 (23.9)
	19	44 (47.8)
	20	18 (19.6)
	21+	5 (5.4)
Gender	Male	39 (42.4)
	Female	51 (55.4)
	Unspecified	2 (2.2)
Mothers' education level	Illiterate	2 (2.2)
	Literate	2 (2.2)
	Primary education	18 (19.6)
	High school	20 (21.7)
	Bachelors' degree or above	50 (54.3)
Fathers' education level	Illiterate	0 (0)
	Literate	2 (2.2)
	Primary education	10 (10.9)
	High school	20 (21.7)
	Bachelors' degree or above	60 (65.2)
Accommodation status	Dormitory	50 (54.3)
	Family home	29 (31.5)
	Shared apartment	4 (4.3)
	Living alone	9 (9.8)
Number of siblings	0	5 (5.4)
	1	51 (55.4)
	2	26 (28.3)
	3	5 (5.4)
	4+	5 (5.4)
Place of birth	Metropolitan	72 (78.3)
	Nonmetropolitan	16 (17.4)
	Other	4 (4.3)

normal distribution, whereas mothers' educational levels did not.

Empathy scores differed significantly according to parental education level. The distribution of participants across education groups was as follows: for mothers, low (n=22), moderate (n=20), and high (n=50); for fathers, low (n=12), moderate (n=20), and high (n=60). A significant difference was found based on the mothers' education (Kruskal-Wallis, ε^2=0.109, p=0.007), indicating a moderate effect size. Similarly, empathy scores varied by father's education (Welch ANOVA, F=42.0, p<0.001); post hoc comparisons indicated significant differences between the high-low and middle-low groups (p<0.001), while no difference was observed between the high and middle groups (p=0.231) (Table 3).

Table 2. Comparison of empathy scores by sex.

Gender	n	Mean ± SD	*t*	*df*	*p*-value
Female	51	55.2 ± 5.47	4.49	88	<0.001
Male	39	49.8 ± 5.73			

Note: Independent samples *t* test was used. Normality was assessed using the Shapiro-Wilk test and was satisfied for both groups (p > 0.05).

In the multiple linear regression analysis, empathy score was the only significant predictor of ethical perception (B=0.474, standard error (SE)=0.117, β=0.440, t=4.053, p<0.001). Other variables, including age, parental education level, number of siblings, gender, accommodation status, and place of birth, were not significantly associated with ethical perception p>0.05 for all variables). The model explained 27.6% of the variance (R^2=0.276) (Table 4).

DISCUSSION

The findings of this study show that first-year medical students at a medical faculty in Türkiye have relatively high levels of empathy and ethical perception. A statistically significant positive relationship was identified between these two variables, supporting the main hypothesis of the study. When demographic factors were examined, sex and parental education levels were found to have a significant effect on empathy, confirming the related subhypotheses, while other demographic variables did not produce a significant difference. The positive relationship between empathy and ethical perception remained significant even after adjustment for these significant factors.

Participants demonstrated relatively high empathy scores according to the Toronto Empathy Scale. Previous research has similarly reported that students in health-related disciplines tend to exhibit higher empathy levels than students in other fields. For instance, Wilson et al. (15) found that nursing and pharmacy students

Table 3. Comparison of empathy scores by parental education level.

Variable	Test	Statistic	*p-value*	Effect size	Significant pairwise comparisons
Mothers' education level	Kruskal-Wallis	*X^2 = 9.93*	0.007	ε² = 0.109	Moderate > Low (*p*=0.017)
Fathers' education level	Welch ANOVA	*F*=42.0	<0.001	ω^2 = 0.471	High > Low (*p*<0.001); Moderate > Low (*p*<0.001)

Note: The Kruskal-Wallis test showed a small-to-moderate effect size, whereas Welch ANOVA indicated a large group difference in empathy scores according to father's education level.

Table 4. Analysis of factors associated with ethical perception scores by multiple linear regression.

Predictor	B	SE	β	*t*	*p*-value
Age	-0.793	0.817	-0.1074	-0.971	0.334
Mothers' education level	-1.521	1.194	-0.2287	-1.274	0.206
Fathers' education level	1.560	1.256	0.1846	1.241	0.218
Number of siblings	0.285	0.981	0.0389	0.291	0.772
Sex					
Male vs Female	0.370	1.450	0.0563	0.255	0.799
Unspecified vs Female	5.004	4.435	0.7619	1.128	0.263
Accommodation status					
Dormitory vs Family home	-0.623	1.531	-0.0948	-0.407	0.685
Living alone vs Family home	1.599	2.430	0.2435	0.658	0.512
Shared apartment vs Family home	-2.813	3.396	-0.4283	-0.828	0.410
Place of birth					
Nonmetropolitan vs Metropolitan	1.489	1.850	0.2267	0.805	0.423
Other vs Metropolitan	2.824	3.367	0.4300	0.839	0.404
Empathy score	0.474	0.117	0.439	4.053	<0.001

Model summary: R=0.525, R^2=0.276. The model was statistically significant (F=2.51, p=0.008).

showed higher empathy scores than law students. Given that the participants in the present study were medical students, the relatively high empathy levels observed are consistent with existing literature.

Another important finding of the study was the positive and significant effect of empathy on ethical perception. Although the regression model explained 27.6% of the variance in ethical perception, the adjusted R^2 value (16.6%) suggests that some variables may have limited explanatory power relative to the sample size. This difference may indicate potential overfitting, particularly given the relatively small sample size (N=92) and the inclusion of multiple predictors. Future studies with larger samples may benefit from more parsimonious models including fewer predictors to improve stability and generalizability. Despite these limitations, the findings are consistent with previous literature. Yuguero et al. (16) also reported a meaningful relationship between empathy and ethical perception. Although Can et al. (17) reported that ethical perception was not associated with empathy skills among nurses, our findings suggest that empathy positively contributes to ethical perception. Additionally, a study conducted among first-year ergotherapy students, which shares a similar limitation to ours, identified a significant and positive relationship between empathy and ethical values (18). This supports the view that empathy may play a fundamental role in the development of ethical perception and may facilitate ethical decision-making processes.

The result from the study also suggested that female participants had significantly higher empathy scores than males. Similar findings were reported in studies conducted among medical students by Akgün et al. (19) and Yuguero et al. (16). This difference has often been discussed in the literature from both biological and sociocultural perspectives, with the implication that women may be more prone to displaying emotional responsiveness and fostering closer emotional bonds with patients.

Maternal/paternal education proved to be a determining factor in empathy development. Participants whose mothers had intermediate educational levels tended to demonstrate higher empathy scores compared with those whose mothers had low educational levels. Likewise, Ekinci and Aybek (20) observed lower empathy tendencies among individuals whose mothers were illiterate. In addition, participants whose fathers had intermediate or high educational levels seemed to show higher empathy scores than those whose fathers had low educational levels, although no significant difference was observed between the intermediate and high groups. These findings imply that empathy might be shaped by the family environment and could increase with higher parental education levels.

In contrast, the number of siblings did not appear to exhibit a statistically significant relationship with empathy levels. Karabulut et al. (21) reported that medical students with a higher number of siblings tended to demonstrate higher empathy levels. Although a weak correlation was observed in the present study, it did not attain statistical significance, which might be attributed to the relatively small sample size and the homogeneity of the study population.

Ethical decision-making requires ethical perception, empathy, and objective evaluation skills, which develop through knowledge and experience (10). Therefore, understanding how empathy and ethical perception change during medical education is important. Some studies report that empathy increases during professional education, particularly among nursing students (22), whereas others have suggested a decline among medical students (23,24). Gönüllü et al. (25) also noted that certain empathy dimensions may vary across academic years. Similarly, Yuguero et al. (16) found no significant change in empathy levels among medical students but observed increases in moral reasoning and ethical perception between the first and third years.

Current literature suggests that the erosion or stagnation of such sensitivity is closely linked to the "hidden curriculum" of medical schools. In these settings, stressful organizational cultures and the prioritization of biomedical knowledge over humanistic values may lead to student adaptations such as cynicism and emotional distancing (26). Given this challenging environment, students often perceive standard empathy training as overly "mechanical" and tend to view it as a mere mandatory "check-the-box" task that conflicts with their natural empathetic abilities (27). To mitigate this, it might be beneficial to acknowledge the "emotional capital" students initially bring, fostering a collaborative and "emotionally reflexive" practice rather than imposing standardized, repetitive patterns (27). Ultimately, for these communication skills to be genuinely adopted rather than sidelined, they likely need to be integrated as structural components of medical evaluation systems (27).

Although previous research indicates that empathy and ethical perception may change during education, studies examining how these variables are affecting each other over time remain limited. Larger and more diverse studies, particularly longitudinal and multicenter designs, are needed to determine whether the relationship observed in this study persists in later academic years.

This study had several limitations. The limited time available to distribute the survey restricted participation, and the final dataset represented less than half of the target population. In addition, 12 participants were excluded due to incomplete or inconsistent responses, which may have affected the representativeness of the sample. Voluntary participation may also have introduced volunteer bias that could influence empathy scores. The similarity of participant characteristics limited sample diversity, and the study included only first-year students from a medical faculty in Türkiye, which restricts the generalizability of the findings. Furthermore, due to the cross-sectional design of the study, causal inference is precluded; and results are interpreted as associations. Consequently, the results may primarily reflect the characteristics of first-year medical students in similar institutions. Larger multicenter studies are needed to validate these findings in broader medical student populations.

CONCLUSION

Our findings showed a significant positive correlation between empathy and ethical perception that remains significant after controlling for demographic variables. Gender and parental education were associated with empathy levels, whereas age, number of siblings, place of birth, and housing conditions were not significantly associated with empathy levels. Future studies with larger samples are needed to examine how educational level affects empathy and ethical perception in medical students. These results emphasize the importance of educational initiatives that strengthen empathy and ethical perception in medical training to support the development of compassionate and responsible physicians.

Ethical Approval: This study was approved by the Marmara University Faculty of Medicine Ethics Committee on March 21, 2025, with decision no. 09.2025.25-0256.

Informed Consent: Informed consent was obtained from all participants through an online voluntary participation form.

Peer-review: Externally peer-reviewed

Author Contributions: Concept – H.Ö., R.D., S.A., Ş.E.A., Ö.T.; Design – Ş.E.A., S.A.; Z.K., A.L.C., Ö.T.; Supervision – Ö.T.; Data Collection and/or Processing – H.Ö., R.D., S.A., Ş.E.A.; Z.K., A.L.C.; Analysis and/or Interpretation – Ş.E.A.; Literature Review – R.D., S.A.; H.Ö., Z.K., A.L.C.; Writer – R.D., Ş.E.A.; Critical Reviews – Ö.T.

Conflict of Interest: The authors declare no conflict of interest.

Financial Disclosure: The authors declare that this study has received no financial support.

Scientific Presentation: This study was presented as an oral presentation at the 25th Marmara Student Congress (MaSCo), held on 22–24 May 2025 in İstanbul, Türkiye.

AI Use Statement: During the preparation of this work, the authors used OpenAI ChatGPT for guidance on certain analytical procedures and clarification of methodological questions. All statistical analyses and data interpretations were performed manually by the authors. DeepL was used for limited word and sentence translation, and Google Gemini was used for minor assistance in organizing and editing parts of the manuscript structure. All outputs generated by these tools were carefully reviewed and revised by the authors. The authors take full responsibility for the final content of the publication.

REFERENCES

1. Preston SD, Ermler M, Lei Y, Bickel L. Understanding empathy and its disorders through a focus on the neural mechanism. Cortex. 2020;127:347–70. [CrossRef]
2. Messineo L, Seta L, Allegra M. The relationship between empathy and altruistic motivations in nursing studies: a multi-method study. BMC Nurs. 2021;20(1):124. [CrossRef]
3. Sağlam E. [An overview of empathy education in medical schools, what can be done to improve?]. Tıp Eğitimi Dünyası. 2019;18(55):62–9. Turkish. [CrossRef]
4. Keshtkar L, Ward A, Winter R, Leung C, Howick J. Does empathy decline in the clinical phase of medical education? A study of students at Leicester medical school. PEC Innov. 2024;5:100316. [CrossRef]
5. Ko EJ, Seo EJ, Lee Y, Ha J, Kim S, Park JH. The impact of an empathy education programme on empathy, communication skills and emotional competency in nursing students: A quasi-experimental study. Nurse Educ Pract. 2025;85:104364. [CrossRef]
6. Yıldırım G, Kadıoğlu S. [Basic concepts of ethics and medical ethics]. Cumhuriyet Üniversitesi Tıp Fakültesi Derg. 2007;29(2):7–12. Turkish.
7. Halldorsdottir S, Bryngeirsdottir HS. Ethical competence in nursing: A theoretical definition. Nurs Ethics. 2025;32(7):2134–62. [CrossRef]
8. Hoffman ML. Empathy and Moral Development: Implications for Caring and Justice. Cambridge, UK: Cambridge University Press; 2001.
9. Liu F, Zhou H, Yuan L, Cai Y. Effect of empathy competence on moral sensitivity in Chinese student nurses: the mediating role of emotional intelligence. BMC Nurs. 2023;22(1):483. [CrossRef]
10. Tekis E. Tıp fakültesi öğrencilerinin etik duyarlılık düzeylerinin incelenmesi [master's thesis]. Konya, Türkiye: Necmettin Erbakan University, Institute of Health Sciences; 2023. Turkish.
11. Meier E, Rigter T, Schijven MP, van den Hoven M, Bak MAR. The impact of digital health technologies on moral responsibility: a scoping review. Med Health Care Philos. 2025;28(1):17–31. Erratum in: Med Health Care Philos. 2025;28(2):367–8. [CrossRef]
12. Spreng RN, McKinnon MC, Mar RA, Levine B. The Toronto Empathy Questionnaire: scale development and initial validation of a factor-analytic solution to multiple empathy measures. J Pers Assess. 2009;91(1):62–71. [CrossRef]
13. Totan T, Dogan T, Sapmaz F. The Toronto Empathy Questionnaire: Evaluation of psychometric properties among Turkish university students. Eurasian J Educ Res. 2012;12(46):179–98.
14. Kurt E, Keser A, Gokmen Y. [Scale development study on ethical problems: An application on medical students]. Nobel Medicus. 2015;11(1):55–63. [Turkish]
15. Wilson SE, Prescott J, Becket G. Empathy levels in first- and third-year students in health and non-health disciplines. Am J Pharm Educ. 2012;76(2):24. [CrossRef]
16. Yuguero O, Esquerda M, Viñas J, Soler-Gonzalez J, Pifarré J. Ethics and empathy: The relationship between moral reasoning, ethical sensitivity and empathy in medical students. Rev Clin Esp (Barc). 2019;219(2):73–8. English, Spanish. [CrossRef]
17. Can R, Işık MT, İnce S. [The Effect of intern nurses' ethical sensitivity on empathy skills: A cross-sectional descriptive study]. Turkiye Klinikleri J Med Ethics. 2022;30(3):264–73. Turkish. [CrossRef]
18. Kocademir FN, Özata Değerli MN, Altuntaş O. [Investigation of occupational therapy students' social sensitivity, empathy skills, and susceptibility to ethical values]. Ergoterapi ve Rehabilitasyon Derg. 2023;11(3):65–74. Turkish. [CrossRef]
19. Akgün Ö, Akdeniz M, Kavukcu E, Avcı HH. Medical students' empathy level differences by medical year, gender, and specialty interest in Akdeniz University. J Med Educ Curric Dev. 2020;7:2382120520940658. [CrossRef]
20. Ekinci O, Aybek B. [Investigation of prospective teachers' empathic and critical thinking dispositions]. Ilkogretim Online. 2010;9(2):816–27. Turkish.

21 Karabulut S, Yildirim R, Zengin H, Celik Z. [Analysis of communication and empathy skills of first-, second-, and third-year medical students]. Tıp Eğitimi Dünyası. 2020;19(58):42–53. Turkish. [CrossRef]

22 Agacdiken S, Aydogan A. [Empathic skills and ethical sensitivity relationship in nurses]. GUJHS. 2017;6(2):122–9. Turkish.

23 Igde FA, Sahin MK. Changes in empathy during medical education: an example from Turkey. Pak J Med Sci. 2017;33(5):1177–81. [CrossRef]

24 Hojat M, Vergare MJ, Maxwell K, Brainard G, Herrine SK, Isenberg GA, et al. The devil is in the third year: a longitudinal study of erosion of empathy in medical school. Acad Med. 2009;84(9):1182–91. Erratum in: Acad Med. 2009;84(11):1616. [CrossRef]

25 Gönüllü I, Erden S, Gökmen D. Evaluation of student empathy level during the first five years of medical education at Ankara University. Journal of Higher Education and Science. 2017;7(3):651–6.

26 Howick J, Dudko M, Feng SN, Ahmed AA, Alluri N, Nockels K, et al. Why might medical student empathy change throughout medical school? a systematic review and thematic synthesis of qualitative studies. BMC Med Educ. 2023;23(1):270. [CrossRef]

27 Harvey SDC, Stacey CL. Being kind in unkind spaces: a qualitative examination of how medical educators and first year medical students perceive empathy training. Front Sociol. 2024;8:1272357. [CrossRef]

RESEARCH ARTICLE | Yeditepe Journal of Health Sciences, 14(1):18–25

Improving Peer Mentoring Competence Through Peer Mentor Training: A Quasi-Experimental Study

Feyza Şule Aslan[1], Şükrü Toprak Durukan[1], Çağrı Gürpınar[1], Firuze Bihter Batur[1], Fatma Nur Çatarmut[1], Ecem Tat[1], Doğa Akkuş[1], Kayra Danışman[1], Muhammed Enes Kızıldil[1], Elif Berfin Sezik[1], Elif Şükran İşler[1], Alihan Akdağ[1], Özlem Tanrıöver[2]

[1] Marmara University Faculty of Medicine, İstanbul, Türkiye; [2] Department of Medical Education, Marmara University Faculty of Medicine, İstanbul, Türkiye.

Abstract

Objective: Peer mentoring programs are increasingly implemented in higher education to support students' academic success and personal development. However, mentors often receive limited formal preparation for their roles. Structured peer mentor training programs may enhance mentors' competencies, including self-awareness, emotional regulation, empathy, and mentoring self-efficacy. This study aimed to evaluate the impact of a peer mentor training program on peer mentors' perceived mentoring competencies.

Materials and Methods: A quasi-experimental study design was used. A total of 25 students volunteered for peer mentoring and participated in a training program designed to develop mentoring competencies. Participants completed a 10-item questionnaire before and after the training. Items assessed five domains: self-awareness, self-management, social awareness, relationship management, and mentoring self-efficacy. Responses were measured on a five-point Likert scale. Descriptive statistics were calculated, and a Wilcoxon signed-rank test was conducted to compare pretest and posttest scores. Internal consistency reliability was evaluated using Cronbach's alpha (α).

Results: A total of 19 peer mentors completed both assessments. The median total mentoring competency score increased from pretest (median=41, IQR=4) to posttest (median=45, IQR=6). The Wilcoxon signed-rank test demonstrated a statistically significant increase in scores following the training (V=97.5, Z=-2.801, p=0.005), with a large effect size (r=0.643). Internal consistency of the scale improved from pretest (α=0.587) to posttest (α=0.859).

Conclusion: The findings suggest that peer mentor training programs can significantly improve mentors' perceived competencies. Providing structured preparation for mentors may strengthen mentoring relationships and enhance the effectiveness of peer mentoring programs.

Keywords: Mentoring, medical students, medical education, peer group, professional competence

Received February 17, 2026 **Accepted** April 16, 2026 **Published** April 29, 2026 **DOI** 10.36519/yjhs.2026.1102

Suggested Citation Aslan FŞ, Durukan ŞT, Gürpınar Ç, Batur FB, Çatarmut FN, Tat E, et al. Improving peer mentoring competence through peer mentor training: A quasi-experimental study. Yeditepe JHS. 2026;14(1):18–25.

Correspondence Feyza Şule Aslan **E-mail** feyza.sule@marun.edu.tr

This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.

INTRODUCTION

Medical education involves an intense academic workload, emotional stress, and challenges in terms of professional identity development (1,2). In this demanding environment, peer mentoring stands out as a low-cost and sustainable educational intervention that strengthens the learning atmosphere by enabling students to receive support from peers with similar experiences (3). Defined as a reciprocal developmental relationship between students of similar status but differing levels of experience, peer mentoring fosters growth through shared experiences and empathy (4). More specifically, near-peer mentoring refers to an approach where senior students provide guidance to junior students who are relatively close to them in training level, typically by one or two years (5). This proximity facilitates a high degree of social and cognitive congruence, allowing the mentor to act as a realistic role model who understands the immediate challenges of the curriculum (6). Unlike traditional hierarchical mentoring, peer mentoring is characterized by reduced power differentials, promoting psychological safety and authentic exchange (7). However, few studies in our country have systematically evaluated peer mentoring programs.

Mentoring relationships play a significant role in professional and academic development (8,9). Structured mentoring programs can enhance mentors' interpersonal and professional competencies (10). Peer mentoring has become an increasingly important educational strategy in higher education, particularly in fields such as medical education where students often face demanding academic and emotional challenges (5,11). Evidence suggests that these programs facilitate student connectedness, boosting psychological safety and motivation (3,12), which aligns with Tinto's integration theory regarding student persistence and connectedness to the academic community (13). Recent national findings indicate that such interventions yield moderate-to-high effects on emotional regulation and resilience (14), providing an emotional scaffolding that aids adaptation to university life (15,16). Peer mentoring programs aim to support students' academic development, professional growth, and well-being through guidance provided by more experienced students (17,18).

The benefits of these programs extend significantly to the mentors, fostering increased responsibility, autonomy, and professional maturity (17). Furthermore, structured peer support can facilitate informal knowledge-sharing and help bridge success gaps between different student demographics (3). Effective mentoring relationships require a range of interpersonal and intrapersonal competencies. These competencies include self-awareness, emotional regulation, empathy, communication skills, and the ability to build supportive relationships (11,19). Relational factors, such as trust, loyalty, and emotional attunement, are also significant predictors of relationship quality (20). Mentors are expected not only to provide academic guidance but also to foster trust, encourage reflection, and support mentees' personal development (21).

Despite the recognized importance of mentoring competencies, many peer mentors receive limited formal training before beginning their roles. Without adequate preparation, mentors may feel uncertain about how to manage mentoring interactions or provide appropriate support to mentees. This lack of orientation can lead to role ambiguity and mentor overload (5). Previous research suggests that structured mentor training programs can enhance mentors' confidence, communication skills, and mentoring effectiveness (22). Training programs may help mentors better understand their roles and develop strategies for managing emotional and interpersonal aspects of mentoring relationships (23).

However, empirical evidence evaluating the effectiveness of mentor training programs remains limited. Understanding how mentor training influences mentors' perceived competencies may provide valuable insights for designing more effective mentoring programs. Therefore, the aim of this study was to evaluate the impact of a peer mentor training program on mentors' perceived mentoring competencies using a quasi-experimental study design.

MATERIALS AND METHODS

This study used a quasi-experimental quantitative pretest-posttest design to evaluate the impact of a peer mentor training program on mentors' perceived competencies. The study was conducted at the medical school at the beginning of the 2025–2026 academic year. This study was approved by the Non-Drug and Non-Medical Device Research Ethics Committee of Marmara University Faculty of Medicine on February 20, 2026, with decision no. 09.2026.26-0247.

A structured near-peer mentoring program was implemented to support students' academic adaptation, professional development, and well-being. Near-peer mentoring refers to a mentoring approach in which senior students provide guidance and support to junior students who are relatively close to them in training level and share similar educational experiences (5).

The program included 25 volunteer mentors from the fourth- and fifth-year medical classes and 32 mentees from

the preclinical years. Mentors were recruited through an open invitation sent to senior students, and participation was voluntary. Mentees enrolled in the program based on their interest in receiving peer guidance during the early years of their medical education. Nineteen mentors completed both the pretraining and posttraining assessments and were included in the final analysis.

Prior to the initiation of mentoring activities, mentors participated in a structured training session delivered by the faculty member from the Department of Medical Education. During the training, the principles of mentoring were introduced using Boyatzis' intentional change framework (19) emphasizing self-awareness, empathy, and relationship-centered mentoring. The training also included practical guidance on communication skills, active listening, goal setting, and maintaining appropriate professional boundaries in mentoring relationships.

In addition, mentors were informed about the institutional well-being support system and were encouraged to refer mentees to the student well-being center when psychological or personal concerns exceeded the scope of peer mentoring. Mentors were strictly advised to refrain from addressing complex psychological or personal issues autonomously, mandating the escalation of such matters to faculty for expert support.

To evaluate the effectiveness of the mentor training, participating mentors completed pretest and posttest assessments measuring their knowledge and perceived competencies related to mentoring. Following the training, mentors were paired with mentees and encouraged to meet regularly throughout the academic year to discuss academic challenges, adaptation to medical school, career planning, and well-being.

The peer mentoring program was developed as part of an institutional initiative to foster a supportive learning environment and strengthen peer support within the medical school (Table 1).

Mentoring competencies were assessed using a 10-item self-report questionnaire developed to evaluate key aspects of mentoring skills. The questionnaire covered five domains: self-awareness, self-management, social awareness/empathy, relationship management, and mentoring self-efficacy. Responses were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Total scores were calculated by summing all item responses, with higher scores indicating greater perceived mentoring competence.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize participant characteristics and mentoring competency scores. Categorical variables were reported as number (n) and percentage (%), while continuous variables were presented as mean ± standard deviation (SD) and median with interquartile range (IQR) and range, as appropriate. The internal consistency of the mentoring competency scale was evaluated using Cronbach's alpha (α) for the pretest and posttest scores.

Table 1. Comparison of empathy scores by sex.

Topic	Content
Mentoring principles	Roles and responsibilities of mentors
Boyatzis framework	Self-awareness, empathy, intentional development
Communication skills	Active listening, feedback
Boundaries	Professional limits in mentoring
Referral pathways	Well-being center and faculty support

Because the study included a small sample and repeated measurements from the same participants, non-parametric methods were selected as the primary analytic approach. Differences between pretest and posttest total mentoring competency scores were assessed using the Wilcoxon signed-rank test. A continuity correction was applied due to ties in the paired scores. Effect size was calculated as $r=Z/\sqrt{N}$, with values of 0.1, 0.3, and 0.5 representing small, medium, and large effects, respectively. The relationship between pretest and posttest scores was examined using Spearman's rank correlation coefficient (ρ), and 95% confidence intervals (CIs) were reported. All statistical tests were two-sided, and statistical significance was set at $p < 0.05$.

RESULTS

A total of 19 peer mentors completed both the pretest and posttest assessments. The sample consisted of 10 (52.6%) female participants and 9 (47.4%) male participants, with a mean age of 22.89 years (SD=0.81; range, 22–25). The majority were fifth-year medical students (n=16, 84.2%), and most had no prior mentoring experience (n=16, 84.2%). Demographic characteristics of participants are presented in Table 2.

Pretest total scores ranged from 36 to 50 (median=41, IQR=4), and posttest scores ranged from 35 to 50 (median=45, IQR=6), indicating an overall improvement in mentoring competency scores following the training

Table 2. Demographic characteristics of participants (N=19).

Variable	n (%)
Sex	
Female	10 (52.6)
Male	9 (47.4)
School Year	
Fifth year	16 (84.2)
Fourth year	3 (15.8)
Prior mentoring experience	
No	16 (84.2)
Yes	3 (15.8)
Age, year	
Mean ± SD	22.89 ± 0.81
Median (IQR)	23 (1)
Range	22–25

IQR: Interquartile range, **SD:** Standard deviation.
Note: Prior mentoring experience coded as 0=No, 1=Yes.

Table 3. Descriptive statistics, reliability, and inferential test results for mentoring competency scores (N=19).

Measure	Pretest	Posttest
Descriptive Statistics		
Median (IQR)	41 (4)	45 (6)
Mean (SD)	41.42 (3.24)	44.63 (4.19)
Range	36–50	35–50
Reliability		
Cronbach's α	0.587	0.854
Wilcoxon signed-rank test		
V	97.5	
Z	-2.801	
p	0.005	
r	0.643 (large)	

IQR: Interquartile range, **SD:** Standard deviation.
Note: Nonparametric methods were used because of the small sample size (N=19). A continuity correction was applied because of tied ranks. Effect sizes were interpreted as small (≥0.10), medium (≥0.30), and large (≥0.50).

program. Descriptive statistics, reliability coefficients, and inferential test results are presented in Table 3.

Reliability Analysis

The internal consistency of the mentoring competency scale was assessed using Cronbach's α. As shown in Table 3, the reliability coefficient for the pretest was α=0.587, while the posttest demonstrated higher internal consistency (α=0.854).

A continuity correction was applied to the Wilcoxon signed-rank test due to ties. Effect size r interpreted as: small (≥0.10), medium (≥0.30), and large (≥0.50). The wide CI for Spearman's ρ reflects the small sample size.

Pre-Postcomparison

A Wilcoxon signed-rank test was conducted as the primary analysis to examine differences between pretest and posttest scores, given the small sample size. A continuity correction was applied due to ties in the data. The results indicated a statistically significant increase in mentoring competency scores following the training program, V=97.5, Z=-2.801, p=0.005. The effect size was large (r=0.643), suggesting a strong association between the training and improvements in mentors' perceived competencies (see Table 3). Individual pretest and posttest scores are illustrated in Figure 1.

Correlation Analysis

Spearman's rank correlation was conducted to examine the relationship between pretest and posttest scores. The analysis revealed a moderate positive correlation between pretest and posttest scores (ρ=0.463, p=0.031; 95% CI, 0.011–0.758), suggesting that participants who initially reported higher mentoring competencies tended to maintain higher scores after the training. The wide CI reflects the small sample size, and the magnitude of the correlation should be interpreted with caution.

Domain-Level Analysis

Domain-level analyses were conducted to examine which competency areas drove the overall improvement. Wilcoxon signed-rank tests were performed separately for each of the five domains; these analyses were exploratory and no correction for multiple comparisons was applied. Results indicated a statistically significant improvement in mentoring self-efficacy (V=120.0, Z=-3.412, p=0.001, r=0.783) and social awareness/empathy (V=55.0, Z=-1.971, p=0.049, r=0.452). No statistically significant changes were observed in self-awareness (p=0.302), self-management (p=0.666), or relationship management (p=0.115), though small- to-medium effect sizes were observed across these domains. Domain-level score distributions are presented in Figure 2.

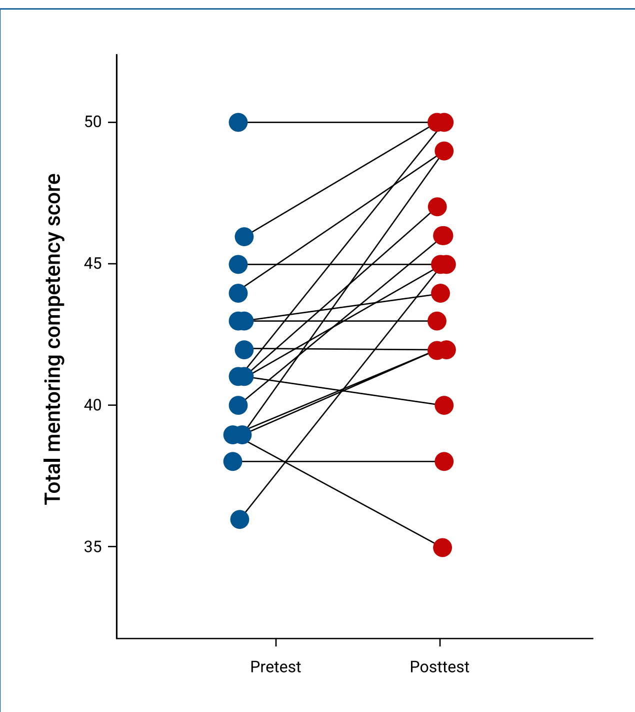


FIGURE 1. Individual pretest and posttest total mentoring competency scores (N=19).
Note: Lines connect scores from the same participant.

DISCUSSION

This study explored the impact of a peer mentor training program on mentors' perceived competencies. The findings showed a significant increase in mentoring competency scores after the training program. This improvement was observed following the training and may reflect changes in several key mentoring skills, including self-awareness, emotional regulation, empathy, relationship management, and mentoring self-efficacy.

These results align with previous research suggesting that structured training interventions are associated with improvements in mentors' self-efficacy, professional competencies, and interpersonal skills (12,24–27). Training programs provide a crucial opportunity for mentors to reflect on their roles and gain a better understanding of mentees' needs. Specifically, earlier studies show that training improves communication strategies, enabling mentors to become more intentional, use open-ended questions to encourage independent thinking, and maintain composure in stressful situations (24–26). Furthermore, interventions have been shown to boost competencies related to establishing helping relationships, utilizing institutional resources, and developing concrete help-seeking skills (28). The consistency across these studies suggests that the perceived competency gains observed in the present study may reflect improvements in communication and relationship-building skills.

Another noteworthy finding was the moderate positive correlation between pretest and posttest scores, alongside relatively lower reliability in the pretest compared to the posttest. The correlation suggests that while the training was beneficial across the entire sample, participants who initially perceived themselves as more competent tended to maintain relatively higher scores, preserving individual differences in baseline experience or confidence. Meanwhile, the lower pretest reliability likely reflects participants' initial uncertainty about their mentoring competencies. Following the training, the higher consistency in posttest responses may reflect a clearer understanding of mentoring concepts and behaviors. This interpretation aligns with the literature suggesting that mentor training helps participants better define their roles, understand appropriate boundaries, and reflect more deeply on their responsibilities (25,26). The large effect size observed in this study further supports a possible association between the training program and improvements in participants' perceived mentoring competencies. This finding highlights the importance of preparing peer mentors through structured training before they begin mentoring relationships.

While the present study demonstrates meaningful short-term gains in mentors' perceived preparedness, the longevity of these effects remains an important consideration. Longitudinal research, such as the study by Uçar et al. (29), indicates that while mentor training improves competence in the short and medium term, its long-term effects may only be partly sustained. As the current study did not include a long-term follow-up, the short-term improvements observed are consistent with these existing patterns.

Several limitations should be considered when interpreting these findings. To begin with, the study included a relatively small sample size (n=19), which may limit the generalizability of the results. Regarding the measurement tool, the instrument was not intended as a standardized scale; rather, it consisted of items developed based on the literature and expert opinion. Therefore, no formal validity analyses (e.g., factor analysis) were conducted. Cronbach's α was reported only to indicate internal consistency, and the lack of comprehensive psychometric evaluation should be considered a limitation. Moreover, the study relied on self-reported measures rather than objective assessments of mentoring behavior. Furthermore, the evaluation was limited to the immediate post-intervention period and did not include any follow-up measurements. As such, the sustainability and long-term transfer of mentoring competencies into

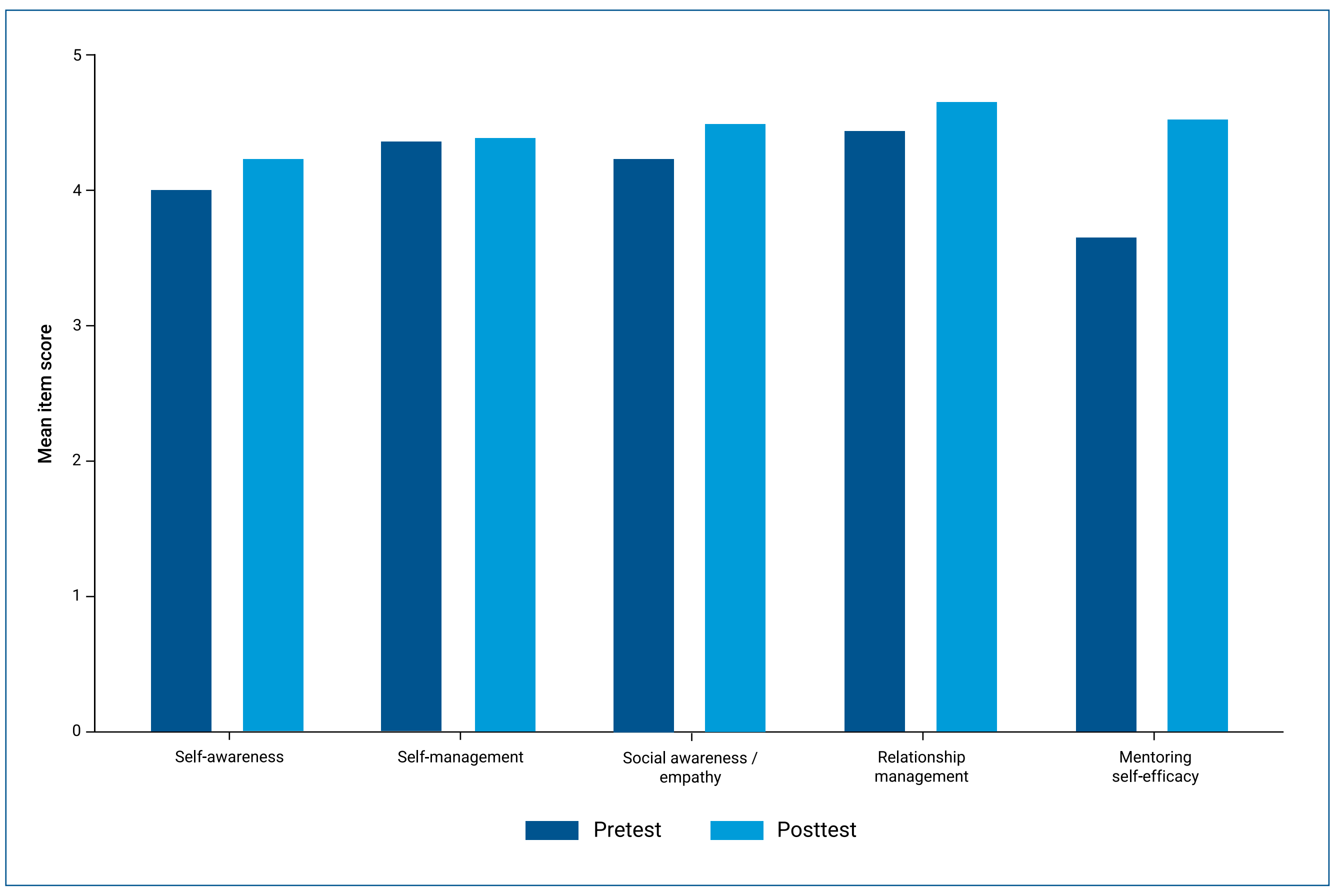


FIGURE 2. Mean pretest and posttest scores across five mentoring competency domains (N=19).
Note: Domain scores represent the mean of two items per domain. Scale range, 1-5.

practice remain unclear. Future research could address these limitations by including larger samples, longitudinal study designs, and evaluations from both mentors and mentees to better understand the long-term impact of mentor training programs.

CONCLUSION

This study highlights the efficacy of formal training in augmenting the professional development of peer mentors, specifically regarding their perceived capabilities. Implementing systematic mentor training prior to role initiation significantly enhances the efficiency of peer mentoring, fostering the development of more robust, evidence-based programs within academic environments.

Ethical Approval: This study was approved by the Non-Drug and Non-Medical Device Research Ethics Committee of Marmara University Faculty of Medicine on February 20, 2026, with decision no. 09.2026.26-0247.

Informed Consent: Written informed consent was obtained from all participants.

Peer-review: Externally peer-reviewed

Author Contributions: Concept – D.A., Ç.G., E.B.S., E.Ş.İ., Ö.T.; Design – D.A., Ç.G., A.A., Ö.T.; Supervision – F.Ş.A., E.T., F.B.B., Ö.T., Ş.T.D.; Materials – F.N.Ç., F.Ş.A., A.A.; Data Collection and/or Processing – E.T., F.B.B., E.B.S., E.Ş.İ.; Analysis and/or Interpretation – F.N.Ç., F.Ş.A., Ö.T., Ş.T.D.; Literature Review – F.Ş.A., E.T., F.B.B., E.B.S., E.Ş.İ. D.A.; Writing – M.E.K., K.D., F.N.Ç., F.Ş.A., Ç.G., Ö.T.; Critical Reviews – M.E.K., K.D., Ö.T., Ş.T.D.; Other – A.A., M.E.K., K.D.

Conflict of Interest: The authors declare no conflict of interest.

Financial Disclosure: The authors declare that this study has received no financial support.

Acknowledgements: The authors thank the peer mentors and mentees for their valuable participation and contributions to this study.

AI Use Statement: During the preparation of this manuscript, the authors used OpenAI ChatGPT for English language editing and generating summaries of published literature related to the topic. The authors reviewed and edited all outputs and take full responsibility for the final content of the manuscript.

REFERENCES

1 Tanriover O, Peker S, Hidiroglu S, Kitapcioglu D, Inanici SY, Karamustafalioglu N, et al. The emotions experienced by family medicine residents and interns during their clinical trainings: a qualitative study. Prim Health Care Res Dev. 2023;24:e25. [CrossRef]

2 Drossard S, Härtl A. Development and implementation of digital peer mentoring in small groups for first-year medical students. GMS J Med Educ. 2024;41(1):Doc11. [CrossRef]

3 Hayes B, Sidarus N, Ramnani N, McEvoy JP, Freestone NS. Peer mentoring to support learning in the life sciences. Emerg Top Life Sci. 2026;9(6):ETLS20253022. [CrossRef]

4 Akinla O, Hagan P, Atiomo W. A systematic review of the literature describing the outcomes of near-peer mentoring programs for first year medical students. BMC Med Educ. 2018;18(1):98. Erratum in: BMC Med Educ. 2018;18(1):167. [CrossRef]

5 Preovolos C, Grant A, Rayner M, Fitzgerald K, Ng L. Peer mentoring by medical students for medical students: a scoping review. Med Sci Educ. 2024;34(6):1577–602. [CrossRef]

6 Taylor JS, Faghri S, Aggarwal N, Zeller K, Dollase R, Reis SP. Developing a peer-mentor program for medical students. Teach Learn Med. 2013;25(1):97–102. [CrossRef]

7 Collier PJ. Why peer mentoring is an effective approach for promoting college student success. Metrop Univ. 2017;28(3):9–19. [CrossRef]

8 Sambunjak D, Straus SE, Marusić A. Mentoring in academic medicine: a systematic review. JAMA. 2006;296(9):1103–15. [CrossRef]

9 Lim JJ, Verbo VA, Khandelwal G, Nograles NH. Peer mentoring as a community of practice in medical education. Clin Teach. 2025;22(6):e70238. [CrossRef]

10 Buddeberg-Fischer B, Herta KD. Formal mentoring programmes for medical students and doctors--a review of the Medline literature. Med Teach. 2006;28(3):248–57. [CrossRef]

11 Teo MYK, Ibrahim H, Lin CKR, Hamid NABA, Govindasamy R, Somasundaram N, et al. Mentoring as a complex adaptive system - a systematic scoping review of prevailing mentoring theories in medical education. BMC Med Educ. 2024;24(1):726. [CrossRef]

12 Gehreke L, Schilling H, Kauffeld S. Effectiveness of peer mentoring in the study entry phase: a systematic review. Rev Educ. 2024;12(1):e3462. [CrossRef]

13 Tinto V. Leaving college: rethinking the causes and cures of student attrition. 2nd ed. Chicago (IL): University of Chicago Press; 1993.

14 Yalçın MA, Yavuz Güler Ç. The effectiveness of peer counseling in school and university settings: a cross-cultural meta-analysis. J Int Educ Sci. 2025;12(45):74–99. [CrossRef]

15 Korkmaz M, Tek-Ayaz S. Determining the effect of peer mentoring programme applied to nursing students on perceived stress and adaptation to university life. Educ Acad Res. 2025;57:23–30.

16 Lillekroken D, Kvalvaag HM, Lindeflaten K, Fłølo TN, Krogstad K, Hessevaagbakke E. Educating the nurses of tomorrow: exploring first-year nursing students' reflections on a one-week senior peer-mentor supervised inspiration practice in nursing homes. BMC Nurs. 2024;23(1):132. [CrossRef]

17 Cho M, Lee YS. Voluntary peer-mentoring program for undergraduate medical students: exploring the experiences of mentors and mentees. Korean J Med Educ. 2021;33(3):175–90. [CrossRef]

18 Dickson KS, Glass JE, Barnett ML, Graham AK, Powell BJ, Stadnick NA. Value of peer mentoring for early career professional, research, and personal development: a case study of implementation scientists. J Clin Transl Sci. 2021;5(1):e112. [CrossRef]

19 Boyatzis RE. Leadership development from a complexity perspective. Consult Psychol J Pract Res. 2008;60(4):298–313. [CrossRef]

20 Erdem G, Safi OA. Predictors of mentoring relationship quality in a college peer mentoring program. Int J Mentor Coach Educ. 2024;13(3):361–77. [CrossRef]

21 Jenkins S. David Clutterbuck, mentoring and coaching. Int J Sports Sci Coach. 2013;8(1):139–53. [CrossRef]

22 Ragins BR, Kram KE, editors. The handbook of mentoring at work: theory, research, and practice. Thousand Oaks (CA): Sage Publications; 2007.

23 Kram KE. Mentoring at work: developmental relationships in organizational life. 3rd ed. Glenview (IL): Scott, Foresman and Company; 1985.

24 Tuck ME, Palomino KA, Bradley JA, Mohr-Schroeder M, Bradley LH. A coaching-based training for underrepresented mentors in STEM. Educ Sci (Basel). 2025;15(3):289. [CrossRef]

25 Banerjee SC, Parker PA, Staley JM, Manna R, Mahoney C, Liberman L. Mentor communication skills training: development, feasibility, and preliminary efficacy. BMC Med Educ. 2024;24(1):646. [CrossRef]

26 Frei E, Stamm M, Buddeberg-Fischer B. Mentoring programs for medical students--a review of the PubMed literature 2000–2008. BMC Med Educ. 2010;10:32. [CrossRef]

27 Hagrass HM, Ibrahim SAE, Anany RIE, El-Gazar HE. Effect of an educational program about mentorship competencies on nurse mentors' performance: a quasi-experimental study. BMC Nurs. 2023;22(1):429. [CrossRef]

28 Terrion JL, Philion R, Leonard D. An evaluation of a university peer-mentoring training programme. Int J Evid Based Coach Mentor. 2007;5(1):42–57. [CrossRef]

29 Uçar MY. The effect of mentor training program on competence and attitude regarding mentorship. J Fam Couns Educ. 2017;2(1):50–71. [CrossRef]