

Assessing Levels of Empathy among Undergraduate Medical Students: Results of a Cross-Sectional Study Conducted in a Medical College in Sohar, Oman

Abdul Hafeez Qureshi^{1*}, Ramitha AlHabsi², Sharifa Alghatrifi², Sara AlHabsi², Omnia AlHarrasi¹

ABSTRACT

OBJECTIVE: Empathy is an essential aspect of communication skills for physicians, especially primary care physicians. The study aims to explore the empathy scores among medical students at different stages of medical training and to analyze the effect of gender and career choice on the empathy scores of medical students.

METHODOLOGY: A cross-sectional study was conducted from October 2021 to January 2022 in a medical college in Sohar, Oman. All the students were eligible to participate in this study. Simple random sampling was employed, and participants were administered a 20-item Jefferson Scale of Empathy-Student (JSE-S) Version. Data were analyzed using SPSS version 22. Mean and standard deviation were reported for continuous variables. Subgroup comparisons were conducted using t-test and ANOVA.

RESULTS: Out of 424 participants, the majority were female (n=390,92%), and over half of the students (56%) were less than 22 years of age. The mean empathy score of students on the JSE-S scale was 104.6 ± 17.43 (range: 37-140). Subgroup analysis revealed that males had a slightly high score on JSE-S (male: 105.7±14.56, female: 104.5±17.6, p=0.23). Empathy scores showed an increasing trend as the student progressed through medical school (6th year: 106.2±16.16). Empathy scores were almost similar for students who had preferred people or procedure-oriented fields as their career pathway (p=0.59).

CONCLUSION: The study reflects the need to include empathy in teaching communication skills to medical students as an integral part of the medical school curriculum, which could assist them in becoming compassionate physicians and increasing patient satisfaction.

KEYWORDS: Empathy, empathy scores, JSPE, Medical Students, Physicians, Undergraduate Medical Students.

INTRODUCTION

Research over the past years has shown that doctors' empathetic behavior towards patients is a crucial component of an effective healthcare system. Mercer and Reynolds have defined empathy as a physician's competence to understand the patient's situation, perspective, and feelings, to communicate that understanding and check its accuracy, and to act on that understanding in a helpful therapeutic way¹.

The training of medicine and practice may be such that empathy is undervalued and under-taught as part of communication Skills. During undergraduate teaching of medical students, more focus on empathy significantly improves the empathy skills of medical students. Recent work with medical students has indicated that empathy skills can be enhanced

considerably by emphasizing compassion during undergraduate teaching¹.

Empathetic healthcare workers can develop feelings of satisfaction among their patients, which may lead to better patient and clinician outcomes. Compassionate physicians can obtain a good rapport with the patients, which may help them in getting an appropriate history of patients' symptoms to reach a correct diagnosis, increase the patient's participation in their care and compliance to medications, ultimately reducing health care costs, and improving the quality of care^{3,4}.

Producing empathetic physicians is one of the objectives of medical school⁵. However, studies show different evidence regarding years of medical training and empathy scores^{6,7}. Some researchers conclude that empathy among medical students declines with the progress in medical training; during the initial years, medical students are excited to become physicians and are more conscious about patients' suffering/distress^{6,7}, while other researchers found that there is a negative association between burnout, stress and empathy scores among medical students^{8,9}.

The difference in empathy scores across different

¹Department of Family Medicine, College of Medicine and Health Sciences, National University of Science and Technology, Sohar Campus, Oman.

²Sultan Qaboos University, Muscat, Oman.

*Correspondence: drhafeez@hotmail.com

doi: 10.22442/jlumhs.2023.01024

Received: 14-03-2023

Revised: 02-05-2023

Accepted: 09-05-2023

Published Online: 01-06-2023



studies has been observed even when using a similar scale. This could be because various universities use diverse methods of teaching empathy in medical curricula. A mean empathy score of 98.15 ± 13.29 (SD: standard deviation)(10) was found among Iranian medical students; another study from Iran shows a mean score of 61.11 ± 2.23 (SD)¹¹, Brazilian medical students had a score of 72 ± 13 (SD)¹², Moroccan and Pakistani medical students scored 97.65 ± 14.10 (SD)¹³ and 90.63 ± 11.55 (SD)¹⁴, respectively.

Different levels of empathy among medical students are dependent upon variously identified factors^{5,16}. Some studies report that female medical students and doctors are more empathetic than their counterparts⁷. At the same time, others have found that career choices in the current year of medical training are the factors that can affect empathy among medical students^{15,17}.

Because of the contradictory findings and lack of studies from Oman, the present study was undertaken to determine the empathy scores among medical students at different levels of their medical training and to analyze the effect of gender and career choice on empathy scores.

METHODOLOGY

A cross-sectional study was conducted from October 2021 to January 2022 in a medical college in Sohar, Oman. During the time of data collection, a total of 916 undergraduate students were enrolled in the college and were eligible to participate in the study. Simple random sampling was employed to gather the study sample. A list of all the medical students was obtained from the administration, and a random number generator was used to select participants. They were then explained about the study protocol, and informed consent was obtained from them. To measure the 5% difference in the mean scores for empathy at a 95% confidence interval, with an error margin of 5%, and 80% power, we need 348 medical students. After inflating the sample size to 30% for non-responders, the final sample size was 422 students.

The Ethics and Biosafety Committee (EBC) of the Medical University of Sohar, Oman, reviewed and approved the study. The confidentiality of the participants was ensured at all stages of the research. A JSE-S questionnaire, medical student-specific, was given to the students. The questionnaire was composed of two sections. The first section included the demographic characteristics of the participants, including age, gender, year of medical training and preferred career option. For ease of analysis and reporting, the future specialty was divided into three major categories, including predominantly People Oriented, which comprises internal medicine, pediatrics, obstetrics-gynaecology, family medicine, and psychiatry; predominantly Procedure-Oriented, which comprises surgery, plastic surgery,

neurosurgery, orthopedic surgery, and public health. The third category included those who could not decide on their future specialty (Undecided).

The second part of the questionnaire included a tool to measure empathy. However, only a few tools were available to measure the empathy levels of doctors and patients. However, one scale, the Jefferson Scale of Physician Empathy (JSPE), has been widely used across studies from 74 countries and has been translated into 56 languages¹⁸. Studies have calculated the scale's psychometric properties and found it reliable¹⁹. To assess empathy in medical students, JSE-S version was particularly designed. The researchers obtained permission to use the JSPE scale from the Jefferson Institute. The JSE-S questionnaire is self-administered and comprises 20 items. This scale is divided into three parts: Perspective Taking (ten positively worded items), Compassionate Care (eight negatively worded items), and Standing in the Patient's Shoes (two negatively worded items). The responses were obtained on a 7-point Likert scale ranging from (1= strongly disagree) to (7= strongly agree) for positive and negative items; the scoring was reversed to 1= strongly agree and 7= strongly disagree. The JSPE-S total score ranges from 20 to 140; higher scores on this scale indicate a higher level of empathy and vice versa. The English version of the scale will be used for this study. Internal consistency (Cronbach alpha) of JSE-S was calculated to be 0.87.

Data were entered and analyzed using SPSS version 20. Before data analysis, the scores on JSE-S were positively or reverse-scored as necessary and were then summed to calculate the mean empathy score on JSE-S; for continuous and categorized variables, frequencies and proportions were calculated by mean \pm standard deviations (SDs). The Independent T-test analyzed the empathy levels stratified by gender and preferred career choice. For establishing statistically significant differences between empathy levels of different years of medical students, variance (ANOVA) was used. A P-value of less than <0.05 was considered statistically significant.

RESULTS

A total of 600 questionnaires were circulated to the students, of which 424 had completed and returned the questionnaire, yielding a response rate of $(424/600) = 70.6\%$. Of the 424 students, over half were below 22 years of age 237(55.7%). The majority of the participants were females 390(92%), and males were less in numbers 34(8%). Among the study participants, the highest rate of participation was from first-year students 84 (19.8%), 76 (17.9%) belonged to the second year, 66 (15.6%) were from the third year, and 78 (18.4%), 56 (13.2%), 64 (15.1%) participants were from fourth, fifth and sixth year respectively. About 179 (42.2%) study participants wanted to opt

for a procedure related career as their future specialty (Table I). The overall mean empathy scores on JSE-S were 104.60±17.43(SD). The highest empathy scores were seen among students aged 25 to 27 years, 109.60±12.09(SD), while the other two age groups had almost similar scores. However, there was an insignificant difference between the scores of male and study participants on JSE-S (p=0.23). Second-year students obtained the highest mean empathy scores, 107.14±16.06(SD), followed by fourth, 106.55±17.18(SD) and sixth-year students, 106.26±16.17(SD).

The mean empathy score on each subscale of the JSE-S scale is presented in Table II. Male participants had the highest mean score on the three subscales of JSE-S (Perspective taking: 56.08±9.32(SD), Walking in patient shoes:8.14±2.84(SD), Compassionate care: 41.50±6.89). Not much difference has been observed between the year of medical training and the three subscales of JSE-S. The highest scores across the subscales were observed among the second-year students.

Figure I depicts the mean empathy scores pattern by gender and year of medical training among study participants. The graph shows that the empathy scores were higher among first-year male medical students (109.33), while female students showed contrasting results in the first year of medical school; their scores were the lowest (102.31). However, both the student groups in the final year had higher empathy scores (male: 108.40, female: 106.08), but in our study, female participants were 92%, and male participants were only 8%.

Table II: Mean Empathy Scores on three Subscales of JSE-S

Variables	Perspective Taking	Walking in Patient Shoes	Compassionate Care
Age of Students			
< 22 years	55.69±10.98	7.97±2.30	40.72±8.44
22 -24 years	56.08±10.89	7.78±2.33	40.34±8.99
25 - 27 years	58.60±8.44	8.13±2.34	42.86±6.63
Gender			
Male	56.08±9.32	8.14±2.84	41.50±6.89
Female	55.99±10.95	7.89±2.26	40.62±8.70
Year of Medical Training			
1 st Year	54.51±11.10	7.90±2.26	40.15±7.69
2 nd Year	57.58±10.42	8.03±2.16	41.52±8.42
3 rd Year	54.22±11.41	8.17±2.53	39.25±9.61
4 th Year	57.33±9.926	7.59±2.33	41.62±9.15
5 th Year	55.37±11.94	7.98±2.21	39.75±8.59
6 th Year	56.84±10.17	7.85±2.43	41.56±7.92
Future Specialty			
Predominantly People Oriented	56.30±11.06	7.83±2.39	40.12±8.59
Predominantly Procedure Oriented	55.98±10.77	7.84±2.22	41.10±8.50
Undecided	55.68±10.71	8.10±2.37	40.70±8.68

±Standard deviation

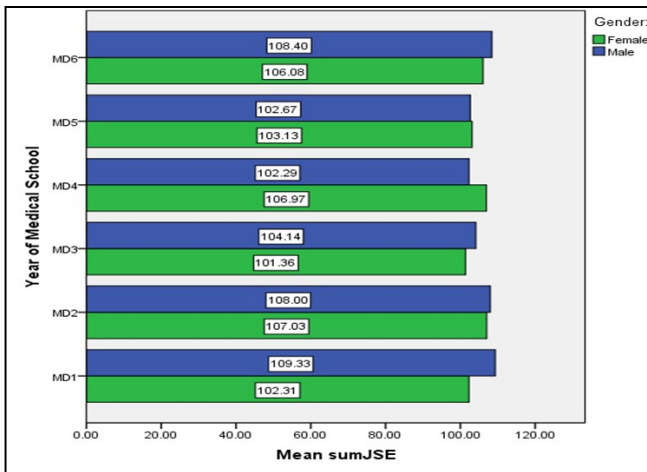
Table I: Empathy Scores of Students on JSE-S (n=424)

	Frequency	Mean Scores	Std. Deviation	Minimum	Maximum	P-value
Total Score on JSE-S	424	104.60	17.43	37	140	-
Age in Years						
< 22	237 (55.9%)	104.39	17.37	42	140	0.36*
22 -24 years	164 (38.7%)	104.21	18.12	37	132	
25 - 27 years	23 (5.4%)	109.60	12.09	87	127	
Gender						
Male	34 (8%)	105.7	14.5	55	126	0.23 ^s
Female	390 (92%)	104.5	17.6	37	140	
Year of Medical Training						
1 st Year	84 (19.8%)	102.56	17.22	42	134	0.25*
2 nd Year	76 (17.9%)	107.14	16.06	59	131	
3 rd Year	66 (15.6%)	101.65	19.33	56	140	
4 th Year	78 (18.4%)	106.55	17.18	48	132	
5 th Year	56 (13.2%)	103.10	18.64	37	130	
6 th Year	64 (15.1%)	106.26	16.17	52	128	
Future Specialty						
Predominantly People Oriented	132 (31.1%)	104.26	17.51	37	132	0.94*
Predominantly Procedure Oriented	179 (42.2%)	104.93	17.20	53	140	
Undecided	113 (26.7%)	104.49	17.85	48	134	

*Anova Test p-value, not significant at <0.05

^s Independent T-test p-value, not significant at <0.05

Figure I: Mean Empathy Scores Pattern by Gender and Year of Medical Training among study participants (n=424)



DISCUSSION

The current study revealed that undergraduate students' mean empathy levels fluctuated during medical training and internship. The study reported no significant differences between the mean scores of male and female study participants. The mean empathy scores of students in this study were 104.60 ± 17.73 (SD), consistent with a cross-sectional study conducted in Kuwait on 264 students, which reported almost similar mean empathy scores of 104.6 ± 16.3 (SD) among undergraduate medical students²⁰. A study from Nepal on 62 undergraduate students showed mean empathy scores of 105.52 ± 10.45 (SD) on the JSE-S scale, following our study results²¹. A study from Iran on 459 medical students reported a mean empathy score of 101 ± 15.6 (SD)²². Another study in India reported concurrent findings (mean score: 100.5 ± 14.8 SD)²³. However, there are variations in the mean score calculated by different studies. These results vary because these studies are from other countries with varying sample sizes, diverse cultures and different curriculums taught in medical schools²⁴.

Many cross-sectional and longitudinal studies have found a significant relationship between gender and presented empathy scores among medical students²⁵⁻²⁷. Studies have reported that the female gender showed higher empathy scores because of their innate characteristics and culture-assigned gender roles; females are generally more compassionate towards patients^{10, 28, 29}. However, the current study shows contrasting results; in the present study, there was no significant difference in the mean empathy scores of male and female students (105.7 ± 14.5 , female: 104.5 ± 17.6 , $p=0.23$). On the three subscales of JSE-S, females had a lower empathy score than their counterparts. The study results were not in line with the majority of research, and our study reported that males could also have an empathetic and caring

attitude towards their patients. A descriptive cross-sectional study conducted on 300 participants from Turkey also reported similar findings⁶. Moreover, a study conducted in Korea³⁰ and another study from Tehran²² also reported no association between gender and empathy scores.

There is a lack of factual data on the association between the age of students and empathy scores. The present study found No correlation between empathy scores and age ($p=0.36$). Some researchers have argued that due to the increasing age, family pressures, and social and professional responsibilities, the empathy scores show a decreasing trend³¹. Others have found no relationship between age and empathy scores³². However, in the current study, we found that the participants who were between the ages of 25 and 27 years had higher scores on the JSE-S subscales of compassionate care (8.13 ± 2.34) and walking in patient shoes (42.86 ± 6.63), in comparison to the younger study participants. Further cross-sectional and longitudinal studies are warranted to provide evidence for this association.

Evidence shows that empathy scores decline as the student progresses in the medical training^{6, 33, 34}. This decrease may be loss of idealism, burnout, stress and excessive workload. Researchers have also reported that increased workload reduces empathy^{35, 36}. Contrary to these findings, the current study shows that the first-year students scored low on empathy levels as compared to final-year students (first year: 102.56 ± 17.22 (SD)), final year: 106.26 ± 16.17 (SD) and the difference between years of medical education was statistically insignificant ($p=0.25$). A systematic review conducted by Anderson FA 2020⁷ on thirty studies disclosed that four cross-sectional studies had reported a higher level of empathy among medical students in the final years of medical school, which is consistent with the current research. Another study conducted in Dammam, Saudi Arabia, on 326 dental students had consistent findings and concluded that the mean empathy score gradually elevated from junior students to senior students and interns ($p=0.008$)³⁷. The possible explanation for these results can be that the students in the final years were actively seeing patients and had more clinical exposure.

Future career pathway also predicts empathy level, as found in many studies^{21, 38-40}. In the present study, most medical students opted for a procedure-oriented (42.2%) field as their future career. Interestingly, the two career options (predominantly people, predominantly procedure-oriented) and students who have not yet decided their career pathway all had almost similar mean empathy scores ($p=0.59$). Whereas previously published studies report that students scoring high on JSE are more likely to opt for predominantly people-oriented specialties^{21, 38}, this may be because, in predominantly people-oriented

fields, physicians directly communicate with the patients and have more exposure to patients. Tariq N 2017³⁹ conducted a study on 1453 students from 8 Pakistani medical schools and concluded no statistically countable difference between the empathy score and specialty interests.

LIMITATIONS

The study has several potential limitations. Since this was a cross-sectional study, temporality (cause-effect relation) cannot be established. The biased response cannot be ruled out in the study as the JSE-S scale is a self-administered tool; hence, the students may have reported favorable answers, which may or may not be related to their actual actions. The majority of the participant students were female. Moreover, the study was undertaken in a medical college in Sohar, Oman, so the results may not represent the level of empathy among undergraduate medical students nationwide. It is recommended that this study be conducted on a larger scale, targeting medical students nationwide in Oman. Focusing on doctor-patient communication skills during undergraduate training could be one way to enhance their empathetic feelings.

CONCLUSION

The findings of this study are essential for medical educators to improve medical students' interpersonal and communication skills by incorporating empathy as part of communication skill teaching. Evidence suggests humans can learn empathy, and educating future doctors about empathy is as important as enhancing their clinical competence. Observing higher empathy scores in the current study's final years of medical training was encouraging. However, the issue remains whether these empathy scores translate into the students' practical lives when dealing with real-life patients.

Moreover, qualitative studies are also needed to evaluate the perspective of patients as to how physicians' empathy can impact the patient's health. In the current study, we found that male participants scored higher on JSE-S than female participants, contrary to the previous studies; hence, more research is needed. Longitudinal studies are warranted to identify the causal association between empathy scores and factors such as age, gender, year of medical training and academic stress.

Ethical Permission: College of Medicine & Health Sciences, National University of Science & Technology, Oman, Ethics & Biosafety Committee letter No. NU/COMHS/EBC004/2020.

Conflict of Interest: No conflicts of interest, as stated by authors.

Financial Disclosure / Grant Approval: No funding agency was involved in this research.

Data Sharing Statement: The corresponding author can provide the data proving the findings of this study

on request. Privacy or ethical restrictions bound us from sharing the data publically.

AUTHOR CONTRIBUTIONS

Qureshi AH: Conceptualizes, designs, analyzes the study, and wrote and edited the manuscript and is the primary corresponding author.

AlHabsi R: Brought new ideas related to the study and was in charge of data collection, assembly of data and technical issues.

Alghatrifi S: Brought new ideas related to the study and helped in data collection and technical issues.

AlHabsi S: Brought ideas related to the study helped in data collection and technical issues.

AlHarrasi O: Brought ideas related to study, helped in data collection, help in statistics for Data analysis.

REFERENCES

1. Mercer SW, Reynolds WJ. Empathy and quality of care. *Br J Gen Pract.* 2002;52(Suppl):S9-12.
2. Wang H, Kline JA, Jackson BE, Laureano-Phillips J, Robinson RD, Cowden CD et al. Association between emergency physician self-reported empathy and patient satisfaction. *PloS one.* 2018;13(9): e0204113. doi: 10.1371/journal.pone.0204113
3. Schwartz R, Dubey M, Blanch-Hartigan D, Sanders JJ, Hall JA. Physician empathy according to physicians: A multi-specialty qualitative analysis. *Patient Educ Couns.* 2021;104(10):2425-31. doi: 10.1016/j.pec.2021.07.024. Epub 2021 Jul 15.
4. Walsh S, O'Neill A, Hannigan A, Harmon D. Patient-rated physician empathy and patient satisfaction during pain clinic consultations. *Ir J Med Sci.* 2019;188(4):1379-84. doi: 10.1007/s11845-019-01999-5. Epub 2019 Mar 27.
5. Pohontsch N, Stark A, Ehrhardt M, Kotter T, Scherer M. Influences on students' empathy in medical education: an exploratory interview study with medical students in their third and last year. *BMC Med Educ.* 2018;18(1): 231.
6. Akgun O, Akdeniz M, Kavukcu E, Avci HH. Medical students' empathy level differences by medical year, gender, and specialty interest in Akdeniz University. *J Med Educ Curric Dev.* 2020;7:2382120520940658. doi: 10.1177/2382120520940658.
7. Andersen FA, Johansen A-SB, Sondergaard J, Andersen CM, Assing Hvidt E. Revisiting the trajectory of medical students' empathy, and impact of gender, specialty preferences and nationality: a systematic review. *BMC Med Educ.* 2020;20(1):52. doi: 10.1186/s12909-020-1964-5.
8. Wang Q, Wang L, Shi M, Li X, Liu R, Liu J et al. Empathy, burnout, life satisfaction, correlations and associated sociodemographic factors among Chinese undergraduate medical students: an exploratory cross-sectional study. *BMC Med Educ.* 2019;19(1):341. doi: 10.1186/s12909-019-

- 1788-3.
9. von Harscher H, Desmarais N, Dollinger R, Grossman S, Aldana S. The impact of empathy on burnout in medical students: new findings. *Psychol Health Med.* 2018;23(3):295-303. doi: 10.1080/13548506.2017.1374545. Epub 2017 Sep 28.
 10. Nasiri M, Amini M, Mani A, Delavari S, Kiani M, Sagheb MM et al. Assessing empathy in final-year medical students using the Persian version of the Jefferson Scale of Physician Empathy. *J EducHealth Promot.* 2021;10: 310. doi: 10.4103/jehp.jehp_1539_20.
 11. Khademalhosseini M, Khademalhosseini Z, Mahmoodian F. Comparison of empathy score among medical students in both basic and clinical levels. *J Adv Med Educ Prof.* 2014;2(2):88-91.
 12. Moreto G, Santos IS, Blasco PG, Pessini L, Lotufo PA. Assessing empathy among medical students: A comparative analysis using two different scales in a Brazilian medical school. *Educ Med.* 2017;19:162-70. doi: 10.1016/j.edumed.2017.07.019.
 13. Jaafari M, Aalouane R, Aarab C, Rammouz I. A measurement of empathy among Moroccan medical students. *Nurs Palliative Care.* 2018;3(3): 1-4. doi: 10.15761/NPC.1000188.
 14. Shaheen A, Mahmood MA, Zia-ul-Miraj M, Ahmad M. Empathy levels among undergraduate medical students in Pakistan, a cross-sectional study using Jefferson scale of physician empathy. *J Pak Med Assoc.* 2020;70(7):1149-53. doi: 10.5455/JPMA.301593.
 15. Huang L, Thai J, Zhong Y, Peng H, Koran J, Zhao X-D. The positive association between empathy and self-esteem in Chinese medical students: a multi-institutional study. *Front Psychol.* 2019;10:1921. doi: 10.3389/fpsyg.2019.01921.
 16. Nandan T, Negi R, Singh D, Mehto AK. Empathy and its Correlates among Undergraduate Medical Students at a Medical College in India. *Int J Sci Stud.* 2021;9(4):64-8.
 17. Biswas B, Haldar A, Dasgupta A, Mallick N, Karmakar A. An epidemiological study on empathy and its correlates: A cross-sectional assessment among medical students of a government medical college of India. *Indian JPsychol Med.* 2018;40(4):364-9.
 18. Williams B, Beovich B. A systematic review of psychometric assessment of the Jefferson Scale of Empathy using the COSMIN Risk of Bias checklist. *J Eval Clin Pract.* 2020;26(4):1302-15. doi: 10.1111/jep.13293. Epub 2019 Nov 19.
 19. Hojat M, DeSantis J, Shannon SC, Mortensen LH, Speicher MR, Bragan L et al. The Jefferson Scale of Empathy: A nationwide study of measurement properties, underlying components, latent variable structure, and national norms in medical students. *Adv Health Sci Educ Theory Pract.* 2018;23(5):899-920. doi: 10.1007/s10459-018-9839-9. Epub 2018 Jul 2.
 20. Hasan S, Al-Sharqawi N, Dashti F, AbdulAziz M, Abdullah A, Shukkur M et al. Level of empathy among medical students in Kuwait University, Kuwait. *Med Princ Pract.* 2013;22(4):385-9. doi: 10.1159/000348300. Epub 2013 Mar 6.
 21. Krishna Bahadur G, Arjyal A, Douglas AH, Subedi M, Gongal R. A quantitative evaluation of empathy using JSE-S Tool, before and after a Medical Humanities Module, amongst first-year medical students in Nepal. *BMC Med Educ.* 2022;22(1):159. doi: 10.1186/s12909-022-03188-y.
 22. Benabbas R. Empathy in Iranian medical students: A comparison by age, gender, academic performance and specialty preferences. *Med J Islam Repub Iran.* 2016;30:439.
 23. Nair S, Shetty RS, Guha S, Anjum Z, Kamath A. Assessing empathy among undergraduate medical students: a cross-sectional analysis using the Jefferson scale in a medical school in Coastal Karnataka. *Int J Comm Med Public Health.* 2018;5:953-6.
 24. Crawford DR. Compassion and empathy in basic medical science teaching: A suggested model. *Cureus.* 2021;13(12): e20205. doi: 10.7759/cureus.20205.
 25. Li D, Xu H, Kang M, Ma S. Empathy in Chinese eight-year medical program students: differences by school year, educational stage, and future career preference. *BMC Med Educ.* 2018;18(1):241. doi: 10.1186/s12909-018-1348-2.
 26. Assing Hvidt E, Sondergaard J, Wehberg S, Hvidt NC, Andersen CM. A cross-sectional study of student empathy across four medical schools in Denmark—associations between empathy level and age, sex, specialty preferences and motivation. *BMC Med Educ.* 2022;22(1): 489. doi: 10.1186/s12909-022-03532-2.
 27. Dores AR, Martins H, Reis AC, Carvalho IP. Empathy and coping in allied health sciences: Gender patterns. *Healthcare(Basel).* 2021; 9(5): 497. doi: 10.3390/healthcare9050497.
 28. Duarte MIF, Raposo MLB, da Silva Farinha PJF, Branco MC. Measuring empathy in medical students, gender differences and level of medical education: An identification of a taxonomy of students. *Invest Educ Med.* 2016;5(20):253-60. doi: 10.1016/j.riem.2016.04.007.
 29. Sathaporn K, Pitanupong J. Factors associated with the improvement of the empathy levels among clinical-year medical students in Southern Thailand: a university-based cross-sectional study. *BMC Psychol.* 2022;10(1): 128. doi: 10.1186/s40359-022-00842-4.
 30. Park KH, Roh H, Suh DH, Hojat M. Empathy in Korean medical students: findings from a nationwide survey. *Medical Teacher.* 2015;37(10):943-8. doi: 10.3109/0142159X.2014.956058.

31. Sommerlad A, Huntley J, Livingston G, Rankin KP, Fancourt D. Empathy and its associations with age and sociodemographic characteristics in a large UK population sample. *PloS One*. 2021;16(9):e0257557. doi: 10.1371/journal.pone.0257557.
32. Bangash AS, Ali NF, Shehzad AH, Haqqi S. Maintenance of empathy levels among first and final year medical students: a cross-sectional study. *F1000Res*. 2013;2:157. doi: 10.12688/f1000research.2-157.v1.
33. Papageorgiou A, Miles S, Fromage M. Does medical students' empathy change during their 5-year MBBS degree? *Educ Health (Abingdon)*. 2018;31(3):142-7. doi: 10.4103/efh.EfH_279_17.
34. Bhatia G, Shetty JV. Trends of Change in Empathy Among Indian Medical Students: A Two-Year Follow-Up Study. *Indian J Psychol Med*. 2023; 45(2): 162-7. doi: 10.1177/02537176221104688. Epub 2022 Jul 15.
35. Roling G, Lutz G, Edelhauser F, Hofmann M, Valk-Draad MP, Wack C et al. Empathy, well-being and stressful experiences in the clinical learning environment. *Patient Educ Couns*. 2020;103(11):2320-7. doi: 10.1016/j.pec.2020.04.025. Epub 2020 Apr 28.
36. Costa-Drolon E, Verneuil L, Manolios E, Revah-Levy A, Sibeoni J. Medical students' perspectives on empathy: a systematic review and meta-synthesis. *Acad Med*. 2020;96(1):142-54. doi: 10.1097/ACM.0000000000003655.
37. Nazir M, Alhareky M, Alqahtani A, Alsulaimi L, Alotaibi R, Yousef N et al. Measuring empathy among dental students and interns: A cross-sectional study from Dammam, Saudi Arabia. *Int J Dent*. 2021;2021: 5584423. doi: 10.1155/2021/5584423.
38. Shah AM, Hussain AA, Asghar A, Siddiqui AT, Sarwar R, Arif A et al. Empathy among Students of a Public-Sector Medical University: A Cross-Sectional Study. *J Clin Epidemiol Toxicol*. 2020;1(1):1-5.
39. Tariq N, Rasheed T, Tavakol M. A quantitative study of empathy in Pakistani medical students: a multicentered approach. *J Prim Care Community Health*. 2017;8(4):294-9. doi: 10.1177/2150131917716233. Epub 2017 Jun 23.
40. Yang Y-S, Liu P-C, Lin YK, Lin C-D, Chen D-Y, Lin BY. Medical students' preclinical service-learning experience and its effects on empathy in clinical training. *BMC Med Educ*. 2021;21(1): 301. doi: 10.1186/s12909-021-02739-z.

