Introducing, doctors are expected to stay current with new developments in their field to ensure they are aware of all the management updates and recent guidelines. Accordingly, the training and knowledge of doctors should always be up to date to provide the best practice for patients. Conducting research requires the integration of certain levels of practice and knowledge, together with the right attitude. Evidence indicates that postgraduate medical trainees with adequate research activities usually experience better critical reasoning, clinical care, and lifelong learning. In addition, it has been demonstrated that early acquaintance with research knowledge and having the necessary experience and skills is significantly associated with better career success, providing residents with adequate knowledge and experience. Further research has also indicated that providing thorough research curricula lessened the obstacles regarding opportunities and time of presentation. Inadequate research training, reduced time, increased work-related stress, and inadequate proper supervision are the main barriers that reportedly prevent medical research.

**Background:** Conducting research requires the integration of certain levels of practice and knowledge, together with the right attitude. This study aimed to investigate the attitude, knowledge, and barriers regarding research analysis and writing among medical residents in Saudi Arabia. **Methods:** This was an online-based cross-sectional study that was conducted in Saudi Arabia. Our targeted population was Saudi medical residents who were enrolled in the Saudi Commission for Health Specialties. Data were analyzed and compared to determine associations between the patients’ demographics and attitude, knowledge, and barriers. **Results:** A total of 218 participants were ultimately included in the present study, with a mean age of 29 (± 2.6) years, and most participants (63.3%) had a previous research publication. Specialty and level of residency were the only significant factors that were associated with attitude ($P = 0.023$ and 0.046, respectively). Specialty and having previously published a research paper were the only factors that were associated with the knowledge scores ($P = 0.001$ and 0.0001, respectively). On the contrary, specialty was the only significant factor that was associated with barriers scores ($P = 0.001$). Regarding attitude scores, most residents (60.1%) had 26%–50%, while only 0.9% had >75% of the total score. Regarding knowledge scores, 38.1% of residents had ≤25% and only 7.8% had >75% of the total scores. **Conclusion:** Reduced awareness regarding research methodology in our population implies that further education measures should be undertaken.

**Keywords:** Attitude, awareness, knowledge, residency, Saudi Arabia
Accordingly, relevant investigations are needed to address these obstacles and increase awareness of medical research among residents.

Many global research studies have been published to assess the knowledge and practice of medical research among students and residents. For instance, an Indian investigation demonstrated that most of their included population from the 2nd and 3rd residency years were involved in research projects. A further Indian investigation also estimated that 0.9% of the undergraduate medical students across the country had a good attitude toward research programs. A Saudi cross-sectional investigation in a military hospital reported that most of their included general practitioner participants did not have any research publications and were not involved in any research projects, although a good attitude was noted among most of them. Another cross-sectional study conducted in 2019 on Family Medicine residents in Saudi Arabia showed that half the trainees were not willing to conduct any research, which was mainly due to difficulty in publishing and having an appropriate statistical support. A challenge presented itself decades ago when the Family Medicine specialty was established. However, there has been great progress documented early on by a group of early researchers. Similarly, in Saudi Arabia, the Family Medicine specialty is a relatively new branch and is still evolving. Therefore, the emphasis on research early is important to not repeat the past. A limited number of multi-center investigations assessed the levels of knowledge and attitude toward research practice among Saudi medical residents. This indicates the importance of conducting investigations that may help to assess the levels of knowledge to allow for adequate planning to subsequently increase the levels of knowledge and practice essentials. Thus, we conducted the current study to investigate the attitude, knowledge, and barriers toward research analysis and writing among medical residents in Saudi Arabia.

Methods

Patients and settings

This is an online-based cross-sectional study that was conducted in Saudi Arabia. The online questionnaire was distributed only through the Saudi Commission for Health Specialties (SCFHS) email systems to residents. The primary objective of this study was to investigate the attitude, knowledge, and awareness of healthcare residents in Saudi Arabia toward research analysis and writing; therefore, our targeted population was Saudi medical residents that were enrolled in the SCFHS and had been enrolled on a rotation basis rather than a yearly break. The study was conducted following the approval of the institutional review board, and participants were asked to agree to participate in the current study before completing the online questionnaire. We excluded respondents that did not agree to take part in this study and others that were not residents enrolled in the SCFHS. The study was registered in the research registry with registration number: researchregistry7450.

Study tool and data collection

The online questionnaire comprised three pages and depended on the self-reporting of the participants. We also included an additional page to explain the questionnaire and the purpose of the intended investigation and its outcomes. The items in the questionnaire were similar to those that had been previously published in other similar investigations. We also modified the questionnaire to suit our intended outcomes and our targeted population. The main sheets of the questionnaire included the following: 1) baseline demographics and characteristics of the respondents, including age, gender, marital status, residency level and place, and specialty, and 2) questions assessing the attitude, knowledge, and barriers toward conducting research analysis and writing. All of these items were previously validated among studies in Saudi Arabia, with estimated reliability values of 0.75, 0.71, and 0.88 for attitude, knowledge, and barriers, respectively, based on the reliability coefficient by Cronbach alpha. Following data collection, all results were briefly reviewed and coded by senior authors to ensure the comprehensibility of the results and to ensure that the statistical analysis step was appropriately interpreted. We compared all the questionnaire parameters with the baseline characteristics, including gender, marital status, specialty, previous research publication, and level of residency, to identify any potential association with any of them. The study was registered in the research registry with registration number (researchregistry7450).

Statistical analysis

All the statistical analysis steps were undertaken using the SPSS statistical package. Means and standard deviations were used to represent the qualitative data, while numbers and percentages were used to represent the quantitative data. Comparison tests, including the Chi-square test, the one-way ANOVA/Tukey, and Student's t tests, were used to assess the potential association between the different variables of this study. P < 0.05 indicates a significant association.

Results

Baseline characteristics

A total of 218 participants were ultimately included in the present study, with a mean age of 29 (± 2.6) years, and a total of 128 (58.7%) male residents. Among the included population, 134 (61.5%) were married, while 34.9% were single. Moreover, most residents worked in family medicine (18.3%), internal medicine (16%), general surgery (14.2%), pediatrics (11%), and obstetrics and gynecology (10.1%), followed by other departments. The level of residency was R1 for 40 (18.3%), R2 for 57 (26.1%), R3 for 52 (23.9%), R4 for 58 (26.9%), and R5 for 11 (5%) participants in this study. Finally, most participants (63.3%) had a research publication [Table 1].

Assessment of the attitude, knowledge, and barriers scores

Regarding the association with the residents’ baseline characteristics, specialty and level of residency were the only
significant factors that were associated with attitude \((P = 0.023\) and 0.046, respectively). Specialty and having previously published a research paper were the only factors that were associated with the knowledge scores \((P = 0.001\) and 0.0001, respectively). In contrast, specialty was the only significant factor that was associated with barriers scores \((P = 0.001\). Neither gender nor marital status was associated with either attitude, knowledge, or barriers scores. The detailed statistics are presented in Tables 2 and 3. Regarding attitude scores, most residents (60.1%) had 26%–50% while only 0.9% had >75% of the total score. Regarding knowledge scores, 38.1% of residents had ≤25% and only 7.8% had >75% of the total scores. Regarding barriers, most residents (73.4%) had 26%–50% while none had >75% of the total scores [Table 4].

### Discussion

In the present cross-sectional study, we assessed the attitude, knowledge, and barriers toward research analysis and writing among medical residents in Saudi Arabia. Our findings indicate that most of the study participants (60.1%) had non-acceptable attitude scores (26%–50%), while 38.1% had low knowledge scores (≤25%), and 73.4% had low barriers scores (26%–50%). This indicates that most of the study participants have low awareness scores regarding research methodology in our identified settings. However, our findings also indicate that most of the included participants (63.3%) had previously published a research paper, which makes us wonder why the estimated scores are low in the present study. In a separate Saudi investigation, AlEnazi et al.\cite{17} reported that only 18% of their population had published a research article, and 61% were involved in research. The authors also reported that their population had a positive attitude toward conducting research studies and being involved in relevant projects. These findings are also comparable

| Variable     | Value |
|--------------|-------|
| Age: mean (±SD) | 29 (±2.6) |
| Gender n (%) |       |
| Female       | 90 (41.3) |
| Male         | 128 (58.7) |
| Marital status n (%) |     |
| Divorced     | 8 (3.7) |
| Married      | 134 (61.5) |
| Single       | 76 (34.9) |
| Place of work n (%) | |
| AlJabers ENT Hospital | 7 (3.2) |
| Johns Hopkins Aramco | 1 (0.5) |
| King Abdulaziz National Guard Hospital | 7 (3.2) |
| King Fahad Hospital | 102 (46.8) |
| King Salman Armed Forces Hospital Tabuk | 1 (0.5) |
| MCH          | 46 (21.1) |
| Omran General Hospital | 2 (1) |
| PHC          | 43 (19.6) |
| Psychiatric Hospital | 8 (3.7) |
| QCH          | 1 (0.5) |
| Specialty n (%) |       |
| Anesthesia   | 7 (3.2) |
| ENT          | 7 (3.2) |
| Family medicine | 40 (18.3) |
| General physician | 1 (0.5) |
| General surgery | 31 (14.2) |
| ICU          | 7 (3.2) |
| Internal medicine | 35 (16) |
| Obstetrics and gynecology | 22 (10.1) |
| Orthopedics  | 6 (2.8) |
| Pediatrics   | 24 (11) |
| Preventive medicine | 9 (4.1) |
| Psychiatry   | 7 (3.2) |
| Radiology    | 16 (7.3) |
| Urology      | 7 (3.2) |
| Level of Residency n (%) | |
| R1           | 40 (18.3) |
| R2           | 57 (26.1) |
| R3           | 52 (23.9) |
| R4           | 58 (26.6) |
| R5           | 11 (5) |
| Have you ever published a study n (%) | |
| No           | 81 (36.1) |
| Yes          | 138 (63.3) |

### Table 2: Comparison of the mean (±SD) of research subjects for demographic characteristics

| Variable     | Attitude | Knowledge | Barriers |
|--------------|----------|-----------|----------|
| Gender       |          |           |          |
| Female       | 53.31±17.61 | 3.43±2.17 | 62.31±17.62 |
| Male         | 54.73±17.64 | 3.25±2.25 | 60.08±16.03 |
| Marital status |        |           |          |
| Divorced     | 63.38±14.48 | 3.88±1.46 | 63.25±18.18 |
| Married      | 53.49±16.78 | 3.08±2.33 | 62.35±15.65 |
| Single       | 54.33±19.16 | 3.7±1.9 | 58.38±18.19 |
| Specialty    |          |           |          |
| Anesthesia   | 43.57±12.42 | 3.29±2.81 | 51.14±19.61 |
| ENT          | 45.86±16.12 | 3.43±1.13 | 54.86±13.01 |
| Family medicine | 57.88±17.19 | 3.38±2.27 | 70.6±18.31 |
| General surgery | 53±19.74   | 2.9±2.09 | 58.97±14.95 |
| ICU          | 53.57±17.21 | 3.14±2.19 | 62.57±13.76 |
| Internal medicine | 53.5±14.7 | 3.15±2.12 | 58.38±15.56 |
| Obstetrics and gynecology | 54.91±20.47 | 3.77±1.72 | 60.14±17.91 |
| Orthopedics  | 40±12.02 | 2.33±2.25 | 51.67±13.94 |
| Pediatrics   | 56.21±19.69 | 2.67±1.79 | 57.25±14.12 |
| Preventive medicine | 56.89±15.05 | 6.89±1.05 | 68.56±18.78 |
| Psychiatry   | 33.86±9.14 | 3.29±2.75 | 43.14±10.24 |
| Radiology    | 60.38±10.47 | 3.44±2.28 | 67.19±10.25 |
| Urology      | 61.86±23.13 | 3.29±1.89 | 59.57±16.96 |
| P (One-way ANOVA) | 0.023* | 0.001* | 0.001* |
| Have you ever published a research n ±% | |
| No           | 53.05±19.44 | 2.3±2.29 | 62.59±16.87 |
| Yes          | 54.78±16.48 | 3.92±1.88 | 60.08±16.59 |

*P is statistically significant.
with previous investigations among residents and medical students.[18-21]

The reason for the low knowledge levels despite the high rate of publications may be attributable to the increased barriers and inadequate experience and skills that can influence against conducting scientific research, as is frequently reported among previous investigations.[19,22] Inadequate time, increased stress at work, lack of proper supervision, and inadequate educational curricula are other reasons for the lack of knowledge among residents that have been reported by previous studies.[10,17,22] However, despite all the reported barriers, estimates indicate that research publications are still abundant among Arab countries, and researchers from Egypt and Saudi Arabia contribute the most.[23-27] Previous studies have demonstrated that writing and statistics skills were the most commonly reported items that students know little about.[18,28,30] Heavy workload has also been reported as a potential reason for not being adequately involved in research activities.[30-37]

We also found that the specialty and the level of residency were the only two significant factors that were associated with the participants’ attitude scores, while residency and having previously published research papers were associated with the knowledge levels of the study participants. Radiology and urology were associated with the highest attitude scores, preventive medicine with the highest knowledge score, and family medicine, preventive medicine, and radiology were associated with the highest barriers scores. In another Saudi investigation, Al‑Mohrej et al.[28] reported that 95% of their orthopedic residents participated in research activities during their residency program. These differences may be attributable to the nature of the work and the availability of proper supervision and cooperation in these departments. In addition, the sample size is not equally distributed among the different departments, which may also aid in magnifying the findings in some departments over others. AlEnazi et al.[17] also reported that residency level and having a previous research experience were significantly associated with a positive association with good attitude scores toward research. The same two factors were also reported to be correlated with being more involved in research during residency and having more frequent publications. In contrast, Khan et al.[34] reported that the levels of attitude and knowledge were not significantly impacted by residency levels. A further investigation indicated that the knowledge and attitude scores were significantly associated with the year of medical education.[14] This is consistent with other reports that indicated that early exposure to medical research curricula may be associated with enhanced levels of knowledge and practice regarding research.[17,38] Khan et al.[19] also indicated that positive attitudes among their undergraduate dental students were significantly associated with being more exposed to education programs about research during their undergraduate studies.

Regarding patients’ demographics, neither gender nor marital status was associated with attitude, knowledge, or barriers. However, AlEnazi et al.[17] reported that single residents participated less in research activities than married ones. Evidence in the literature regarding the significance of the participants’ demographics is conflicting among studies in different global settings.[16,18] This may be attributable to the differences in the baseline characteristics and conditions that some residents can be subjected to over others, including previous exposure to education campaigns and the presence of cooperative supervisions for the corresponding residents. Therefore, further larger investigations are needed for increased understanding. Similar to the finding reported by Soubhanneyaz et al.[21], our study showed that there is a lack of knowledge toward research among family medicine residents. This is also supported by studies that were performed in countries where Family Medicine was a fairly new branch of medicine. Proper workshop skills, mentorship, online courses, and statistical support will provide a better long‑term outcome in research skills and acceptance among the residents and trainees.

Our study may be limited by the small sample size of the included participants and the inadequate representation of some residents from the different departments, which may have affected the findings. Differences in the baseline characteristics may also have formulated a potential bias when formulating the evidence. Therefore, we encourage further studies to be conducted for better representativeness and to overcome these obstacles.

Conclusion

Our results indicate that medical residents in Saudi Arabia do not have adequate positive attitudes, knowledge, or barriers scores regarding research methodology. Further research should be undertaken to understand why some specialists have better awareness and knowledge scores than others, and education campaigns should be inaugurated accordingly. Having previously
published a research paper is also significantly associated with higher levels of knowledge; therefore, we suggest that publications should be mandatory in the residency programs to encourage residents to acquire more knowledge and skills and be more involved in research activities.

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Conflicts of interest
There are no conflicts of interest.

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