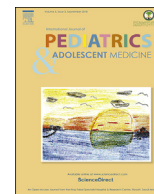


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Original article

## Research involvement and obstacles among trainees enrolled in a pediatric residency program in Saudi Arabia



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### ABSTRACT

**Objective:** This study aimed to investigate pediatric residents' involvement in research and their attitudes toward potential barriers to conducting research.

**Methods:** This cross-sectional survey was conducted in February 2017 and targeted residents enrolled in the Saudi Pediatric Residency Program. An online self-administered questionnaire was designed to assess residents' involvement in different domains of scholarly activity and their perception of barriers to research. All items used a five-point Likert-type scale with response options varying depending on the question. The relative importance index (RII) approach was used to analyze the relative contribution of each indicator to its main theme.

**Results:** A total of 314 pediatric residents agreed to complete the survey. Of these, 168 (53.5%) were female. Residents rated their involvement in all aspects of research as low. The top-ranked item was residents' participation in data collection for research (mean [standard deviation, SD] rating, 2.74 [1.3]; RII, 54.2%), followed by residents' participation in a structured literature review of a topic (mean [SD] rating, 2.6 [1.3]; RII, 52.1%). The lowest-rated items were residents' involvement in manuscript writing (mean [SD] rating, 2.3 [1.24]; RII, 46.1%) and their participation in statistical analysis (mean [SD] rating, 1.23 [1.21]; RII, 44.5%). The residents ranked the lack of dedicated time as the most significant barrier to their participation in scholarly activities (mean [SD] rating, 3.44 [1.3]; RII, 68.83%). Conversely, they ranked the lack of interest as the lowest barrier to research participation (mean [SD] rating, 2.85 [1.2]; RII, 56.96%).

**Conclusion:** Overall, pediatric residents rated their involvement in all aspects of research as low, especially in manuscript writing and statistical analysis. These findings suggest the need to provide support for the development of a mentoring program as well as to develop a robust and longitudinal research curriculum for the pediatric residency program to encourage the involvement of trainees in research.

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## 1. Introduction

Pediatric health research is necessary to improve children's health and well-being, as well as that of their families. In pediatric medicine, significant scientific and clinical advancements are made when pediatric residents can hone their research skills. Furthermore, by facilitating scholarly thinking, a larger proportion of graduates will pursue physician-scientist careers, and future pediatricians will have acquired the research skills required to become research mentors [1,2].

To develop residents' competencies in research, the professional associations and academic institutions responsible for medical training have acknowledged that scholarly activity is a crucial element of residency training. The Royal College of Physicians and Surgeons of Canada stipulates that physicians should strive to master their skills in research and implement a planned strategy to learning to improve in each CanMEDS role [3]. They should also be able to discern pertinent evidence, using specified criteria to evaluate the data, disseminate medical knowledge, and apply their findings in clinical practice and scholarly activities—which constitute one of the seven key competencies that residents must achieve during residency [3]. Other professional bodies, such as the Accreditation Council for Graduate Medical Education, acknowledge that research is an essential component of residency training

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programs. The Accreditation Council for Graduate Medical Education also supports the idea that residents should be encouraged to participate in scholarly activities and acquire knowledge of the fundamental principles of research, including the conception and conducting of research, the evaluation of data, the involvement of patients, and the application of research findings to patient care [4].

Nevertheless, many pediatric leaders have voiced concerns that pediatric residency programs do not sufficiently expose residents to research training, and consequently, pediatric graduates and pediatricians do not have the skills to appraise and implement scientific findings to solve practical problems in the clinical setting [1,5,6]. This deficiency is especially true in Saudi Arabia, where research activity and training are not fully incorporated into the curricula of residency programs [7]. Furthermore, a cross-sectional survey conducted in 2013 of residents enrolled in pediatric training programs in Saudi Arabia showed that although trainees were interested in participating in research, few trainees had the opportunity to do so [8]. The current study investigates pediatric residents' involvement in research and their attitudes toward potential barriers to conducting research.

## 2. Methods

### 2.1. Participants

This cross-sectional survey was conducted in February 2017 and targeted residents enrolled in the Saudi Pediatric Residency Program. A total of 1052 residents were enrolled in the program, and the size of the calculated representative sample was 282 participants (95% confidence interval and 5% marginal error).

### 2.2. Ethical consideration

Permission to conduct this survey was obtained from the Institutional Review Board of King Saud University. Participation in the survey was voluntary and potential participants were assured of the confidentiality of their responses.

### 2.3. Questionnaire distribution

The questionnaire was designed with SurveyMonkey (<https://www.surveymonkey.com>), and the survey link was provided in the invitation email that was sent to potential participants using the Saudi Commission for Health Specialties' emailing groups. Reminders were sent twice within a 4-week period to non-respondents to ensure maximum participation in the survey.

### 2.4. Survey instrument

After review of the published literature, a structured questionnaire was developed to determine residents' perceptions of their competencies and training needs based on the CanMEDS competency framework. A multidisciplinary team reviewed the questionnaire and produced the final version after a pilot test had been conducted to detect flaws in the questionnaire in terms of content and format. Questions were edited out of the questionnaire when they were marked as unclear.

The questionnaire was designed to assess residents' involvement in different domains of scholarly activity and their perception of barriers to research. All items used a five-point Likert-type scale, with response options varying depending on the question. Residents were asked to rate their involvement in different domains of scholarly activity on a scale from 1 to 5, with 1 meaning no involvement at all, and 5 meaning extremely involved. Similarly, they were asked to rate their perception of obstacles to research

training on a scale from 1 to 5, with 1 meaning not an obstacle at all, and 5 meaning always an obstacle.

### 2.5. Statistical analysis

IBM SPSS Statistics for Windows version 23 (IBM, Armonk, NY, United States) was used to analyze the data. Descriptive statistics were computed for all study variables. Continuous variables are expressed as means and standard deviations (SDs), whereas categorical and binary variables are expressed as numbers and percentages.

The internal consistency of the questionnaire was analyzed with use of Cronbach's  $\alpha$  coefficient. A summative analysis and the recode features in IBM SPSS Statistics were then used to compute the mean and SD for each of the indicators that formed the main perceptive concepts of the study. The relative importance index (RII) was used to analyze the relative contribution of each indicator to its main theme. This statistic is a reliable way of identifying the top and bottom key relevant perceptions in terms of weighted contribution. The method described by Holt [9] was used to compute the RII.

## 3. Results

The total number of pediatric residents who agreed to complete the survey ( $n = 314$ ) represents approximately 111% of the calculated representative sample. Women formed more than half of the sample ( $n = 168$ ; 53.5%). Most of the residents were younger than 30 years (82.2%), and approximately 25.5% were in their fourth year of residency training. Residents hailed from all regions of Saudi Arabia, but those from the central province were the most heavily represented (48.7%) (Table 1).

Table 2 shows the means, SDs, and RIIs for respondents' responses and how they ranked their perception of research involvement and obstacles to research training. In general, residents rated their involvement in all aspects of research as low. Specifically, the top-ranked item was residents' participation in data collection for research (mean [SD] rating, 2.74 [1.3]; RII, 54.2%), followed by residents' participation in a structured literature review of a topic (mean [SD] rating, 2.6 [1.3]; RII, 52.1%) and residents' involvement in preparing research proposals for submission to an institutional review board (mean [SD] rating, 2.55 [1.3]; RII, 50.97). The lowest-rated items were residents' involvement in manuscript writing (mean [SD] rating, 2.3 [1.24]; RII, 46.1%) and residents' participation in statistical analysis (mean [SD] rating, 1.23 [1.21]; RII, 44.5%).

**Table 1**  
Sociodemographic characteristics of the respondents.

Variable	Number	Percentage
<b>Age</b>		
25–30 years	258	82.2
>30 years	56	17.8
<b>Sex</b>		
Male	146	46.5
Female	168	53.5
<b>Residency level</b>		
R1	72	22.9
R2	46	14.6
R3	70	22.3
R4	80	25.5
Graduated R5	46	14.6
<b>Region</b>		
Eastern	46	14.6
Western	106	33.8
Northern and southern	9	2.9
Central	153	48.7

**Table 2**  
Residents' perceived level of involvement in scholarly activities during their training.

Indicator	Mean (SD)	RII (%)	Rank
<b>Research involvement level</b>			
Literature review	2.6 (1.3)	52.08	2
Research proposal and IRB application drafting	2.55 (1.3)	50.97	3
Data collection for research	2.74 (1.3)	54.74	1
Biostatistical analysis	1.23 (1.21)	44.53	5
Manuscript writing	2.3 (1.24)	46.08	4
<b>Research obstacles</b>			
Lack of dedicated time	3.44 (1.3)	68.83	1
Lack of supervision	3.27 (1.29)	65.32	2
Lack of interest from residents	2.85 (1.2)	56.96	5
Lack of interest from staff	3.12 (1.28)	62.36	4
Lack of research infrastructure (e.g., no research assistants or data analysts)	3.14 (1.41)	62.74	3

RII, relative importance index; SD, standard deviation.

The residents ranked the lack of dedicated time as the most significant barrier to their participation in scholarly activities (mean [SD] rating, 3.44 [1.3]; RII, 68.83%). Conversely, they ranked the lack of interest as the lowest barrier to research participation (mean [SD] rating, 2.85 [1.2]; RII, 56.96%).

#### 4. Discussion

An assessment for improvement is necessary to gain insight into how well residents participate in programs and use the knowledge acquired during their training. Curriculum developers and scientific committee members can then use the findings of such an assessment to improve the pedagogical approaches to learning [10,11]. However, since the Saudi Commission for Health Specialties implemented a dedicated scholarly research program (involving 8 weeks of research rotation) in the pediatric residency program in 2014 [8], no study has been formally conducted to assess the efficacy of a scholarly concentration program in promoting research involvement among pediatric residents. The research program was divided into two parts, each lasting 4 weeks. The first part included a basic module on the fundamental principles of clinical research and was offered during the second year of training, and the second part—an advanced module that focused mainly on statistical analysis and methods of research communication—was offered in the third year of residency training.

Currently available data are limited to residents' productivity in research, as well as their perceptions of factors precluding them from participating in research. The present research expands on previous research regarding pediatric residents' perceptions of barriers to research training in Saudi Arabia [8]. Furthermore, it attempts to identify the level of involvement of pediatric residents in different research domains.

These analyses show that residents rate their involvement in all aspects of research as low, with the top-ranked items being their involvement in collecting data for research and preparing a structured literature review of a topic. Manuscript writing and participation in statistical analysis were the lowest-rated items. While several studies have addressed pediatric residents' involvement in research [6,12–14], much of the published literature originates from North America. The existing literature suggests that although resident research training is an integral part of most residency training programs [14], scholarly activity involvement is suboptimal among pediatric residents [6]. Research involvement among pediatric residents has been reported to range between 14% and 26% in studies conducted in the United States [1,15]. Previous studies mainly support the theory that a research requirement encourages pediatric residents to become more involved in research and scholarly activities [13,14,16]. However, there have

been mixed opinions as to whether a research requirement can help residents in light of concerns that they do not have enough time to acquire pediatric clinical skills [6].

Medical school administrators in various training programs have attempted to develop residents' research skills in pediatrics and other disciplines, such as medicine and surgery [5,12–14,17,18]. However, challenges have been met in successfully conducting research during residency training. In the current study, the five cited obstacles to research, in decreasing importance, were a lack of dedicated time, lack of supervision, lack of research infrastructure, lack of interest from staff, and lack of interest from residents. Similar findings were reported by Alhaider et al. [8], who found that a lack of protected time was cited as the main barrier to research training among pediatric residents in seven medical schools in Saudi Arabia. Other factors that were perceived as obstacles included a lack of research skills and knowledge, lack of mentoring, lack of research topics, and lack of ideas for research questions [8].

In Western countries, surveys assessing residents' perceived barriers during residency found that a lack of time, lack of financial support, undefined curricular requirements, and lack of research training during the early years of medical training were cited as perceived obstacles [6,19,20]. It was recently reported [20] that pediatric chief residents believed a lack of time to be the most significant barrier to research, even among those who had more than 8 weeks of protected time. The lack of mentoring has also been cited as one of the major factors precluding participation of residents in research during their training [6,12,14,15,21], which is consistent with our findings.

Before the introduction of a dedicated scholarly research program in the pediatric residency program in 2014, research training was not incorporated in any practical sense into the curricula of Saudi residency programs [7]. Although a needs assessment was conducted in 2015 to support the development of a research curriculum for Saudi pediatric residency, there is a general lack of evidence for the best strategy to adopt to encourage the culture of a residency training program in our context. As training centers consider strategies to tackle these obstacles, the focus should be placed on the need to cultivate and recruit faculty members who can mentor and instruct residents and fellows in several aspects of research. Other obstacles, such as a lack of infrastructure, can be circumvented by the creation of a collective research activity among the training centers and investment in infrastructure, especially staffing, to encourage the involvement of residents in research. Additionally, training centers should have a core curriculum and allocate protected time.

This study has several limitations, including those inherent to cross-sectional studies. We cannot exclude the possibility that some conditions may have caused a response bias, including

interest in the survey topic. Furthermore, our study design makes it hard to determine where respondents rate with respect to response bias.

## 5. Conclusion

Overall, pediatric residents rated their involvement in all aspects of research as low, especially in manuscript writing and statistical analysis. This underscores the need to focus more on manuscript preparation and statistical analysis of data obtained from a basic laboratory and/or clinical research setting. Furthermore, we identified some barriers to research participation, including a lack of dedicated time, lack of mentorship, lack of research infrastructure, lack of interest from staff, and lack of interest from residents. These findings suggest the need to provide support for the development of a mentoring program as well as to develop a robust and longitudinal research curriculum for the pediatric residency program to encourage the involvement of trainees in research.

Additionally, pediatric residents need more dedicated research time, a mentorship program, and a better research infrastructure to increase their involvement in several aspects of research.

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