

Research Involvement of Surgical Residents in Saudi Arabia: A Cross-Sectional Survey of Predictors, Barriers, and Motivations

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Introduction: Research is a vital component of surgical training, enhancing academic skills and career opportunities. This study aimed to assess the research involvement of surgical residents in Saudi Arabia and identify key predictors, barriers, and motivations.

Methodology: A cross-sectional study was conducted among 297 surgical residents between December 2021 and September 2023 using a structured online questionnaire. Data were analyzed with SPSS.

Results: Overall, 51.2% of residents published at least one paper during residency. Prior research experience in medical school significantly predicted publication during residency ($P = 0.012$). In logistic regression, residents in gynecology had lower odds of publication compared to general surgery (OR 0.58, $P < 0.05$). The main motivation for research was fellowship acquisition (63.3%). The leading barriers were lack of time (67.0%) and work-related stress (50.0%).

Conclusion: Early research engagement in medical school strongly predicts future productivity during residency, while time constraints and stress remain major obstacles. Our findings suggest that residency programs could enhance research output by providing structured mentorship, allocating protected research time, and encouraging early exposure to research activities.

Keywords: residency program, surgical, trainees, research, publication

Introduction

As a result of ongoing research into all aspects of healthcare and the healthcare system, the medical field is constantly evolving.¹ Scientific research is a vital component of healthcare since it significantly improves patient outcomes. Specifically, research provides an evidence-based approach to treatment and critical information for developing the skills of healthcare practitioners. Research can be defined as a systematic exploration of study materials and sources to establish facts and reach new conclusions.² During their training, resident physicians must be encouraged to enhance their critical thinking and reasoning abilities, as well as cultivate a constructive attitude toward scientific inquiry.³

Residency training programs provide structured environments where graduate doctors undergo specialization in accredited hospitals to become independent specialists. Residents are expected not only to acquire clinical knowledge and technical skills but also to develop competence in interpreting, utilizing, and conducting medical research.⁴ Internationally, research productivity is increasingly used as a benchmark for surgical training programs. Studies from North America and Europe report that between 60% and 80% of residents publish at least one manuscript during training, with many US programs offering dedicated research years to further enhance scholarly output.⁵ One recent US cohort study of general surgery graduates showed that over half (52.6%) had formal research output, and 35% pursued at least one research year during residency, reflecting structured institutional support and mentorship.⁶

In contrast, available data from Saudi Arabia and the wider Middle East are limited, with reports suggesting lower levels of resident research engagement compared to these international benchmarks.⁷ Surgical residents face unique

challenges that can hinder research productivity, including heavy clinical workloads, limited protected research time, and variable access to mentors and research resources. These challenges can impact academic progression and opportunities for innovation, underscoring the need for targeted strategies to foster a research culture within residency programs.

Despite increasing recognition of the importance of scholarly activity, not all trainees are willing or able to take time away from clinical duties to conduct research. Therefore, it is crucial to ensure that research opportunities are integrated with clinical responsibilities, providing residents with early exposure to research methods, structured mentorship, and protected time to enhance scholarly productivity.⁸

The current study addresses a gap in the national literature by systematically assessing the engagement of surgical residents in research activities across Saudi Arabia. Specifically, it explores whether surgical specialty influences research outcomes and identifies barriers and motivating factors that shape residents' scholarly productivity, with implications for program design, mentorship, and academic career development.

Methods

Study Design and Population

This cross-sectional study was conducted in Saudi Arabia between December 2022 and September 2023. A total of 315 surgical residents accessed the online survey. After excluding 9 incomplete questionnaires, 306 fully completed responses were included in the analysis, yielding a response rate of 97.1%. Eligible participants were residents enrolled in accredited surgical training programs across Saudi Arabia. Informed consent was obtained electronically from all participants. Ethical approval was granted by the Research Ethical Committee at Taibah University (Study code: STU-21-019; Decision date: 31/01/2022).

The sample size of 306 was determined based on feasibility and the total number of residents accessible during the study period. While no formal *a priori* power calculation was performed, this sample represents a substantial proportion of the national surgical residency population and is sufficient for descriptive analyses and multivariate logistic regression. All included questionnaires were fully completed, so no missing data were present.

Survey Instrument

The questionnaire was developed by the study authors after reviewing relevant literature on research productivity among residents. It consisted of two sections: the first focused on sociodemographic information, including age, gender, marital status, parenthood, income, and chronic medical conditions. The second section addressed research-related factors, such as previous publications during medical school, publications during residency, motivations, and barriers to conducting research.

The instrument was prepared in English, the standard language of medical education in Saudi Arabia. It underwent pilot testing with 15 surgical residents (who were not included in the final analysis) to ensure clarity, comprehensiveness, and relevance of the items. Minor revisions were made to improve wording and flow, supporting face and content validity. The full survey instrument is available and provided upon request.

Distribution Strategy

The survey was created using a secure online platform and distributed electronically via surgical residency program coordinators, who invited all eligible residents nationwide to participate. Participation was voluntary, and anonymity was assured.

Outcome Measures and Covariates

The primary outcome of the study was whether a resident had published a scientific paper during residency, classified as a binary variable (yes/no). Several covariates were assessed to explore factors associated with research productivity. Continuous variables included age, while binary variables included gender and the presence of chronic medical conditions. Categorical variables encompassed marital status (single, married, divorced), parenthood (none, 1–3 children,

or more than 3 children), income, postgraduate year (PGY), region of residency training, and number of on-call days per month. In addition, prior publication during medical school was recorded as a potential predictor of research productivity.

Data Analysis

Categorical variables were summarized as frequencies and percentages. Associations between categorical variables were assessed using Chi-squared tests. Multivariate logistic regression was performed to identify predictors of research publication during residency. Variables included in the model were age, gender, marital status, parenthood, chronic medical condition, specialty, residency level, training region, hours of sleep per day, number of on-call days per month, and prior publication during medical school. All analyses were conducted using SPSS version 23, with statistical significance set at $p < 0.05$.

Results

A total of 306 surgical residents across Saudi Arabia accessed the online questionnaire. Of these, 9 were excluded based on predefined exclusion criteria, leaving 297 residents for final analysis. The demographic characteristics of respondents are presented in Table 1. The majority were between 25 and 30 years of age (77.8%), male (67.3%), single (58.2%), and childless (74.7%). Most reported no chronic medical conditions (83.8%). Salary distribution showed 42.8% in the 15,000–20,000 SR range and 25.9% earning more than 20,000 SR. With respect to training stage, the highest proportion of residents were at R1 (27.6%) and R2 (26.9%). Western program enrollment was the most common (38%), and nearly two-thirds of participants reported 4–7 on-call shifts per month (59.6%).

Regarding research productivity (Table 2), almost half of the participants (49.5%) had published at least one study during residency. Among them, 57.8% had one to two publications, 29.3% had three to four, and 11.6% had more than

Table 1 Baseline Characteristics

Baseline Characteristics	n%
Age	
20-30 years	231 (77.8%)
Over 30 years	66 (22.2%)
Gender	
Male	200 (67.3%)
Female	97 (32.7%)
Marital status	
Single	173 (58.2%)
Married	116 (39.1%)
Divorced	8 (2.7%)
Parenthood	
None	222 (74.7%)
1-3 children	64 (21.5%)
More than 3 children	11 (3.7%)
Chronic medical condition	
Yes	48 (16.2%)
No	249 (83.8%)
Income (Saudi Riyals)	
Less than 10,000 SR	51 (17.2%)
10,000–15,000 SR	42 (14.1%)
15,000–20,000 SR	127 (42.8%)
More than 20,000 SR	77 (25.9%)

(Continued)

Table 1 (Continued).

Baseline Characteristics	n%
Post-graduate year (PGY)	
PGY 1	82 (27.6%)
PGY 2	80 (26.9%)
PGY 3	32 (10.8%)
PGY 4	42 (14.1%)
PGY 5	50 (16.8%)
PGY 6	4 (1.3%)
PGY 7	7 (2.4%)
Region of residency program	
Central	108 (36.4%)
Western	113 (38%)
Eastern	43 (14.5%)
Northern	16 (5.4%)
Southern	17 (5.7%)
On-calls days per month	
1-3 calls per month	65 (21.9%)
4-7 calls per month	177 (59.6%)
8-10 calls per month	55 (18.5%)

Abbreviation: PGY, Postgraduate year.

Table 2 Participants Profile of Research During Residency

Questions	n%
Did you publish any research during the current residency program?	
Yes	147 (49.5%)
No	150 (50.5%)
How many studies did you publish?	
1-2	85 (57.8%)
3-4	43 (29.3%)
More than 4	17 (11.6%)
Other	2 (1.4%)
Time of published research?	
PGY 1-2	49 (16.5%)
PGY 3-4	32 (10.8%)
PGY 5-6	13 (4.4%)
Other	66 (22.2%)
How many research projects do you have in progress?	
None	113 (38.0%)
3 and less	142 (47.8%)
More than 3	42 (14.1%)

four. Case reports were the most frequent type of publication (42.2%), followed by cross-sectional studies (34.0%), while clinical trials remained rare (3.4%) (Figure 1). Research output occurred predominantly in the early residency years, with PGY 1–2 accounting for 16.5% of publications, PGY 3–4 for 10.8%, and PGY 5–6 for 4.4%. In addition, more than half

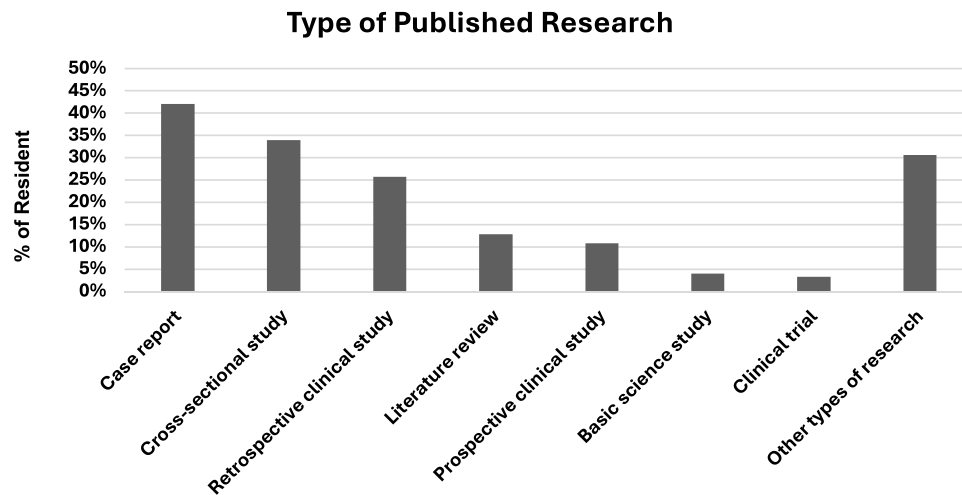


Figure 1 Type of Published research among surgical residents.

of the residents reported being actively involved in one to three projects (47.8%) or more than three (14.1%) at the time of survey completion.

Motivations and obstacles to research involvement are summarized in [Table 3](#). Fellowship opportunities were the strongest motivator (63.3%), followed by aspirations for an academic career (47.5%) and program requirements (43.8%). Barriers were also prominent: lack of time (63.3%) and work-related stress (50.2%) were most common, followed by limited interest in research (34.3%) and inadequate supervision (32.3%). A small minority (6.4%) reported encountering no obstacles.

[Table 4](#) showed detailed factors associated with publishing research during residency program. Bivariate analysis identified several significant associations. Parenthood was positively associated with publishing during residency ($p=0.006$), with higher rates among residents with children. A notable and unexpected finding was the strong association between chronic medical conditions and research productivity ($p<0.001$), with affected residents showing higher publication rates than those without such conditions (75% vs 44.6%). Residency level was also significant ($p<0.001$), with the highest publication rates observed in R7

Table 3 Participants Perception Toward Motives and Obstacles for Participating in Research

Rational	n%
For participating in research activities	
Help obtaining a fellowship	188 (63.3%)
Initiating an academic career	141 (47.4%)
Mandatory in my program	130 (43.7%)
Find out if I like research	54 (18.1%)
Take a break from residency	43 (14.4%)
Other	5 (1.6%)
Against participating in research activities	
Lack of time	199 (67.0%)
Work-related stress	149 (50.1%)
Lack of interest	102 (34.3%)
Lack of supervisors	96 (32.3%)
Not available in my program	49 (16.5%)
Already performed research activities before residency	46 (15.4%)
Difficulties getting papers accepted in peer-reviewed journals	40 (13.4%)
Plans to postpone research activities until after residency	28 (9.4%)
None	19 (6.4%)
Other	6 (2.0%)

Table 4 Factors Associated with Publishing Research During Residency Program

Factor	Published Research During Residency		P-value
	Yes	No	
Age			
25 - 30 years	111 (48.1%)	120 (51.9%)	0.35
Over 30 years	36 (54.5%)	30 (45.5%)	
Gender			
Male	96 (48%)	104 (52%)	0.45
Female	51 (52.6%)	46 (47.4%)	
Marital Status			
Single	79 (45.7%)	94 (54.3%)	0.26
Married	63 (54.3%)	53 (45.7%)	
Divorced	5 (62.5%)	3 (37.5%)	
Parenthood			
None	99 (44.6%)	123 (55.4%)	0.006*
1–3 children	39 (60.9%)	25 (39.1%)	
More than 3 children	9 (81.8%)	2 (18.2%)	
Chronic medical condition			
Yes	36 (75%)	12 (25%)	< 0.001*
No	111 (44.6%)	138 (55.4%)	
Residency program			
General surgery	42 (50%)	42 (50%)	0.27
Pediatric surgery	8 (44.4%)	10 (55.6%)	
Ophthalmology	17 (50%)	17 (50%)	
Plastic surgery	4 (28.6%)	10 (71.4%)	
Neurosurgery	14 (53.8%)	12 (46.2%)	
Urology	22 (66.7%)	11 (33.3%)	
Orthopedic	16 (43.2%)	21 (56.8%)	
Obstetrics and gynecology	9 (36%)	16 (64%)	
ENT (Otorhinolaryngology)	15 (57.7%)	11 (42.3%)	
Postgraduate year (PGY)			
PGY 1	20 (24.4%)	62 (75.6%)	< 0.001*
PGY 2	42 (52.5%)	38 (47.5%)	
PGY 3	17 (53.1%)	15 (46.9%)	
PGY 4	27 (64.3%)	15 (35.7%)	
PGY 5	34 (68%)	16 (32%)	
PGY 6	2 (50%)	2 (50%)	
PGY 7	5 (71.4%)	2 (28.6%)	
Region of residency program			
Central	50 (46.3%)	58 (53.7%)	0.10
Western	51 (45.1%)	62 (54.9%)	
Eastern	23 (53.5%)	20 (46.5%)	
Northern	10 (62.5%)	6 (37.5%)	
Southern	13 (76.5%)	4 (23.5%)	
Sleeping hours per day			
Less than 6 hours	52 (48.6%)	55 (51.4%)	0.72
Between 6–8 hours	88 (50.9%)	85 (49.1%)	
More than 8 hours	7 (41.2%)	10 (58.8%)	

(Continued)

Table 4 (Continued).

Factor	Published Research During Residency		P-value
	Yes	No	
On-calls per month			0.77
1–3 calls per month	30 (46.2%)	35 (53.8%)	
4–7 calls per month	88 (49.7%)	89 (50.3%)	
8–10 calls per month	29 (52.7%)	26 (47.3%)	
Published article during medical school.			0.012*
Yes	126 (53.2%)	111 (46.8%)	
No	21 (35%)	39 (65%)	

Notes: *Significance p value less than or equal to 0.05.

(71.4%) and R5 (68%), compared with R1 (24.4%). Prior research experience during medical school was associated with greater productivity during residency (53.2% vs 35%; $p=0.012$). By contrast, age, gender, marital status, residency program, program region, average sleep, and number of on-calls were not significantly related to research output.

In multivariate logistic regression (Table 5), several factors independently predicted higher research productivity. These included:

- Having a chronic medical condition impacting quality of life (OR 3.48; 95% CI 1.43–8.52; $p=0.006$),
- Being in R2 (OR 5.12; 95% CI 2.34–11.23; $p<0.001$), R3 (OR 4.72; 95% CI 1.73–12.89; $p=0.002$), R4 (OR 17.16; 95% CI 5.55–53.03; $p<0.001$), or R5 (OR 30.85; 95% CI 9.39–101.35; $p<0.001$), compared with R1,
- Having published during medical school (OR 2.95; 95% CI 1.36–2.95; $p=0.006$).

Conversely, being male (OR 0.43; 95% CI 0.22–0.86; $p=0.017$) and being enrolled in obstetrics and gynecology (OR 0.15; 95% CI 0.04–0.54; $p=0.004$) were associated with lower productivity.

Table 5 Multivariate Logistic Regression (Factors Predicting Publishing Research During Residency)

Factor	OR (95% CI)	P-value
Gender		
Female	Reference	
Male	0.43 (0.22–0.86)	0.01*
Age		
Over 30 years	Reference	
25–30 years	2.08 (0.78–5.55)	0.14
Marital status		
Single	Reference	
Married	0.79 (0.37–1.70)	0.54
Divorced	0.17 (0.01–2.03)	0.16
Parenthood		
None	Reference	
1–3 children	1.62 (0.60–4.40)	0.34
More than 3 children	4.40 (0.53–36.56)	0.17
Chronic medical condition		
No	Reference	
Yes	3.48 (1.43–8.52)	0.006*

(Continued)

Table 5 (Continued).

Factor	OR (95% CI)	P-value
Residency program		
General surgery	Reference	
Pediatric surgery	1.23 (0.34–4.48)	0.75
Ophthalmology	1.63 (0.59–4.54)	0.34
Neurosurgery	1.17 (0.39–3.47)	0.78
Urology	2.52 (0.88–7.26)	0.08
Orthopedic	1.23 (0.45–3.35)	0.68
Obstetrics and gynecology	0.15 (0.04–0.54)	0.004*
ENT (Otorhinolaryngology)	2.30 (0.71–7.46)	0.16
Postgraduate year (PGY)		
R1	Reference	
R2	5.12 (2.34–11.23)	< 0.001*
R3	4.72 (1.73–12.89)	0.002 *
R4	17.16 (5.55–53.03)	< 0.001*
R5	30.85 (9.39–101.35)	< 0.001*
Region of residency program		
Central	Reference	
Western	0.46 (0.21–1.01)	0.05
Eastern	1.07 (0.42–2.74)	0.88
Northern	1.60 (0.38–6.84)	0.52
Southern	3.14 (0.75–13.18)	0.11
Sleeping hours per day		
Less than 6 hours	Reference	
Between 6 and 8 hours	1.26 (0.67–2.38)	0.47
More than 8 hours	1.08 (0.28–4.14)	0.90
On-calls per month		
1–3 calls per month	Reference	
4–7 calls per month	1.07 (0.49–2.36)	0.86
8–10 calls per month	0.68 (0.24–1.92)	0.46
Published article during medical school.		
No	Reference	
Yes	6.4 (2.95–13.36)	0.006*

Note: *Significance p value less than or equal to 0.05.

Overall, these results contribute novel national-level insights into the research productivity of surgical residents in Saudi Arabia. The associations with postgraduate year, prior research experience, and gender align with international literature, enhancing the credibility of the findings. However, the association with chronic illness—though statistically robust—remains unexpected and requires cautious interpretation. This finding should be viewed as hypothesis-generating rather than conclusive, warranting further investigation in larger multicenter studies.

Discussion

Residency training programs were established to meet the growing demand for specialization arising from expanding medical knowledge.^{9–11} These programs emphasize evidence-based medicine, encouraging residents to engage in scholarly activities not only to advance scientific understanding but also to enhance clinical decision-making.^{12,13} Prior work has demonstrated that residents with higher research output often exhibit improved clinical performance compared to peers with fewer or no publications.^{14,15}

In our study, several factors predicted greater research productivity among surgical residents. Consistent with international literature, prior research experience was strongly associated with subsequent productivity. Residents who

had published during medical school were significantly more likely to publish during residency (53.2% vs 35%, $p=0.012$). This aligns with findings from Northwestern Nigeria, where pre-residency research experience was a robust predictor of publication during training.¹⁵ Such results highlight the importance of early exposure to structured research opportunities, which can build skills, confidence, and academic trajectories.

Motivations for research engagement in our cohort primarily included securing fellowship positions and developing an academic career. These drivers are consistent with other studies that have emphasized the importance of protected research time, mentorship, and institutional resources in fostering resident productivity.¹⁶ By contrast, barriers to research were dominated by lack of time, work-related stress, and limited personal interest. These findings parallel previous reports from Saudi Arabia, where competing clinical and educational demands were the most commonly cited obstacles.¹⁷ Collectively, these results emphasize the urgent need for residency programs to introduce actionable interventions—such as structured mentorship systems, designated research blocks, and research skills training—to help mitigate barriers and enhance scholarly engagement.

Our study also revealed interesting patterns in the predictors of research productivity. Progression through residency years was strongly associated with greater output, which is expected given increased academic maturity, supervisory relationships, and cumulative exposure to scholarly environments. However, one novel and unexpected finding was the association between having a chronic medical condition and higher research productivity. While statistically significant, this result should be interpreted with caution. It is possible that residents with chronic conditions may adapt by prioritizing academic work over clinical or extracurricular commitments, or that unmeasured confounders—such as stronger institutional support or self-selection into research-oriented pathways—played a role. To our knowledge, no previous studies have described this association, and replication in larger, multicenter cohorts will be important to confirm or refute this finding. At this stage, it should be considered hypothesis-generating rather than definitive.

Another noteworthy finding was the lower research productivity among male residents and those enrolled in obstetrics and gynecology. These associations merit further exploration, as they may reflect structural, cultural, or specialty-specific differences in mentorship opportunities and research expectations. Identifying and addressing such disparities could help ensure equitable access to research opportunities across specialties and demographics.

From an international perspective, resident research productivity in North America and Europe has been reported to range from 60–80%, often supported by structured research curricula, mentorship programs, and even dedicated research years. In contrast, our study suggests that Saudi Arabia lags behind these benchmarks, with approximately half of surgical residents reporting publication during training. This discrepancy highlights a major opportunity for national residency bodies to adopt and adapt successful international strategies to the Saudi context, thereby fostering a stronger culture of academic medicine.

Our study has several limitations. First, while the national scope and high response rate are strengths, the overall sample size remains modest, and subgroup analyses should be interpreted cautiously. Second, the types and quality of publications (eg, journal ranking, citation impact) were not explored in depth, limiting assessment of the broader academic contribution. Third, the cross-sectional design precludes causal inferences about predictors of productivity. Future research should compare Saudi surgical residents' research productivity with international cohorts, including high-income, middle-income, and lower-income countries, to contextualize the findings and identify best practices for capacity building.

Overall, this study provides the first national-level insights into the research productivity of surgical residents in Saudi Arabia. While many findings are consistent with international literature, the observed association with chronic illness introduces a new avenue for investigation. Importantly, our results underscore the value of structured mentorship, protected research time, and early exposure to scholarly work as strategies to enhance resident productivity. Embedding these elements into Saudi residency training programs may bridge the gap with international standards, improve academic output, and ultimately enrich the quality of surgical education and patient care.

Conclusion

Advanced residency level and prior research experience were key predictors of research productivity, while lack of time remained the main barrier among surgical residents. The unexpected association between chronic illness should be interpreted cautiously but merits further study. Residency programs should prioritize mentorship, protected time, and structured research opportunities, and future large-scale, comparative studies are needed to contextualize these findings internationally.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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