Addis Ababa University College of Health Sciences

School of Medicine

Department Of Emergency Medicine

RESEARCH PRACTICE AND ASSOCIATED FACTORS AMONG EMERGENCY AND CRITICAL CARE MEDICINE RESIDENTS IN ETHIOPIA

by

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Declaration

I, Gedefaw Tigabu, declare that this study was originally conducted by me, and that all the materials I used are properly acknowledged.

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Abbreviations

- AAU: Addis Ababa University
- BDU: Bahir Dar University
- ENT: Ear Nose Throat
- FMOH: Federal Ministry of Health Ethiopia
- ECCM: Emergency and Critical Care Medicine
- GDP: Gross Domestic Product
- HRU: Haramaya University
- HSciR: Health Science Research
- HU: Hawassa University
- IFEM: International Federation of Emergency Medicine
- IRB: Institutional Review Board
- JU: Jimma University
- LMIC: Low- and Middle-Income countries
- SPMMC: Saint Paulo's Millennium Medical College
- TAAAC: Toronto Addis Ababa Academic Collaboration
- TASH: Tikur Anbessa Specialized Hospital
- UAE: United Arab Emirates
- UOG: University of Gondar
- WHO: World Health Organization
- Yr,: Year

Abstract

Background: Outside the required academic research, very little and no research practice involvement has been determined. There is a paucity of knowledge regarding research practices in Emergency Medicine residents in Ethiopia, which calls for further research and analysis.

Goal: To evaluate the degree of research practice and identify variables influencing research practice among emergency residents undergoing training in Ethiopia

Methodology: From September 9, 2023, to November 9, 2023, a cross-sectional study using an online administered structured questionnaire was conducted 106 emergency medicine residency trainees in Ethiopia. stratified sampling was used to allocate residents stratified by year of residency and college after obtaining sampling frame.

Results: Overall, 62 residents (58.5%) conducted research. Only 6 residents (5.7%) conducted research other than the required thesis during their residency. Of 62 residents only 5 (8.1%) of residents have publication and only 4.7% of residents have completed a case report during residency. Good skills are associated with better research practice in 61.1% versus 37.7% ($p = 0.016$) compared to poor skills. University-sponsored residents have better skills compared to MOH residents in 60.9 vs. 40.4%, $P = 0.026$. Year 3 residents have better practice in conducting research projects other than the required thesis in 83.3%, $P=0.013$.

Conclusion: Despite a positive attitude, emergency and critical care medicine residents have a low level of research practice and a lack of skills. Advocacy should be undertaken for research project activities. A study should be conducted to objectively evaluate the factors.

Keywords: Research Practice, Skill, Attitude, Emergency Residents

1. Introduction

1.1. Background

Resident research, research done during post graduate medical study, is any systematic investigation aimed at obtaining new information, actively involving the resident-learner and facilitating the acquisition of a greater understanding of the scientific method(1). Because residents practice medicine and work in the health field, they practice health research as part of their research activities. A resident is a doctor, a student, a self-learner, a teacher, a health advocate and presumably a researcher who specializes in one of the fields of medicine after completing medical school.

According to Section 321(g)(1) of Title 21 of the United States Code, medical research is defined as “research that is connected to the development of biomedical products, devices, or drugs or that is related to the causes, diagnosis, treatment, control, or prevention of physical or mental diseases and impairments of humans and animals”.(2). The aim of health research is to improve the quality of life. Various organizations emphasize medical and high-quality research. Among these, the WHO advocates high-quality research as essential to the achievement of its constitutional goal and emphasizes the importance of research to the motto "the achievement of the highest possible level of health for all peoples" (3).

The International Federation of Emergency Medicine (IFEM) defines emergency medicine as “a practice that is grounded in the knowledge and abilities necessary for the acute and urgent prevention, diagnosis, and treatment of physical and behavioral disorders that affect patients of all ages”.(4). It is a young specialty of medicine that was introduced in Ethiopia in 2009 at TASH (Tikur Anbessa Specialized Hospital) and SPMMC (Saint Paul’s Millennium Medical College), followed in 2011GC(5). It is even a recent development for the world and also for Africa.

According to the harmonized curriculum for emergency and critical care programs developed by FMOH in 2018, there is a one-month research leave during the residency and a research methodology specifically incorporated into the curriculum(6). Although lectures on evidence-based medicine have been delivered at some institutions by faculty and the TAAAC (Toronto Addis Ababa Academic Collaboration) team, there are no formal lectures and training on research methodology incorporated to the curriculum. But like all other medical residencies, there are also regular journal club presentations that help residents improve their critical appraisal skills and the practice of evidence-based medicine. Although conducting academic

research is a prerequisite for completing residency training in emergency medicine, the level of research practice of emergency medicine residents in Ethiopia has not been studied since the beginning of the residency program. In addition to developing research practices and skills, residency research is a way to explore future career opportunities in health research and build evidence-based medicine. In order to solve local problems in local context, research is an important tool to guide academic and leadership tasks. As emergency medicine is a new area for the country with many unknown and yet buried problems, more importantly, physician scientists are also needed who combine clinical research into a paradigm of clinical care. Enhancing the research conducted by Emergency Medicine Residents is imperative for the advancement of the field of emergency medicine and emergency care. These services are critical to public health and should be provided as universal health care..

There are many researches done on resident's research practices, activities and factors affecting conducting research during residency. Only limited article is found in Ethiopian context. But there is no specific research done on emergency and critical care residents in Ethiopia. Research capacity in emergency care is limited in Low- and Middle-Income Countries (LMIC) too. In addition to practicing clinical practice, active research by practitioners and residents is important to practice evidence-based medicine and improve quality of emergency care. It has been seen that lack of research knowledge and practice, inadequate financial and mentor support are barriers in research practice in resident students of Ethiopia(7).

The aim of this proposal is to investigate the attitude, practice, skill, research productivity, barriers and facilitators of conducting academic research in Emergency residents practicing in Ethiopia.

1.2. Statement of Problem

Health research is an important tool to improve, strengthen and build emergency care and practice. In addition to treating patients, practice of research among physician is an important to bring robust emergency health system and care. Also, to practice evidence-based medicine the role of research activity and practice is great. Even though mandatory research activity is included in all medical residency training curricula and most undergraduate medical school the practice and productivity of research are not known.

As emergency and critical care medicine is a young field in Ethiopia it is still with many challenges from acceptance to patient disposition(8) ,which needs investigation and in-depth

research to strengthen and build a strong emergency care system. By the nature of patients and it's public health importance, emergency care is a critical entry way to a health system and a key determinant of individual and population health(9). To strength health system and medical practice postgraduate resident students research activity can help a lot in problem solving, if strengthened and managed well. Ideally research practice should develop at school and strengthen progressively. There was study done on resident research attitude, knowledge and practice which was done with convenience sampling in TASH(Tikur Anbessa Specialized Hospital) ,which showed inadequate mentor and financial support and lack of research knowledge as barriers(7). Similar barriers were identified too among radiology residents in Ethiopia(10).

Studies focusing emergency residents were not done in Ethiopia. As emergency health care is declared as one of universal health coverage right by WHO, research practice by emergency residents should be looked in depth(11). Emergency health care research has many areas yet to be investigated. Emergency residents research activity should be more encouraged and research culture should reach at its zenith. Although there is diversified and high volume of patients in emergency which is a good chance for place of research, staffs are concerned of giving patient care in a crowded emergency and uncontrolled area with ill-defined illness, unclear diagnosis which poses challenges to research[9(p501)]. Till the recent knowledge, there is no study conducted on the practice or productivity of emergency resident's research, even though there are some publications done by emergency residents

1.3. Significance of the Study

The sheer volume and diversity of patients make emergency care a fertile place for research(12). To use this fertile place of research, resident's involvement has a great role in producing research manpower. In LMICs in particular, there are several reasons to invest in emergency research that residents are welcome to investigate like the burden of disease, issues of cost-effectiveness of emergency care, emergency care system, global health security, and need for content specific intervention in LMIC(9). Knowing the practice of research also helps future career development of physician scientist and clinical researcher and may aid in curricula revision. Assessing the involvement and development of research practice could asses the level of practice of evidence medicine too, which is important in quality of care. Studying research practice will help also to identify and plan next for the department development and emergency

care research. The fact that there is a gap in information and absence of previous studies in level of practice, level of skill in research and factors affecting research practice makes the study more important and helps identify specific factors to emergency residents.

2. Literature Review

2.1. Health Research

In the age of evidence-based medicine in the twenty-first century, research fosters critical thinking, intellectual curiosity, and lifelong learning skills. (9). The field of health science research, or HSciR, encompasses basic, clinical, and applied sciences related to human health and well-being, as well as the causes, prevention, diagnosis, treatment, and control of disease. (10). Laws must exist in addition to the coordinated efforts of researchers, funders, and users in health research projects. (11). The lack of highly qualified researchers and the absence of a strong and functioning health research system require attention in Ethiopia (11,12). In Ethiopia, health research is mostly conducted by academic institutions in addition to MOH and public health institutes (11).

Ethiopia has low national health expenditure of GDP of around 0.27%, according to a 2017 World Bank report (13). Likewise, GDP spending on health research by most African countries is low. Even the NIH (National Institute of Health) allocates the lowest grant for emergency medicine and nursing research, only 0.7% of its allocated budget, and emergency medicine has the fifth lowest funding per capita (7). Overall, only 0.79% of emergency care publications come from low- and middle-income countries (7). In general, Ethiopia has a low number of researchers (45 per million population) and a low number of publications (33 per million population), as shown by the Scimago journal country ranking in 2019(14). In 2021, Ethiopia also has a low number of health researchers (64.74 first authors per million inhabitants) and a low number of paper producers (96.93 per million inhabitants) (15). When Ethiopian trainees' knowledge of evidence-based medicine was assessed, it was low, there was also a lack of formal training in EBM and only 25% were aware of the Cochrane library but none used it (16).

Even though there are many areas of capacity for research opportunities like the burden of emergency disease, the cost-effectiveness of emergency care, public health intervention in emergency, the effectiveness of emergency care and a content specific interventions in LMIC the challenges and constraints are wide(9). There are many challenges in researching emergency care in LMICs such as Ethiopia, including difficulties in defining the population of interest (medical emergencies occur anytime and anywhere), challenges in defining interventions and outcomes (as care is time-dependent), challenges in Study design, etc. Data collection due to acuity, sensitivity and symptom-based diagnosis, ethical concerns (getting

consent may be difficult) and low focus giving to build research capacity and research environment of emergency care(9).

2.2. Attitude, Skill and Practice of Research

Since emergency medicine is a new development in medicine, research activity has not yet been increased. Less than 1% of the world's emergency medicine literature discusses emergency care in Africa, according to a 2014 report by the African Conference on Emergency Medicine. (17). It lags far behind the world not only in terms of the number but also in the quality of research. A survey conducted among residents of Addis Ababa University showed an average research knowledge score of 34.6%, only 2% had publications, the majority had a positive attitude towards research with an average score of 3.8 and 54.5% of them were planning to had some kind of research contact when starting as a junior doctor, while 29.6% were involved in research after starting their specialist training (5). And among radiology residents in Ethiopia, in a 2021 study, 6% of them had publications, 10% of them participated in writing case reports during their residency, and 96.2% of them had a positive attitude with 3.78 average score(8).

The results of a 2012 Saudi Arabian study showed positive attitudes: 97.9 percent of respondents felt that research is crucial to medical practice, 92.2 percent agreed that junior doctors should engage in research, and 937 percent agreed that. teaching research methods should be a part of the curriculum for research residencies. Merely 30.4% of the participants in this study engaged in research activities during their stay. (18). Furthermore, 92.7 percent of participants concurred that research fosters critical thinking, 93.2 percent felt that research enhances healthcare, and 869 percent felt that research progresses their professional lives. (18).

According to a study conducted in African countries in 2016, among emergency service providers, 22% of physicians have never been involved in research activities, while only 13.1% have been involved in research activities (17). Residents with advanced training levels were significantly more likely to have conducted research than those in early residency and residents who had one or two children during their residency were less likely to have completed research compared to those without children (18).

In a survey conducted in Nigeria 98% of surgery residents perceived Journal club is very important(13). Similarly in Iran Tabriz University of medical sciences clinical residents, the

self-assessment of research skill was mostly weak and somewhat good even after one month research training(14). Following a four-day biostatistics workshop, medical doctors and other health professionals in Indonesia demonstrated a marked improvement in their conceptual grasp of statistical concepts and their applications. (15). Among 32 Emergency medicine residents training in Rochester Medical center in case-controlled trial comparing EBM approach to traditional journal club approach to critically appraise, there was no skill difference in critically appraisal skill.

2.3. Productivity of Research and Output

Research is an important for addressing local problems in local context. Research productivity is a crucial for the application of the work done. Research published more in reviewed world journal will have impact in the matter. There are multiple health journals in Ethiopia issuing and publishing health and medical articles. There is a newly established journal ready to publish emergency care research area, The Pan African Journal of Emergency Medicine. This local journal will increase peer review and help solving problems in local context.

Less than 1% of the global emergency medicine literature addresses emergency care in Africa as seen in from African conference on emergence medicine in 2014(16). Even among residents and among medical educators in Addis Ababa University average number of publication per year was less one 0.47(7,17). In involvement of research and number of peer reviewed publications males staffs were predominant in Addis Ababa University(18). Among radiology residents in Ethiopia only 5% had published article in a survey conducted in 2020 by Dandena etal.(10)

2.4. Facilitators of Research

For most research is an opportunity to ensue next career and practice more research methodology. Factors such as developing research skills (93 percent), getting research published (91 percent), adding a noteworthy accomplishment to one's resume (89 percent), pursuing research interests (88 percent), making it easier to get accepted into a subspecialty fellowship program (79 percent), or having it required by the residency program (63 percent) were found to be the main drivers of research among Saudi Arabian residents surveyed in 2012(19). In a Mansci et al. 2019 study of ENT residents, 72% of the participants cited mentor support as their main motivation for pursuing research, while 60% of the participants cited personal interest. (20).

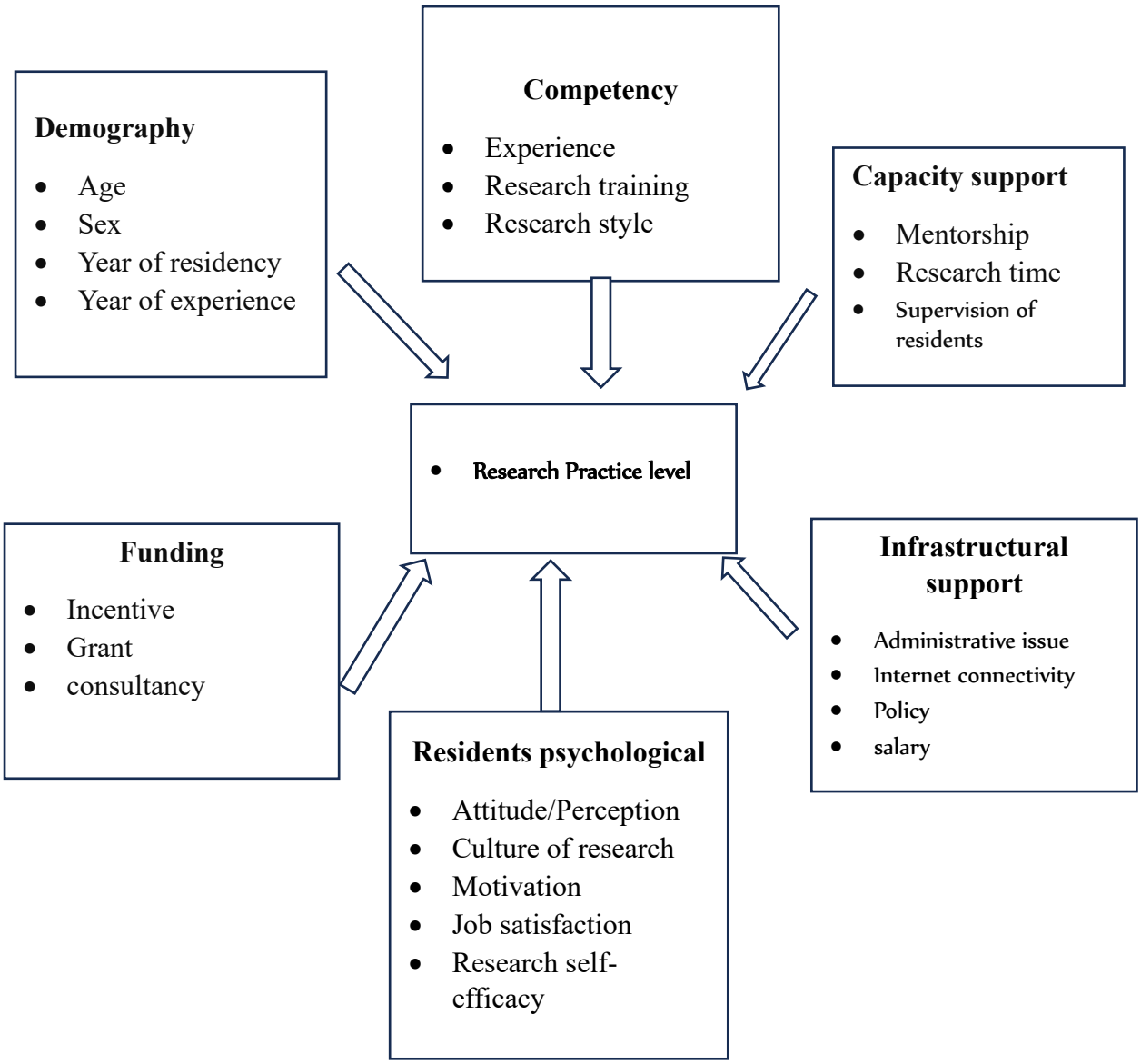
Among family residents in Canada in a mailed survey holding university appointment was significantly associated to participate in research activity since completing residency, also residents who completed residency have been more significantly involved than those who didn't which was 0.89 projects/yr. Versus 0.38projects/yr. respectively(21).

2.5. Barriers of research

Even though research is a way to the practice of quality health care and evidence-based medicine there are many challenges despite good attitude to research activity. Among the challenges and barriers mentioned are lack of time and workload, lack of financial support, lack of mentor, lack of knowledge of statistics and research methodology. These perceived barriers were mentioned on a survey conducted among residents students of Addis Ababa University.(7) Similarly, radiology residents in Ethiopia reported that a lack of training, a heavy workload, inadequate mentor support, and inadequate financial support prevented them from having enough time(10). Research-trained residents, competition with work activities, and lack of protected time were other barriers faced by residents of Latin America. (22). Similar studies shows lack of time and lack of research methodology training as the most significant barriers in studies in India(23) and Abu Dhabi(24). In Thailand statistics and its applications, limited time and topic formulations were the cited barriers by residents. In Australia among emergency trainees lack of time followed by skill was the most barrier but financial issue was the least barrier(25).Also in Canada lack of time, lack of research project perceived curriculum deficiency were too barriers(26) . Lack of research methodology emphasis during journal club and lack of protected time were the most identified barriers in a study conducted in UAE medical residents(24). In a physician study conducted in Cameroon, the top three obstacles were finding permission to collect data, lacking financial incentives, and lacking grants. (27). In conclusion more or less the barriers identified were similar in different setting. In a study conducted among medical residents in Latin America, gender was found to be a contributing factor. Although females accounted for 62% and 34% of publications, respectively, only 37% of the residents had national and 34% international publications. (22). A study by Mansci et al. among ENT residents also revealed that the biggest limitation was time (93%), followed by a lack of statistical knowledge (52%) and a lack of interest (43%)(28).

Conceptual Framework

Figure 1: Conceptual Framework of factors associated with research productivity (29)



3. Objective

3.1. General objective

- To Asses research practice, Skill, Attitude and Associated Factors among Emergency and Critical Care Medicine Residents.

3.2. Specific objective

- To measure the attitude of emergency and critical care residents towards research practice during Residency
- To estimate research methodology skill of Emergency and Critical Care Residents during Residency.
- To assess perceived barrier and facilitator factors of research practice during residency

4. Research Methodology

4.1. Study Setting and Period

The setting of the study is universities that offer training in emergency medicine, such as those currently found in Ethiopia, a country in East Africa with an area of 1,128,571 square kilometers (34). The study site was the seven universities that have a training program for emergency medicine residency in Ethiopia. There are currently total of 201 emergency residents at seven universities nationwide. The first emergency medicine trainees completed their studies at TASH in 2013GC. Emergency medicine training is currently being carried out at seven medical universities(5). Two of the seven universities Bahir Dar University and University of Gondar started in 2023 have only the first Year one batch. Haromiya University started training in 2021 and currently have the first year three batch. Hawassa University have accepted the second batch and started training in 2022GC and have no year three ECCM residents. Jimma University has graduated its first batch of ECCM trainee in 2022. 201 emergency Medicine Residents are currently being trained in Ethiopia. The study was conducted from September 10, 2023 to November 10, 2023.

4.2. Study Design

A multicenter descriptive and analytical cross-sectional study was conducted in seven universities currently offering emergency and critical care medicine residency training in Ethiopia.

4.3. Study population

The study population were all emergency residents currently on training in Ethiopia who full filled the eligibility criteria.

4.4. Source population & Target Population

The source population consisted exclusively of emergency residents who completed training in AAU, SPMMC, JU, HW, HRU, BDU, and UOG. The target group were all emergency residency trainees in Ethiopia.

4.5. Study unit

Each Emergency Medicine trainee was the study unit.

4.6. Sampling frame

A list of all 201 residents of the seven universities along with their contact was created in order to stratify the respondents according to university and year of residence and finally select them randomly

4.7. Eligibility criteria

4.7.1. Inclusion criteria:

Residents from year one to year three currently on training emergency medicine in seven universities.

4.7.2. Exclusion criteria:

Residents who drop out and have withdrawn currently from training were not included in the study. The principal investigator currently year 3 emergency medicine resident was not included in the study. Emergency Residents From other departments attaching Emergency by the time were excluded from the study. Residents included in the questioner's pretest and pilot study were also excluded.

4.8. Sample size determination and sampling procedure

4.8.1. Sample size determination:

The sample size was calculated using a single population formula with EPI-Info 7, using the proportion value from previous studies on research practices during residency among residents in Tikur Anbessa in 2017 (5), which was 29.6%, and the total number of emergency residents in Ethiopia is currently 201. And a significant value of 0.05 and a power of 80% were assumed.

Using single population proportion formula for population survey.

$n = \left(z\alpha/2\right)^2 \times \frac{P(1-P)}{d^2}$, single population proportion formula

z=1.96, α= 0.05, P= 29.6, d= 0.05 and considering design effect of 2 for stratified proportionate sampling and the calculated n will be 246. But as the population size is < 10,000 the sample size n needs correction using finite population correction formula.

$nf = \frac{n}{1+{}^{n}/_{N}}$, where n = 246 (the sample size of single population formula), N is population size which is 201 and *nf* is finite population sample size which is approximated to 110. Considering adjustment to nonresponse and inconsistent response of 10% final sample size was 122 using formula $\frac{110}{(1-0.1)}$ = 122.

Comparing the variables of research training during undergraduate and postgraduate studies for the proportion of residents who have published, a sample size of 82 was obtained using the double population proportion formula from a similar study conducted in TASH among residents. Overall, the sample size was calculated using the simple population proportion group formula 122 was used.

Table 1: Double population Formula

Factors	Training During Under graduate study	Training during Post graduate study
Power	80	80
Confidence Interval	95%	95
Proportion of unexposed (undergraduate training)	17.7%	79.6%
Risk Ratio	4.49	0.23
Odds Ratio	18.1	0.05
Proportion Of Exposed (post graduate training)	79.6%	18.4%
Calculated Sample size	82	31

4.8.2. Sampling procedure

Stratified sampling was used, each university taken as a stratum. Numbers of study unit from each university was assigned proportionally and, in each university, lottery method was used to select participants from each year batch proportionally using allocation formula from the sampling frame. And the questioner link was directly sent to each individual via direct SMS.

Figure 2: Sampling procedure

4.9. Study Variables

The independent variables were sex, year of residency, journal club participation, attitude, research methodology skill, previous research experience, and having research methodology training.

Dependent variables: presence of research project other than the required thesis.

4.10 Operational definition

Attitude: Participants' feelings toward the scientific inquiry process, statistics, literature review, and critical evaluation of evidence(30).

The average score for all five Likert scale questions was determined. A mean score of 0 points to 1 point was considered strong disagreement, 1 point to 2 points was considered disagreement, 2 points to 3 points was considered neutral, 3 points to 4 points was considered agreement, and 4 points to 5 points was considered strong agreement. Additionally, any resident's mean attitude score toward research was interpreted as positive if it was greater than 3 points, and negative if it was less than 3.

Research practice: how research participants acted to express their knowledge and beliefs(10). This may include previous involvement in research endeavors such as completion of previous research projects, previous publications, presentations, writing case reports, and participation in activities such as writing or developing articles that require research methodological skills(10).

Barriers: are factors that negatively affect research practice.

Facilitators: are factors that positively affect research practice.

Research Skill: ability to participate in research practice.

The mean score for each of the five Likert scales used to measure skill was determined, and it was grouped into a range that was comparable to the mean score for attitude. More than three points was considered good skill for all residents, and less than three points was considered poor skill.

4.11 Data collection tool and Procedure

Self-Administered -Structured questioner having five sections: informed consent, questions assessing demography, attitude, practice, Skill, perceived facilitator and barrier factors was administered via online e – survey methods using google forms. The data was collected by the principal investigator The questioner was prepared in English. The questioner online link was sent directly via SMS to each study unit. Respondents were remembered via SMS and phone call after the link is sent. The questioner is adopted from previous studies done in Ethiopia by Moges etal (7), Dandena etal(10) and van hoving etal(16)research methodology skill assessment tool developed by Meerah etal(31) and modified for the topic of interest. Annex 1: Questioner

4.12. Data Quality Control

The Questioner was pretested and Pilot study was conducted to check the comprehensibility and analyze the time required for the questioner among residents training. Nonresponse rate was calculated. Those who didn't respond to the questions by the end of study period were considered as nonrespondents. The reliability of a tool assessing the skill of residents was calculated using Cronbach's Alpha which was 0.956. Similarly, the Cronbach's Alpha value for questioner assenting attitude, facilitator factors and barrier factors were 0.860, 0.724, 0.731 respectively. Missing data, Incomplete, outliers, non-differentiated responses choices and inconsistent responses were checked and managed. Data was Imported from google form excel, cleared and coded using Microsoft excel 2019 finally entered, cleaned and analyzed using SPSS Version 27. Missing values were managed using paired deletion. Responses from four residents were deleted due to incomplete response of more than 20%.

4.13 Data Processing and Statistical Analysis

SPSS version 27 was used for statistical analysis. Descriptive analyzes such as mean, median, frequency and proportion of demographic characteristics, attitude level, research practice, research practice skills, perceived moderator and barrier response were calculated and presented in tables. The chi-square test and Fisher's exact test were used to evaluate the difference in frequency between different categorical variables. Cochran's rule was used to select between chi-square tests and Fisher's

exact tests. Statistical significance was assumed to be a P value <0.05 with a confidence interval of 95%.

4.14. Ethical consideration

The study was conducted after receiving official approval letter from Addis Ababa University, Department of Emergency Medicine research committee. Participants will respond in writing after written consent has been obtained. Each respondent was informed about the aim of the study. The confidentiality and anonymity of the respondents was maintained so that the questioners did not receive any identification data and the data was not passed on to third parties. Only residents who volunteered after providing written informed consent via the online form were included in the study.

5. Results

5.1 Baseline Characteristics

Of the estimated sample of 122 residents, only 114 residents were accessed, of whom 106 responded, with a non-response rate of 8(7%). Most non respondents were from SPMMC. Six respondents were expected from BDU and UOG, but online administration of questionnaires or access to residents was not successful due to unavailability of internet data network in the region. The average age of the five emergency and critical care residents from the medical school who took part in the study was 29 years. Of all residents 79(74.5%) were male, the remainder female. There almost equal distribution in each batch of residency 35 (33%), (38)35.8%, and (33)31.3% of residents had postgraduate degrees in their first, second, and third years of residency, respectively. Their average experience before entering residency was two and a half years. MOH sponsored residents were77 (72.6%) and23 (21.7%) were from universities. Most of the residents were from AAU and SPMMC, which are 40% and 30.2%, respectively (Table 2).

Table 2: Demographic Characteristics

Category		Frequency (106)	Percentage
Age	25- 30	80	75.5
	31 – 35	20	18.9
	36 – 40	6	5.7
Sex	Male	79	74.5
	female	27	25.5
Marital Status	Married	64	60.4
	Single	42	39.6
Year of residency	PGY1	35	33
	PGY2	38	35.8
	PGY3	33	31.1
Sponsor	MOH	77	72.6
	Self	1	0.9
	University	23	21.7
	Other	5	4.7
College	AAU	43	40
	SPMMC	32	30.2
	JU	17	16
	HRU	8	7.5
	HU	6	5.7

Of the 106 residents, 20.8% of them took some kind of training on research methodology only during their undergraduate studies, while 39.6% took it during their residency, and 37.7% took training both during their undergraduate and residency training. Regarding reading 45 (43.3%) of residents have regular article reading, and the mean hour spent on

research activities and practice was 2.5 hours per week. among all residents 57 (54.4%) of the residents also have easy access to journals. But only 67.4% of residents responded that emphasis was given to research methodology and statistics in journal clubs.

5.2 Research Practice

From 106 residents 62 (58.5%) of residents have done at least one research project. But only 6 (8.1%) of them 62 residents who ever did research have published the article, and only 5.7% of them have done research other than the mandatory thesis during their residency. Similarly, only 5 (4.7%) from all 106 of residents have done case reports during their residency. . Just 8 (14.2%) residents who had ever conducted research participated in all process from coming up with a research question to writing a manuscript. In 72.6 percent of the cases, cross-sectional research designs were used (See annex Tables 6 and 7).

Table 3: Research Practice

Category		frequency	percentage
Research ever	Yes	62	58.5
	No	44	41.5
Research during residency	Yes	6	5.7
	No	100	94.3
Case report	Yes	5	4.7
	No	101	95.3
Publishing	Yes	5	8.1
	No	57	91.9
Project time	Undergraduate course	45	72.6
	During Residency	5	8.1
	Both	12	19.4
workshop	Yes	21	20.4
	No	82	79.6
Grant proposal	Yes	13	12.2
	No	92	86.8
Critical Appraisal	Yes	31	30.1
	No	72	69.9

Table 4: Training and Access

Category		Frequency	percentage
Training Time	Undergraduate only	22	20.8
	Residency	42	39.6
	Both Undergraduate and Residency	39	36.8
	Other (GP, Quality, MPH)	3	2.8
Emphasis to research on journal club	Yes	58	67.4
	NO	28	32.6
Regular Journal Reading	Yes	45	43.3
	No	59	56.7
Easy access to journal	Yes	56	54.4
	No	47	45.6

5.3 Skill And Attitude

Based on the provided Likert scale, the mean research methodological competence is 2.97, which is below average and unsatisfactory. According to their confidence level rating, 51.5 percent of the people have mean skill levels over 3. The average attitude toward research is 3.87, which is a good and above expected average value. Additionally, 97.9% of Residents have a favorable attitude that is greater than 3.

5.4 Barrier and Facilitator factors

Work-related stress, a lack of training, a lack of time allotted for research, a lack of financial incentive, a lack of desire, and a lack of financing were the most often mentioned hurdles to conducting research, as reported by 98%, 96%, 96%, 94%, and 93% of residents, respectively. Refer to Figure 3.

Research is something that residents do because it's required, according to 82% of them. Researching to advance one's research abilities or to add to a positive accomplishment is one reason, according to 77% of residents. Furthermore, 73% of participants believe that conducting research equates to publishing research. Researching to enhance positive achievement and to advance research skills were cited as motivators by 77% and 77% of residents, respectively. Similarly, 73% of residents cited conducting research in order to publish it as a motive. Just 28% of respondents agreed that receiving money was a good reason to conduct research.

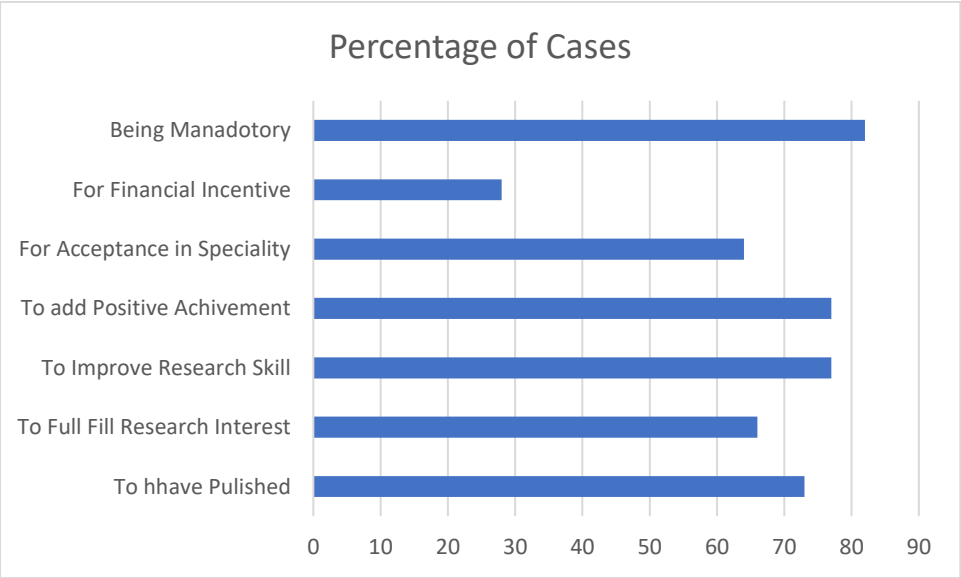


Figure 3: percentage of cases for cited facilitator factor by Emergency Residents

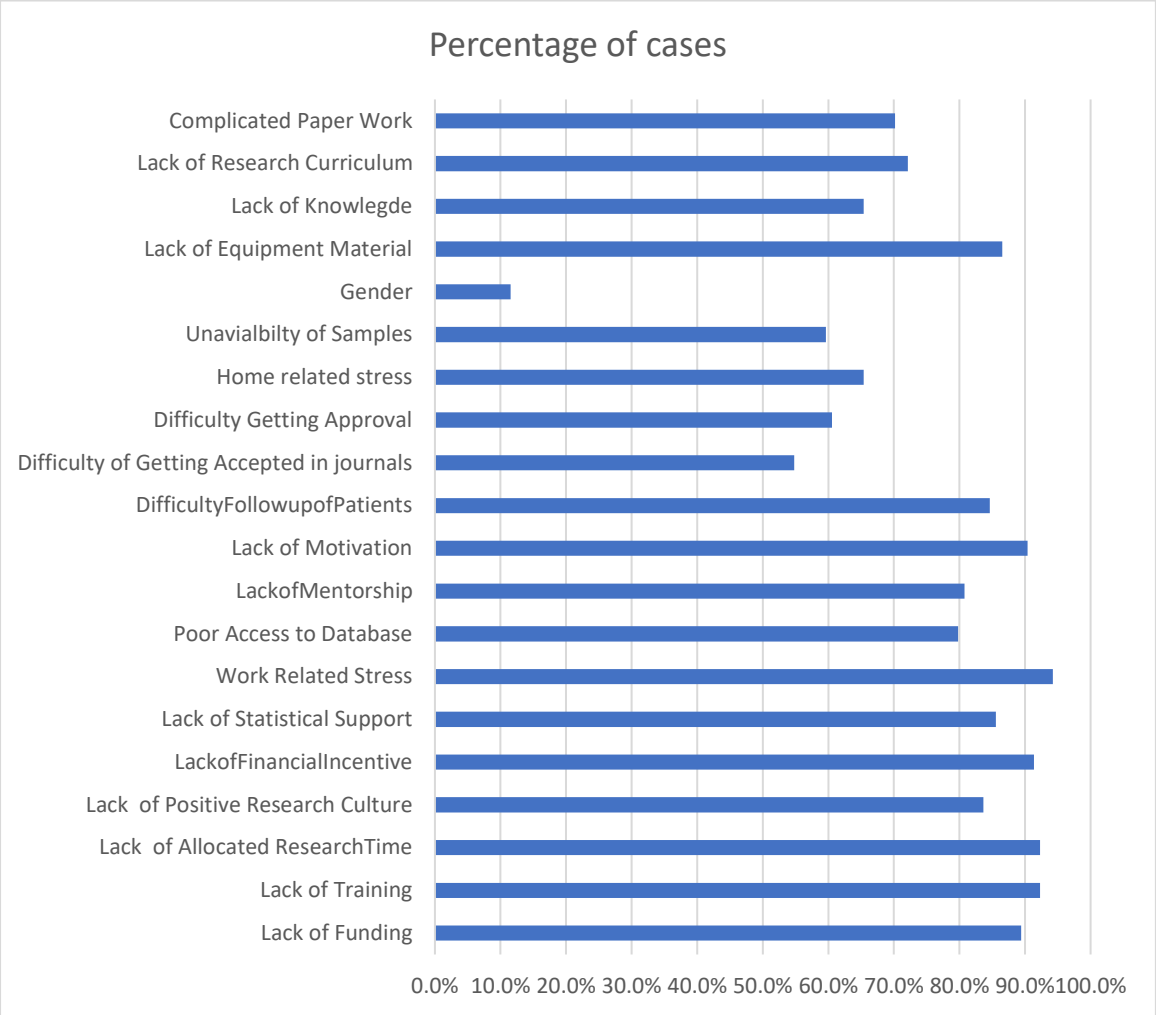


Figure 4:perceived barrier factor agreement by residents

5.5 Group Comparison

When the Prescence or absence of publication is assed in different groups using chi-square there was no deference in skill, sex, marital status, sponsor, college, training time, Year of residency and the presence of emphasis for research methodology.

When Skill was assessed to different groups using chi-square those who ever have done research had good skill compared to those who haven't which is 61.1% versus 37.7% with P value 0.016. When Skill is assessed with sponsor groups most university group residents had good skill compared to MOH sponsored residents 60.9% versus 44.4% with P value of 0. 026.But there was no difference when compared to sex, marital status, level of residency, residency college, research methodology training time (See annex Table 8). When the presence of research project other than mandatory thesis is compared with year of residency, 83.3% Year Three residents have done project as compared to 16.7% Year two residents with

P value 0.013. And among those who have research project other than mandatory thesis 100 % of them have good skill with P value 0.027. And all of the have research methodology training both during undergraduate and postgraduate time with P value of 0.02.

And there was no difference in attitude among different groups including sex, marital status, level of residency, sponsoring institution, college, previous research experience or emphasis given to research methodology.

Table 5: comparison of presence research project other than mandatory Thesis

category		Research Other than Mandatory thesis		X^2	P* value
		Yes	NO		
Sex	Male	4(66.7%)	75(75%)	0.207	0.649
	female	2 (33.3%)	25(25%)		
experience	<= 2 Years	3(60%	49(52.1%)	5.768	0.144
	2 – 5years	1(20%)	43(45.7%)		
	5 years	1(20%)	2(2.1%)		
Year Of Residency	Year 1	0(0%)	35(35%)	8.320	0.013
	Year 2	1(16.7%)	37(37%)		
	Year 3	5(83.3%)	28(28%)		
Sponsor	MOH	5(83.3%)	72(72%)	0.54	1.00
	Self	0	1(1%)		
	university	1(16.7%)	22(22%)		
college	AAU	3(50%)	40(40%)	3.607	0.296
	SPMMC	1(16.7%)	31(31%)		
	JU	0	17(17%)		
	HU	1(16.7%)	5(5%)		
	HRU	1(16.7%)	7(7%)		
Skill	Good	6(100%)	46(48.4%)	6.011	0.027
	Poor	0	49(51.6%)		
Attitude	Good	6(100%)	88(97.8%)	0.136	1.00
	Poor	0	2(2.2%)		
Training Time	One time only†	0	64(66%)	10.926	0.02
	Both	6(100%)	33(33%)		

** P value < 0.05, significant

† Either during under graduate or postgraduate only once.

6. Discussion

The study has shown that the research practice among emergency residents is low. Despite most emergency residents have ever done a research project the numbers published were countable in digits of a hand. Similarly, the residents who published or did a research project during residency other than the required thesis were only a few. The findings indicated that 58.5 percent of residents had at least one research experience, which may raise a question indicating that several university graduates have completed their undergraduate degrees without engaging in any research. The outcome is similar to a survey conducted among AAU TASH residents and radiology residents (5). A small percentage—just 8.1% of residents who have ever completed research has published the article, and just 5.7% of residents have completed research beyond the required thesis. This is extremely minimal. In comparison to radiology residents in Ethiopia, just 4.7% of residents wrote case reports during their residency. (8)

Although the mean attitude score of residents towards research is 3.87, and 90 percent of them have a mean score higher than 3, very few residents have published their research or done research outside of their required thesis. This might be as a result of their research methodology, which is subpar at Skill 2.97. Additionally, 96% of residents concurred that insufficient training posed a challenge.

Furthermore, a comparison of residents' research skill between those who have never done research and those who have revealed that those who have ever done so rate their skill as good and above in 61.1 percent versus 37.7 percent of cases. It is implied that encouraging research during undergrad or at any other time will boost residents' self-assurance in their capacity for conducting research.

When the confidence in research skill of MOH sponsored residents and university sponsored residents is compared, the university sponsored residents have a higher level of confidence in 60.9 percent versus 44.4 percent of cases. This could be because universities are thought of as centers of excellence with funding for research; as a result, university staff residents will be exposed to more research and have more opportunities to advance their careers.

The lack of a significant difference in the rate of publication and skill among resident groups according to their current college, level of residency, prior research experience, research methodology training duration, or emphasis on research methodology in journal clubs calls for a thorough examination of the curriculum or a more practical approach to research

methodology training. Despite good attitude with lower rate of practice and publication, research advocacy is required for emergency medicine residents to actually involve in a research activity. Also, those who have good skill were associated in activities of research project other than the mandatory thesis during residency. Which shows it is the skill that helps more to be involved in the research activities.

Training time both during under graduate and postgraduate time, Good Skill and years three residents were associated with research projects other than the required thesis. This shows the importance of additional training and the inclusion of research methodology courses during postgraduate has effect too, even though the number of cases is only a few. This finding supports finding in Saudi Arabia residents where residents at advanced level training have involvement in research(19). The fact that being Year Three is associated may be explained by the enough time spent required a research project to be completed till reaching year three.

Like most other studies the most agreed barrier factors were work related stress, lack of training, lack of allocated research time, lack of financial incentive, lack of motivation and lack of funding as in radiology residents, residents of TASH, India and Abu Dabi medical residents(7,10,24,32). Lack of statistical support and research curriculum were also agreed as barriers to do a research activity in this study in great number as compared to TASH residents and Radiology residents in Ethiopia(7,10)

This study is the first, which studies aiming Emergency and critical care medicine residents in Ethiopia. Previous studies were focusing radiology residents and other that was done focuses all but the inclusion of emergency residents was very low. The study only assesses the perceived attitude, factors and skill of residents. To assess the actual skill and factors may need another study with objective measurement of factors and their association to the level of practice. The perceived and the actual factors may be different on the ground. Data collecting from two universities UOG and BDU was not achieved but the presence of very low number of residents there may not affect the result of this study. As the data is collected online survey form, the data may be exposed to response biases. Even though data checking for outlier, inconsistency and non-differentiated responses was done during data cleaning, respondents time analysis was not done during data collection to measure respondents speeding on questions. Even though stratified sampling was done, most nonrespondents were from SPMMC and residents from SPMMC may be underrepresented.

7. Conclusion

Generally, the research practice of residents was very low and the skill of resident's research methodology was low too, despite having previous training. Good skill was associated with more research practice level. Additional training also is associated with a better level of research practice.

8.Recommendations

Research advocacy should be done for Emergency residents to be involved in research activities. The research methodology training curriculum should be modified in a way that includes additional practical training during residency. Emphasis should be given to research practice by stakeholders like Hospitals and MOH. Additional Qualitative study is recommended to identify the actual factors, the experience and difficulty faced by the residents. A study assessing the actual factors and their association is recommended as this study only tries to analyses the perceived factors.

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Annex 1: Information Sheet and Consent form

Research Project: Factors affecting Research Practice Among Emergency Medicine and critical care Residents in Ethiopia

Name of Principal Investigator: Gedefaw Tigabu, MD

Introduction: This information sheet and consent form is prepared by the investigator whose main aim is to study attitude, research practice, skill and factors affecting residency research among emergency residents in Ethiopia. The investigator is third year Emergency and critical care resident in Addis Ababa University.

Purpose: the purpose of the study is to identify the asses attitude, research practice, skill and determine factors affecting research practice among emergency residents in Ethiopia which is currently unknown.

Procedures: you are kindly invited to take part in our research because we believe you can provide the necessary information for the research. Participation in the study is voluntary. All the responses given by the participants and the results obtained will be kept anonymous and confidential. No one outside the research team will have access to your responses.

Risk and/or Discomfort: There is no risk that this research will pose to its participants. Benefits: This study will have paramount importance. It will generate a hypothesis for further research done in this area. Further, the result will be communicated to the respective stakeholders, including department, medical college and FMOH for reviewing of curriculum and training policy.

Incentives: There is no incentive associated with the study

Confidentiality and Anonymity: The information we will collect from this research project will be confidential. Information about you that will be collected from the survey will be stored in a file, which will not have your name on it, and it will not be revealed to anyone except the principal investigator.

Right to Refuse or Withdraw: you have the full right to refuse to participate in this research (you can choose not to respond to some or all of the questions). If you do not wish to participate, this will not affect you. You also have the full right to withdraw from this study without losing your rights as a site resident.

The questionnaire has five parts starting from sociodemographic assessment in the first part, practice assessment, attitude assessment, research methodology assessment, perceived barrier and facilitator assessment questions. You kindly requested to fill what you feel and think only.

Are you volunteer to participate in this study? ☐Yes ☐NO

Persons to contact for further information: If you have any questions, you can contact the principal investigator at the following address:

Name: Gedefaw Tigabu, MD

Tel: +25128453534

Email: gedefawtigabun@gmail.com

Contact information for complaint: If you have any concern that the research team is conducting their activities unethically or inappropriately, please contact Addis Ababa University college of health science department of Emergency Medicine

Tel:

Annex 2: Questionnaire

I. Sociodemographic status

1. Age…….
2. Sex…… .☐ Male ☐ Female
3. Marital status … ☐ Married ☐Single ☐ Divorced
4. Experience as a physician before residency in years…...
5. Year of residency….
6. Sponsor ☐ MOH ☐Self ☐University ☐other…… write if any
7. Where are you doing your Residency? ☐ AAU ☐SPMMC ☐ Jimma ☐ Hawassa ☐ Haramaya ☐ Bahir Dar ☐ Gondar
8. Monthly Income_____

II. Research practice

9. Have you taken Research methodology and statistics lecture or training?

☐ Yes ☐ No

10. When did u take research methodology and statistics training? Multiple responses allowed

☐during undergraduate courses

☐ during residency courses

☐ other courses(mention)

11. Do you have regular Journal club presentation in your residency

☐ Yes ☐NO

12. Was emphasis given to research methodology and statistics in journal club presentation? ☐Yes ☐ No
13. How many hours per week do you spend for research activity and practice? _____
14. Have you ever participated in research? ☐ Yes ☐ No

15. When was you participated in research? (Multiple response allowed)

☐ Before joining Residency ☐ After Joining Residency

16. What was your contribution in the research project you participated in? (Multiple responses allowed)

☐literature review

☐ proposal writing

☐ data collection

☐ data entry

☐data analysis

☐writing the manuscript

☐submission of the manuscript journal

17. What type of research project have you participated in?

☐case report

☐case series

☐cross sectional

☐case control

☐Cohort study

☐clinical trial

☐review article

18. Have you ever presented your research in a conference? ☐Yes ☐ No

19. Have you worked on a case report during your residency? ☐Yes ☐ No

20. Have you worked on a research project other than the mandatory thesis during your residency? ☐Yes ☐ No

21. Do you read scientific journals regularly? ☐Yes ☐ No
22. Have you participated in a critical appraisal of research paper? ☐Yes ☐ No
23. Have you ever participated in a research methodology workshop?
    ☐Yes ☐No
24. Have you ever written a grant proposal for a research project? ☐Yes ☐ No
25. Do you have easy access to Scientific Medical Journals? ☐Yes ☐No
26. Have you worked on a case report during your residency?

III. Perceived facilitators of research practice during residency?

No	Question	Yes	NO	I can't Say
1	To improve research skills			
2	To have research published			
3	To fulfil research interests			
4	To add a positive achievement to resume			
5	To facilitate acceptance in a subspecialty fellowship program			
6	Financial incentives			
7	It is mandatory in the postgraduate program			

IV. Perceived Barriers of research practice during residency?

	Question	yes	no	I Can't Say
1	Lack of research funding			
2	Lack of research training			
3	Lack of allocated research time			
4	Lack of positive research culture			
5	Lack of financial incentives			
6	Lack of statistical or research support			
7	Work-related stress			
8	Poor accessibility to databases			
9	Lack of mentorship and supervision			
10	Lack of motivation			
111	Difficulty in following-up of patients			
12	Difficulty of getting papers accepted in peer-reviewed journals			
13	Difficulty obtaining approval for the study			
14	Home-related stress			
15	Unavailability of samples or patients			
16	Gender			
17	Lack of access to equipment or Research material			
18	Lack of acknowledgement for research work			
19	Lack of research curriculum			
20	Complicated and onerous paper work			

V. Perceived Attitude towards research

no	Question	Strongly disagree	disagree	neutral	agree	Strongly agree
1	Training in medical research methodology should be included in emergency residency program					
2	Engaging in medical research can improve patient's outcome					
3	Engaging in research increase the burden on emergency Residents					
4	Research methodology should be mandatory for appearing in final exams in post graduate studies					
5	Research time should be allotted separately during emergency residency training					
6	Emergency residents should not engage in Research Activities					
7	Emergency residents are given adequate training on Research methodology					
9	I want to carry out medical research in the field of emergency in the Future					
10	Research promotes critical thinking					
11	Research is an asset to a fellowship/senior residency position application.					
12	Research is an essential component of an emergency medicine residency					
15	Research develops essential skills for lifelong learning					
17	Research allows the advancement of scientific/medical knowledge and education					
18	Research facilitates training to be clinician investigators/scientists					
19	Research satisfies intellectual curiosity					

VI. Research methodology skill assessment

no	questions	Very poor	poor	So So	satisfactory	Very satisfactory
1	Ability to plan research					
2	Developing a research question					
3	Searching for a research problem					
4	Doing a literature review					
5	Design an experiment study					
6	Selecting an instrument (data collection tool)					
7	Developing an instrument (data collection tool)					
8	Writing an abstract					
9	Preparing a manuscript for publication					
10	Selecting an appropriate research method					
11	Choosing an appropriate method analysis of data					
12	Interpretating the result of a research study					
13	Collecting of survey data					

Annex 3: Result Tables and Figures

Table 6: Number of emergency medicine residents in emergency medicine training universities

University Name		Male	Female	Total
AAU	Year 3	12	8	64
	Year 2	18	7	
	Year 1	13	5	
SPMMC	Year 3	21	7	68
	Year 2	15	5	
	Year 1	20	0	
Jimma	Year 3	9	0	27
	Year 2	7	3	
	Year 1	8	0	
Haramaya	Year 3	4	0	15
	Year 2	2	1	
	Year 1	7	1	
Hawassa	Year 3	0	0	15
	Year 2	9	0	
	Year 1	5	1	
Bahir Dar	Year 1 only	6	0	6
Gondar	Year 1 only	6	0	6
Total				200

Table 7: Involvement in the research

Category	Frequency (62)	Percentage
Developing Research Question	20	32.3
Literature Review	23	37.1
Data Collection Tool Development	20	54.8
Proposal writing	34	54.8
Data Collection	54	87.1
Data Entry	39	62.9
Data Analysis	26	41.9
Writing Manuscript	9	14.5

Table 8: Study design practiced

Category	Frequency (62)	Percentage
Case Report/ Case Series	5	8.1
Cross Sectional	45	72.6
Case Control	2	3.2
Cohort study	9	14.5
Review Article	2	3.2

Table 9: Chi-square Group comparison for research Skill and Attitude

Factor	Category	Good Skill	Poor Skill	X^2	P value	Good Attitude	Bad Attitude	X^2	P value
Sex	Male	37	38	0.540	0.502	69	2	0.719	1.00
	Female	15	11			25	0		
Marital Status	Single	32	30	0.01	1.00	52	2	1.281	0.521
	Married	20	19			37	0		
Year of Residency	PGY1	17	17	0.829	0.679	32	1	0.928	1.00
	PGY2	17	19			32	1		
	PGY3	18	13			30	0		
Sponsor	MOH	32	40	7.670	0.026	67	1	0.907	0.50
	University	1	0			1	0		
	Self	14	9			21	1		
	Other	5	0			5	0		
College	AAU	20	20	7.103	0.126	36	1	2.550	0.602
	SPMMC	14	18			31	0		
	JU	7	8			14	1		
	HU	6	0			5	0		
	HRU	5	3			8	0		
Training Time	Undergraduate	10	11	2.619	0.484	20	0	2.985	0.538
	Residency	17	22			37	2		
	Both	23	15			34	0		
	other	2	1			3	0		
Journal club	Present	40	41	7.24	0.459	77	1	1.309	0.341
	Absent	12	8			17	1		
Methodology Emphasis in journal club	Yes	32	24	4.371	0.054	53	1	0.405	1.00
	No	8	27			24	0		
Research ever	Done	37	23	6.134	0.014	53	2	1.523	0.505
	Not Done	15	26			42	0		
Project time	Before Residency	22	21	4.93	0.073	37	2	0.851	1.00
	During Residency	4	1			5	0		
	Both	10	2			11	0		