

## ORIGINAL RESEARCH

# Knowledge generation in reproductive health research centers: A step towards the youth of the Iranian population

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**Abstract:** **Background:** Reproductive health is a focal point for governments during this epidemiological transition. By adopting innovative research strategies, reproductive health research centers can determine priorities and practical measures. They can also take impactful steps toward protecting family development and decreasing the population's average age through knowledge production. Therefore, this study is designed to investigate the knowledge production in reproductive health research centers in Iran during 2017-2021. **Methods:** Reproductive health research centers active for 5 or more years were evaluated during 2017-2021. In this study, three main axes including stewardship, knowledge production, and impact were evaluated with 15 key indicators. **Results:** This evaluation included 28 research centers related to reproductive and family health with at least 5 years of activity across 17 universities of medical sciences or organizations affiliated with the Ministry of Health in Iran. The final scores were calculated by summing the scores across the different axes. Based on the overall score, the top three research centers include (1) the Reproductive Biomedicine Research Center at the Academic Center for Education, Culture, and Research (ACECR), (2) the Reproductive Biotechnology Research Center at the (ACECR) and (3) the Preventive Medicine and Public Health research center at Iran University of Medical Sciences. **Conclusion:** Mission-oriented research activities in reproductive health research centers with the priority of treating infertility and childbearing care are effective in reducing the problem of population aging.

**Keywords:** reproductive health, research centers, evaluation program

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## 1. Introduction

The World Health Organization defines reproductive health as involving complete physical, mental, and social well-being throughout the reproductive process; it does not simply mean the absence of disease. Reproductive health comprises the ability to have a responsible, satisfying, and safe sex life and have autonomy over reproductive decisions [1]. The reproductive process for women does not begin with puberty and does not end with menopause. Instead, it follows the entire life cycle, and thus, reproductive health needs may be dif-

ferent at each stage of life. The inability to address reproductive health problems at any of these stages can lead to future health problems [2].

Currently, reproductive health problems are a global challenge, but they are especially important for women in their reproductive years. Reproductive health is an integral part of a person's overall health and a predictor of quality of life [3]. Reproductive and sexual health problems account for more than one-fifth of the world's burden of disease and premature death, and one-third of women of reproductive age suffer from disease and death [4]. Maternal mortality is still the leading cause of death for women of reproductive age in many countries [5].

The United States has a high rate of maternal mortality rate (more than 1200 deaths in 2021) compared to other high-income countries. Therefore, the National Institute of Health (NIH) has allocated 24 million dollars for the first year to es-

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establish maternal health research centers in the USA [6]. On the other hand, during the last 50 years, socioeconomic development, low fertility, and high life expectancy have led to significant changes in the population pyramid [7]. The aging of the population is a problem affecting most countries in the world, including Iran [8]. With the growth of the elderly population exceeding the growth of the world population as a whole, reproductive health should be a focal point for governments during this epidemiological transition [9]. The adoption of research, innovative, and collaborative strategies with the guidance of experts will not only identify needs and areas for improvement but will also determine priorities and practical measures using scientific approaches [10]. So, research centers, in collaboration with public service centers, are of particular importance for the development of reproductive health programs, maintaining family structure, and ultimately decreasing the average age of the population. In Iran, more than 70 universities of medical sciences, 65 research institutes, and 900 research centers operate in various fields, among which the number of research centers related to reproductive health and family health is 29. Considering the challenges in maintaining the youth of the population and the reproductive health of women in Iran, similar to other countries, the strategic role of reproductive health research centers in producing new and practical knowledge to produce evidence for decision-making is very important. Therefore, this study is designed to investigate the production of knowledge in reproductive health research centers in Iran during the years 2017 to 2021. The results of this study can help policymakers in designing beneficial interventions to improve reproductive health and maintain family structure as a reliable document.

## 2. Materials and Methods

### 2.1. Background

Iran is home to 69 governmental medical sciences universities of three types (based on size) and more than 900 research centers active in clinical sciences, biomedical sciences, and health promotion. In addition to their areas, research centers are also categorized based on the presence or absence of an independent budget line, whether they are public or private, and years of activity. All of the research centers with more than one year have been evaluated according to a set of indicators in knowledge production, stewardship, and impact fields. The last two fields were assessed only in 2021.

### 3. Study Design

This cross-sectional study was conducted in 2021 by the Deputy of Research and Technology in the Ministry of Health and Medical Education in the Islamic Republic of Iran.

The target population of the study includes all reproductive health and family health research centers in Iran. Inclusion criteria were having approval documents from the Development Council of medical sciences universities and at least five years of activity, and exclusion criteria included centers that were suspended or shut down by the Development Council due to scientific stagnation. This study was completed comprehensively and completely.

## 4. Implementation Steps

2.3.1. Forming a strategic committee for policy-making in reproductive and family health. This committee included policy experts (the Deputy of Research and Technology, the head of the Center for Development, the Deputy of Evaluation, three Deputies of Research and Technology from medical universities), as well as practical experts (three obstetrics and gynecology specialists).

2.3.2. Forming a scientific committee consisting of 5-7 experts in reproductive and family health who are familiar with scientific evaluation, with at least 5 years of relevant experience.

2.3.3. Forming an executive committee consisting of an evaluation team and two experts from each of the university types responsible for evaluating universities and research centers.

2.3.4. Examining and reviewing resources on research and technology evaluation criteria, selecting indicators, and preparing evaluation guidelines with the involvement of the scientific committee.

2.3.5. Holding three workshops to train and familiarize research centers with the evaluation criteria.

2.3.6. Designing a data collection and evaluation system.

2.3.7. Designing a scoring system (with the involvement of the scientific committee) based on the indicators of importance, measurability, and feasibility.

2.3.8. Evaluating collaboration with the executive committee.

## 5. Evaluation Indicators

The three main axes, including (1) stewardship (2) knowledge production, and (3) impact, were evaluated with 15 key indicators as follows:

2.4.1. Stewardship: This area has 2 indicators including:

- Writing and monitoring the strategic planning of research centers with the cooperation of all stakeholders.

- Setting research priorities with stakeholders' cooperation

2.4.2. Knowledge Production: This domain includes nine indicators consisting of:

- The number of research articles affiliated with research centers indexed in ISI-WOS / PubMed and Scopus

- The number of conference papers (domestic/foreign)

- The number of published books affiliated with the research

center

- The number of Published articles in the top 25% of journals affiliated with the research center
- The number of Published articles with international cooperation
- The number of citations to published articles during the last five years affiliated with the research center
- Five-year h index of the research center
- The number of domestic patents
- The number of foreign patents

2.4.3. Research impact: this domain has four indicators as follows:

- The number of research projects that have led to change in decision-making
- The number of research projects that have led to change in health and social determinants of health
- The number of research projects that have led to change in service delivery
- The number of research projects that have led to change in the economy. The definitions of the indicators according to the axes are provided in Table 1.

2.4.5. Evaluation model:

All stages of research evaluation including input, process, output, outcome, and impact using quantitative and accurate indicators based on the intervention model have been used in this study [11].

## 6. Data Analysis

Descriptive and analytical statistics were conducted using the SPSS software (version 22.0, SPSS Inc., Chicago, IL, USA), and a P value less than 0.05 was the significance level.

## 7. Ethical Considerations

All ethical considerations have been observed in this research. Maintaining anonymity, informed consent, lack of conflict of interest, and providing feedback from evaluation results to stakeholders are examples of ethical compliance in this research.

## 8. Results

In this study, 28 research centers related to reproductive and family health with at least five years of activity participated. These research centers were based in 17 universities of medical sciences, as well as organizations affiliated with the Ministry of Health. The mean years of activity of these centers was  $12.17 \pm 4.9$  years. The minimum and maximum years of activity were 6 and 24 years, respectively. We found no statistically significant relationship between the years of activity and the final score obtained by the research centers ( $P > 0.05$ ). For the axis of stewardship, all research centers had a strate-

gic plan, and their research priorities were extracted with stakeholders' participation and with scientific methods. The first five priorities were: infertility, Physiological delivery & pregnancy, gynecological cancer, men's health, and population youth.

Their lines of research inquiry included: improving reproductive health and reducing infertility, protecting the population and fertility, treatment of women's diseases (with priority given to polycystic ovaries, endometriosis, and cancers specific to women), sexual health, and health in childbirth, designing community-oriented interventions, and lifestyle modification. Table 2 shows the three main research priorities in reproductive health research centers.

For the axis of knowledge production, 4820 articles indexed in the WOS, PubMed, and Scopus databases had been published by the research centers, including credible national and international journals. 73% of these articles were indexed in the ISI WOS database, 21.7% were published in first quartile (Q1) journals, and 20% were written with international collaboration. The total number of citations for these articles between the years of 2017 to 2021 was 35031, and the mean five-year h index for these research centers was 11. On average these research centers were comprised of 8.2 researchers, with a yearly average of 3.93 publications per researcher during the years of the study.

For the axis of impact, only three research centers had plans for impact in the year 2021, including the reproductive biotechnology research center at the (ACECR), the Reproductive Health Research Center at the Urmia University of Medical Sciences, and the Infertility and Reproductive Health Research Center of Babol University of Medical Sciences.

The final scores were calculated by the summation of scores across the different axes. Table 3 shows the results of the evaluation and ranking of reproductive and family health centers. Based on the overall score, the top three research centers include (1) the Reproductive Biomedicine Research Center at the Academic Center for Education, Culture, and Research (ACECR), (2) the Reproductive Biotechnology Research Center at the (ACECR) and (3) the Preventive Medicine and Public Health research center at the Iran University of Medical Sciences. The highest number of citations and average 5-year h index belonged to these research centers.

## 9. Discussion

Reviewing these results, we found that 28 research centers related to reproductive and family health have been operating for at least five years (based in 17 universities of medical sciences or organizations affiliated with the Ministry of Health), and are active in 11 provinces. The province with the highest number of research centers is the Tehran province, with 13 research centers. 20 provinces have no research centers



in the field of reproductive health. According to statistics published in the year 2021 by the Statistical Centre of Iran, the total fertility rate was 1.71 children [12]. Meanwhile, the provinces of Tehran, Semnan, Alborz, Mazandaran, and Gilan had very low fertility rates [13]. Considering that almost half of the reproductive health research centers in the country are in Tehran, it seems that there is a need to redefine the duties and missions of these centers to focus on research related to increasing birth rates and solving challenges leading to low fertility. On the other hand, considering the low fertility rates in the Semnan and Alborz provinces, setting up reproductive and family health research centers can be a way forward. The focal areas of research at these centers should additionally reflect the problems of infertility and childbearing. Although these areas of research are critically important, it is additionally necessary to address this issue across different disciplines and at different levels, investigating the cultural, social, economic, and political components affecting it to remove any obstacles [14].

The results of this study show that 230 full-time and part-time researchers are engaged in research in reproductive health research centers, with an annual average of 3.93 publications each – which is almost twice the national average [15]. Despite these efforts, the fertility rate in the country has not increased, and it appears necessary for the health research system to review and revise priorities by evaluating the most important needs, determining practical priorities, and addressing ongoing challenges in the field. Currently, many governments and policymakers are willing to adopt a more comprehensive approach in the field of reproductive health, to help make beneficial decisions.

The results of this study show that the Reproductive Biomedical Research Center at (ACECR) and the Reproductive Biotechnology Research Center at (ACECR) rank first and second among reproductive health research centers, respectively. Simultaneously, the fourth place is the Reproductive Epidemiology Research Center at (ACECR). Additionally, the highest score for impactful projects was given to the reproductive biotechnology research center at the (ACECR), which is fully justified and expected considering their goals of research development and expansion of research implementation [15]. This public institution not only conducts research through research centers and research institutes but also brings the results of their research to the patient's bedside by implementing methods to prevent or confront infertility [16] [17].

In this study, the intervention model has been used to evaluate the research activities of reproductive health research centers. In this model, based on reproductive health needs, goals, and objectives will be determined, and based on the existing input, the process of knowledge production and their mid-term and long-term effects will be evaluated [18].

In this model, assessing the needs and setting the research priorities have been evaluated via stewardship axis indicators. One of the main weak points in this area was the lack of organizing the research priorities at the national level. Designing mission-based oriented programs based on needs, research capabilities and human resources for universities of medical sciences is mandatory [19]. One of the main limitations of our study was not paying attention to the input. Designing the input-based indicators such as paper to faculty members, is necessary. On the other hand, in the current evaluation model, the indicators are simple and there is a need to design integrated indicators. Impact assessment was the final area that has been added to the evaluation system since 2021. Paying attention to some guidelines including the background, objectives, needs, stakeholder engagement, methods, data sources, and conceptual framework in impact evaluation is effective in upgrading the evaluation system [20].

This study makes two contributions. First, it evaluates the production of knowledge in the field of reproductive health according to priorities and policies related to decreasing the age of the population. Secondly, considering the geographical distribution of reproductive health research centers, it reiterates the necessity of establishing centers or revising their missions in areas with low fertility rates.

The strengths of this study include the comparison of knowledge production in research centers with the same topic, and on the other hand, it provides the possibility of assigning specific research missions according to their potential.

## 10. Conclusion

Mission-oriented research activities in reproductive health research centers with the priority of treating infertility and childbearing care are effective in reducing the problem of the aging of the population.

## 11. Appendix

### 11.1. Acknowledgment

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### 11.2. Conflict of Interest

All Authors declare no conflict of interest.

### 11.3. Funding and supports

None.

### 11.4. Authors contributions

KF, MBE and HSH contributed to the design and supervised the study. MBE and KF contributed to the acquisition, analysis, or interpretation of data. KF, MBE and HSH contributed to drafting of this Manuscript and revising. HSH contributed to translating and revising manuscript final draft. All authors approved the final version of the manuscript.

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**Table 1:** Axes and indicators of research and technology evaluation of reproductive health research centers - years 2017 to 2021

Name of Axes	Name of indicator	Description	How to calculate scores	Maximum Score
Stewardship	Strategic Planning	The strategic plan should have a vision, mission, goals, situation analysis, strategy, objective, activities	Mandatory	Without score
	Research Priorities	The list of priorities should be determined with the presence of stakeholders and based on scientific methodology		
	Research lines	Determining the areas with the most/best research activities of the center		
Knowledge Production	Research Output(RO)	The number of articles published during the years 2017 to 2021 indexed in: ISI-WOS(W), PubMed(P), Scopus(S)	$(w*2) + (p*1.5) + (s) + (b*2) + (cp*0.5) = \text{research output score}$	250
	First quartile publication(Q1)	The number of books (b)authored in the Scopus database from 2017 to 2021 The number of conference papers (cp)indexed in ISI WOS/Scopus databases The number of articles published in the top 25 percent of journals in the Scopus database (Q1) during the years 2017 to 2021	Q1= Total score Q1	250
	International collaboration	The number of articles published with international collaboration (IC) indexed in the Scopus database during the years 2017 to 2021.	IC= Total score IC	150
	Citation to 5 year articles	The total number of citations(c) from 2017 to 2021 to articles published in the last five years in the Scopus database.	C= Total score C	400
	Five-year average H index	The average value of the five-year H index for the years 2017 to 2021	Average h index = total h score	100
Impact	Affecting decision-making levels, health status, service delivery, determinant of health, economy	All approved research projects that lead to changes on one of the mentioned levels in the evaluation period(2021)	This axis was evaluated in 2021. At the university level, 5 points - at the provincial level, 20 points and at the national level up to 100 points	100

**Table 2:** The titles of research priorities in reproductive health research centers during 2017-2021

Name of UMS	Titles of priorities		
	First	Second	Third
Urmia	sexually transmitted diseases	Physiological delivery	Women's cancer
Ahvaz Jundishapur	Childbearing / challenges / solutions	Fetal health	infertility
Babol	infertility	Gynecological cancers	Mental health in women's diseases
Tehran	Fertility behaviors in men	The effect of pollution on mother, baby and infant	Gynecological cancers
ACECR*	Cell therapy in the treatment of infertility	In vitro production of cow embryos	artificial intelligence in infertility treatment
Iran	Population health	Women's health	Social determinants of health
Zahedan	pregnancy care	Reproductive health of men and women	infertility
Shaheed Beheshti	Physical health of men in Iran	Men's lifestyle and health	Men's health and environmental factors
Shiraz	infertility	Improving methods of maintaining fertility	infertility registry program
Yazd	infertility	Pregnancy and related diseases	Poly cystic ovarian diseases
Iran's oil industry	Women's diseases	Non communicable disease	Improving the quantity and quality of elderly life
Kashan	Gynecological cancers	infertility	Mental health on fertility and infertility
Kermanshah	fertility and childbearing	Gynecological cancers	infertility
Gilan	Physiological delivery	Breastfeeding	infertility
Mazandaran	Physiological delivery	Childbearing and population youth	infertility
Hormozgan	infertility	Gynecological cancers	family Health



**Table 3:** Results of research evaluation in Iranian reproductive health research centers - years 2017 to 2021

Name of UMS	Name of RHRC	Number (Adjusted Score**)				Average h-index	Impact	Total score	Rank
		Output	Q1	IC	C				
Urmia	P H RC	121(46)	12(16)	4(4)	930(72)	12(44)	26(63)	245	12
Ahvaz Jundishapur	F I & P RC	83(28)	13(18)	13(14)	580(46)	12(44)	-	150	16
	R H P RC	109(36)	11(15)	7(8)	578(43)	10(37)	-	139	17
Babol	I & R H RC	177(70)	23(31)	7(8)	1109(84)	14(52)	2(4)	249	11
Tabriz	W R H RC	275(113)	71(96)	84(91)	1716(133)	14(52)	-	485	5
Tehran	V-E-A R H RC	100(39)	15(20)	12(13)	355(27)	9(35)	-	134	18
	M F & N RC	208(80)	32(43)	32(35)	742(57)	9(35)	-	249	11
ACECR*	R B RC	601(250)	185(250)	139(150)	4913(378)	20(76)	-	1104	1
	R B RC	456(190)	135(182)	111(120)	4506(346)	19(71)	42(100)	1009	2
	R E RC	305(126)	66(90)	58(63)	2270(173)	14(52)	-	504	4
	R I RC	47(20)	16(22)	11(12)	820(62)	12(44)	-	160	15
Iran	P M & P H RC	271(109)	94(127)	138(149)	5204(400)	27(100)	-	885	3
	S F & I RC	25(10)	3(4)	6(6)	214(17)	6(21)	-	58	23
Zahedan	P H RC	162(60)	13(18)	3(3)	744(57)	10(37)	-	175	14
Shaheed Beheshti	M H & R H RC	211(83)	63(85)	61(66)	757(59)	7(27)	-	320	8
	R E RC	209(83)	70(95)	38(41)	1732(133)	16(58)	-	410	6
	F H RC	14(5)	2(3)	4(4)	13(1)	1(4)	-	17	24
	M & R H RC	286(100)	37(50)	15(16)	1005(78)	9(34)	-	278	9
Shiraz	I RC	169(68)	30(40)	12(13)	1115(86)	13(48)	-	255	10
Yazd	A RC	88(35)	16(22)	17(18)	250(19)	6(21)	-	115	20
	R & C C for I	266(201)	42(57)	47(51)	1896(146)	13(49)	-	504	4
	R I RC	43(17)	7(9)	3(3)	134(11)	5(18)	-	58	23
Iran's oil industry	F H RC	0	0	0	23(2)	1(5)	-	7	25
Kashan	G RC	74(30)	25(34)	10(11)	842(65)	13(49)	-	189	13
Kermanshah	F & I RC	244(96)	33(45)	53(57)	1775(136)	16(58)	-	392	7
Gilan	R H RC	87(33)	3(4)	5(5)	226(18)	6(21)	-	81	22
Mazandaran	S & R H RC	120(43)	9(12)	17(18)	377(29)	5(18)	-	120	19
Hormozgan	F & I RC	69(28)	18(24)	17(18)	206(16)	7(27)	-	113	21