Iran J Public Health, Vol. 50, No.10, Oct 2021, pp.2085-2094

Original Article

Obstetrics–Gynecology Educational Achievements in Iran (1979-2017): Trends, Consequences and Future Implications

Shima Tabatabai [1], Nasser Simforoosh [2], Seyed Esmaeil Azimi Khatibani [3]

1. *Medical Education Department, Shahid Labbafi Nedjad Educational Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran*
2. *Urology and Nephrology Research Center, Shahid Labbafi Nedjad Educational Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran*
3. *Department of Pathology, Amir-Al-Momenin Hospital, Zabol University of Medical Sciences, Zabol, Iran*

***Corresponding Author:** Email: shimatabatabai@sbmu.ac.ir

(Received 09 Aug 2020; accepted 11 Oct 2020)

Abstract

Background: To study the current trends in Obstetrics–Gynecology (Ob-Gyn) education and workforce in Iran since 1979 and to discuss the consequences and implications.

Methods: This descriptive-analytical study was conducted to describe the Ob-Gyn residency and fellowship growth and workforce profile in Iran (1979-2017).The first-hand data gathered from MOHME and Iran's Medical Council. The Obstetrician-Gynecologist (Ob-Gyns) per 100000 populations' ratio and the percentage changes calculated and the trends analyzed.

Results: Between 1979 and 2017, the proportion of trained Ob-Gyns at national universities increased by 86.27%, the number of certified Ob-Gyns increased by 333% and, female Ob-Gyns increased by 1142%.The ratio of active gynecologists per 100,000 people was 5.0 in 1979 and 8.05 in 2017, represents an increase of 70%. Since 1979 the number of active gynecologists has increased by 278 and the number of active female gynecologists has increased by 996%. Since 1990 the maternal mortality per 100,000 live births decreased by 79.9% in Iran. However, since 1980 the Cesarean proportion increased by 203% in Iran.

Conclusion: Ob-Gyn education has undergone remarkable growth. Ongoing research should focus on Ob-Gyn's geographic distribution, and potential implications of female Ob-Gyns practice pattern and technologies on women's health.

Keywords: Obstetrics-gynecology; Specialty education; Workforce; Growth; Gynecologist gender

Introduction

The obstetrics-gynecology (Ob-Gyn) training in Iran has a 100 years old history. Since 1918, the obstetrics-gynecology field has been designated as a formal training program of the Medical School at Tehran University (1). In 1938 midwifery school began to admit students. Certified midwives practice as primary caregivers in the obstetric care team. Now midwives can perform natural births under Ob-Gyn supervision in hospitals. Between 1950 and 1960, the department of

gynecologic surgery has gradually been transferred to Ob-Gyn wards at educational hospitals. In 1963, the Ob-Gyn specialty academic department established in 5 main medical universities in Iran (1,2). However, the shortage of specialists was a serious issue in the 1970s (1,3).

Following the revolution of 1979, promoting mother and child health was determined as one of the most important priorities of Iran's health system. Along with the establishment of the Ministry of Health and Medical Education (MOHME) of the country, major changes have been implemented in Ob-Gyn specialty education (1,3).

According to the MOHME decision, in 1984, only female physicians could attend the national Ob-Gyn residency entrance exam. This decision made due to female patients demand and right for the same gender physician (3). At that time the educational policymakers recognized the projected shortage of specialists and announced the need for the increase of Ob-Gyn residency admission rate (1,3).

Analysis of growth trends in special education and monitoring the specialists-to-population ratio in the context of Iran with different demographic and cultural characteristics is critical for health system policymakers to determine whether the supply could fulfill the health care demands properly (1,4). Despite recognition of the importance of the analysis of the trends worldwide, there is a lack of precise data of physician supply (5). Therefore this study provided accurate data to understand the current and potential future trends.

We aimed to analyze the growth trends of Ob-Gyn education and workforce in Iran (1979-2017) and to discuss the consequences and implications.

Methods

This descriptive-analytical study was conducted to provide a description of the Ob-Gyn education and workforce profile in Iran (1979-2017), and supported by the Academy of Medical Sciences of Iran.

Data collection

First-hand data of admitted and graduated residents were collected from the Secretariat of the Council on Medical Education and Specialty Training, and the Department of Evaluation of the MOHME. The data included information on the number of residents, certified Ob–Gyns and active workforce by gender (1979-2017) and trained fellowships.

Ob–Gyns engaged in providing professional medical services from clinical care (full time or part- time), to non-patient care activities such as educational activity and research are considered as active workforce in this study.

We retrieved data from paper based record and entered to the structured electronic databases to analyze the growth trends.

Data accuracy

The first-hand data was collected by referring to multiple information sources and from the main documents in the Medical Education secretary of MOHME, the Center for Medical Education Assessment, and the Medical council of the Islamic Republic of Iran. In order to ensure the accuracy of the statistics, for each data source separately, electronic databases were created, and these databases were compared together .If there were any difference and deficiency in retrieved data, the new information sources (the fellowship training centers) would use. Thus, with the use of multiple sources (triangulation), the accuracy of the data was confirmed (6).

In this study, active supply is the number of Ob-Gyns engaged in providing professional medical services from clinical care to non-patient care activities such as education and research (5,7).

The method for calculation

A: the percentage change Ob-Gyns

Percentage change is a simple mathematical concept that represents the degree of change over time and was calculated using the following formula

$$Percentage\ Change(where\ y1\ is\ 1st\ value\ \&y2\ is\ 2nd\ value) = \left(\frac{Y2 - y1}{y1}\right) * 100$$

B: Absolute change: is absolute difference between to real numbers: asx2-x1

C: the percentage change of active Ob–Gyns t per 100,000 people assessment

$$\text{Active Ob. Gynsto 100,000 Population ratio: } {}^{100000 \times active\ Ob-Gyn\ numbers}/_{total\ population\ in\ year}$$

$$\text{(SPR in 2017): } {}^{100000 \times 6440}/_{80000000} \quad \& \quad \text{(SPR in 1979): } {}^{100000 \times 1700}/_{34000000}$$

Results

The results show Ob-Gyn residency training has experienced steady quantitative growth since 1979. Ob-Gyn residency programs are held in 30 medical sciences university's across Iran. There was a remarkable increase in the number of annually admitted residents in Ob-Gyn educational program (Fig. 1).In 1980, 51% of Ob-Gyns trained at national universities that number had increased to 95% in 2017.

Ob-Gyn Residents Growth Trends

Between 1979 and 2017, there was a remarkable increase in the number of Ob- Gyns residents (Table 1). The first increase in Ob-Gyn admission occurred in 1985, and the second sharp increase occurred in 1990 and the trend has continued in recent years (Fig.1). The number of female certified Ob-Gyns increased in a linear fashion and this trend will continue to fulfill the nation's demand for female Ob-Gyns (Fig. 2). Today, 78% of certified Iranian Ob-Gyns are women (Table 1).

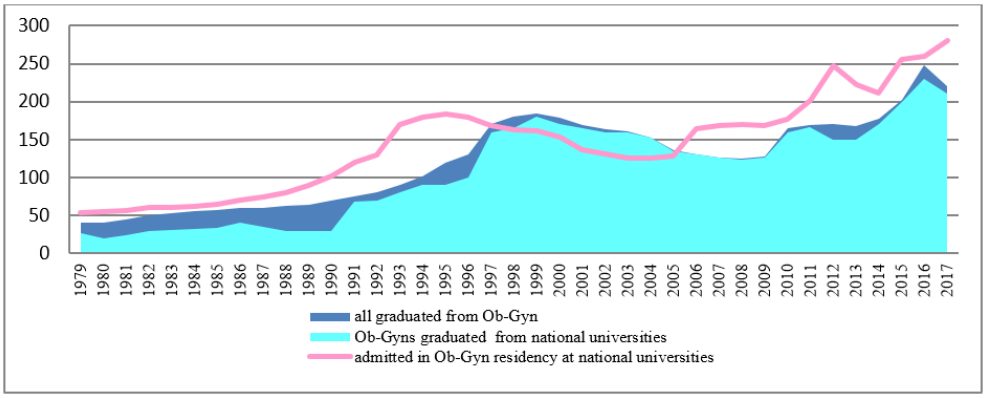

Fig.1: Comparing the Growth Trends of Ob-Gyns graduated in the country vs. abroad, and Ob-Gyn residents annually admitted in Iran (1979-2017)

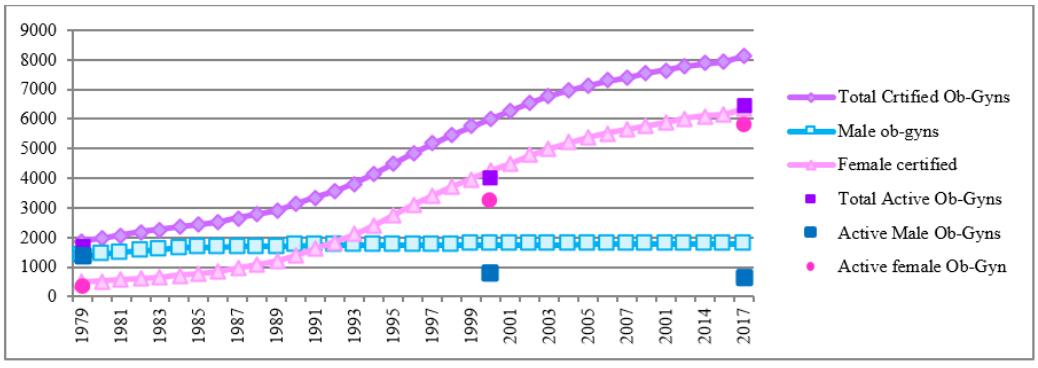

Fig. 2: Comparing the growth trends of Iranian Ob-Gyns (certified vs. active) by gender (1979-2017)

Table 1: Obstetrics-Gynecology profile in Iran from1979 to 2017(numbers, percent, percentage change, and absolute change)

Years	***1979***	***2017***	***Percentage Change of numbers & (%)***	***Absolute change of numbers& (%)***
Numbers (%)				
Annually admitted Iranian Ob-Gyn. Residents	52(100%)	281(100%)	+440.38%	+229(0)
Total Ob-Gyn. Residents	151(100%)	1010 (100)	+ 569%	+859(0)
Annually graduate Ob-Gyn.Who trained at National universities	26 (51%)	210(95%)	+707.6% (+86.27%)	+184(+44%)
Trained and Graduate abroad Annually	24(49%)	10(5%)	-58.33 % (-89.8%)	-14(-44%)
Total Trained Iranian Ob-Gyns	731(100%)	6491(100 %)	+789%	+5760 (0%)
Ob-Gyns trained inside the country(1979-2017)	215(29%)	5043 (78 %)	+2245% (+167%)	+4828(+49%)
Total Ob-Gyns trained abroad (1979-2017)	516(71%)	1448 (22%)	+181% **(- 6**8%)	+932(-49%)
Total Ob-Gyns - took board exams	75(100%)	273(100%)	+264%(0)	+198(0)
Male Ob-Gyns took board exams	68(90.66%)	2(0.8%)	-97.6%(-99.12%)	-66(-89.86%)
Female Ob-Gyns took board exams	7 (9.34%)	271(99.2%)	+3771 %(+962%)	+264(+89.86%)
(board-certified) Ob-Gyns who passed board exams	70(93.33%)	212(77.65%)	+ 203%(-16.8 %)	+142(-15.68%)
Male Ob-Gyns passed board exams (board-certified)	65(92.85%)	1(0.5%)	-98.46 (-99.46%)	-65(-92.85%)
Female Ob-Gyns passed board exams (board-certified)	5(7.25%)	211(99.5%)	+4120%(+1272%)	+206 (+92.25%)
Certified Iranian Ob-Gyns.	1880 (100%)	8140 (100%)	+ 332.97 %	+6260(0)
Iranian Male Certified Ob-Gyns.	1330 (73%)	1780 (22%)	+33.83% (-67%)	+450(-51 %:)
Iranian Female Certified Ob-Gyns.	512 (27%)	6360 (78%)	**+1142%** (+189%)	+5848(+51%:e)
Active ob-Gyns in practice (Both gender)	1700(90%)	6440(79%)	+ 278 .8 % (-12.22%)	+4740(-11%)
Male Active ob-Gyns	1360(80%)	640(10%)	-53% (- 87.5%)	-720(-70%)
Female Active ob-Gyns	340(20%)	5800(90%)	+995.8 % (+350%)	+5460(+70%)
Active Ob-Gyns to 100,000 Population ratio	5.0.	8.5	+70%	+3.5
Active Ob-Gyns + Residents	1851	6440+1010= 7440	+302%	
Active Ob-Gyns + Residents Per 100,000 Population	5.4	9.67	+79.07%	+4.27
Age(<50 yr old)	1200(65%)	5263 (68%)	+338.5 % (+ 4.6 %)	+3%
Age (> 65 yr old)	112(6%)	1042 (14%)	+830 % (+ 133 %)	+8%
Age(< 35 yr old)	93 (5%)	1040 (13%)	+1018 % (+160 %)	+8%

Certified Iranian Ob-Gyns Growth Trends

Between 1979 and 2017, the overall number of certified Iranian Ob-Gyns increased by 333%, while the number of Iranian female Ob-Gyns increased significantly by 1142% (Table 1). Over the last 38 years, the growth of Iranian female Ob-Gyns has had an upward trend, while the trend has been almost stable for Iranian male Ob-Gyns (Fig. 2). Between 1979 and 2017, the percentage of active female Ob-Gyns in practice in Iran grow by 350%; however, during the same period, the percentage of male Ob-Gyn in practice fell by 87.5%.

From 1979 to 2017, the number active Ob-Gyns to 100,000 population ratio increased by 70%, while the overall of active Ob-Gyn supply (certified and residents) to 100,000 population ratio increased by 79% (Table1).

Ob–Gyn Fellowships Growth trends

Currently, 5 fields of Ob-Gyn Fellowship programs offer by 7 Iranian medical universities. These fellowships programs are rapidly increasing in quantity and quality. The number of Ob-Gyns accepted into fellowships increased steadily (from 0% in 1979, to 2 fellows in one field in 1999, 36 fellows in two fields in 2007, 64 fellows in three fields in 2010, and 208 in five fields in 2017). Overall, 202 Ob-Gyns had graduated from fellowship programs by academic year 2017. The fellowship discipline that is sought after by Ob-Gyns is Infertility due to a large number of patients referred (Fig.3).

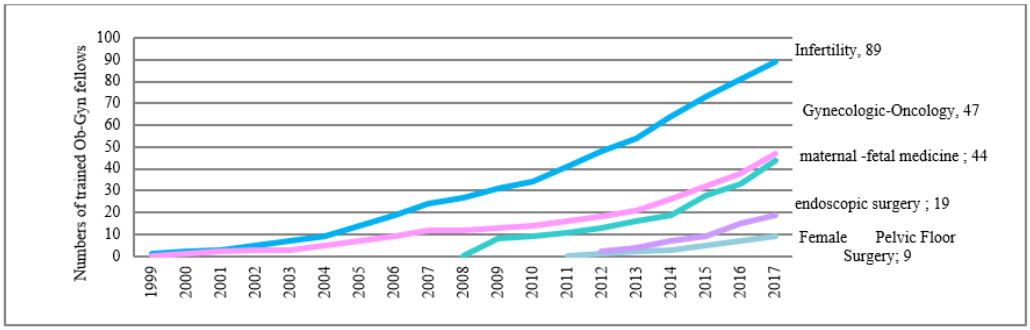

Fig. 3: Comparing the growth of Ob-Gyn. fellow's numbers in established fellowship programs in Iran (1999-2017)

Improvement in the Women health indicators

Iranian women Life expectancy (LE) is on the rise, while general fertility, mother/infant mortality rate, female mortality rate, diseases related to pregnancy-childbirth, and communicable disease mortality rate are declining (Table 2).

Table 2: Trends in Iranian Women health indicators

Health indicators	*Time Duration*	*V1*	*V2*	*Percentage changes*
Life expectancy (LE) at birth	1980-2016	59.7	76.9	28.8
LE at 60	1985-2016	15	20	33.3
Maternal health				
Maternal mortality per 100,000 live births	1990-2015	123	25	-79.7
female Mortality rate				
Mortality rate, adult (per 1000 female ages15 - 60)	1979-2015	279.23	62.01	-77.7

V1, 1st Value; V2, 2nd Value

Increase of cesarean sections:

Iran's total CS prevalence rate was 51% in 2017, and about 50.5% in 2018. Between 1979 and 2017, the proportion of CS in Iran increased by 203%, while the proportion of NVD assisted by Ob-Gyns decreased by 45.5% (Table 3).

Table 3: The Natural Delivery vs. Cesarean section rate, and influencing reasons of CS in Iran (1979-2018)

Delivery method	*Years &*	*Mean rate*	*Percentage Change (of %)*
	Number (percent)	**Number (percent)**	
NVD (Assisted directly byOb-Gyns)	509060 (45.5%)	166500 (25%)	-45.5
NVD (Assisted by mid-wives)	634890 (55.5 %)	499500 (75%)	+35.1
CS	226,050 (16.5 %)	674,040 (50.2%)	+203.0
Most Influencing reasons of CS	1.Repeated CS 2.Slow progress of labor 3. Fetal distress	1. Fear of NVD 2. Repeated CS 3. Cephalo-pelvic disproportion 4. Doctor advice 5. Fetal distress 6. Mother request	

Discussion

Self-sufficiency in training Ob-Gyn resident at national medical universities:

The proportion of Ob-Gyns trained at national medical universities grew sharply by +86.27% (Fig. 1). In 1979, 49% of Ob-Gyns have trained abroad, while, this proportion fell to 5% in 2017. Between 1979 and 2017, the proportion of Ob-Gyns graduated abroad (annually) declined by 89.8% (Table 1).This trend enhances the quality of the Ob-Gyn residency program inside the country and Ob-Gyns workforce retention.

Transforming the Ob-Gyn residency education

Changes have occurred rapidly in Ob-Gyn practice, and there are parallel trends in Ob-Gyn residency programs and procedural volume. Considering the volume of the core procedural skills in Iranian Ob-Gyn curriculum(8), the limited number of required obstetric procedural skills such as complicated vaginal delivery including malpresentation (twins, breech) and, interventional (Forceps, Vacuum-Assisted Delivery) is noticeable. ACGME obstetric report revealed decreases in the volume of vaginal, forceps, and vacuum deliveries, and increases in cesarean and multifocal deliveries in the last decade (9).This lack of enough experience will affect the obstetric skills of tomorrows' Ob-Gyns (10,11).

Trends in Ob-Gyn practice and Growth of cesarean sections

Over the last decades, there has been a nationwide decline in the mean number of vaginal deliveries and an increase in the mean number of cesarean sections (CS) in Iran (12-15). There is a globally decline in average numbers for normal vaginal deliveries (NVD), forceps deliveries, vacuum deliveries, and amniocentesis, and an increase in multi-fetal vaginal deliveries and cesarean sections. The numbers of invasive perinatal procedures (amniocentesis, chorionic villus sampling) and vaginal breech deliveries also declined significantly (13).

There is a statistically significant decline in average numbers for NVD assisted by Ob-Gyns in Iran (14). According to the MOHME report in 2017, Ob-Gyns attended about 166500(25%) of

Natural birth, while midwives attended about 499,500 (75%) of Natural birth in Iranian hospitals (Table 3). The trend parallels the declined in numbers of obstetric procedures such as complicated and interventional vaginal delivery in a residency program in Iranian Ob-Gyn curriculum.

The CS prevalence rate for first delivery was 47.5% in 2018 that has decreased from 48%in 2017 (Table 3). This shows a very high prevalence of CS in Iran, much greater than the ceiling (15%) recommended by the WHO (15,16).

The influencing reasons for cesarean section in Iran were mostly because of socio-demographic, and non-clinical/non-midwifery elements. On the whole, Iranian women having CS were older, better educated, married at a relatively later age and with lower parity (15,17).These may be considered as modernization, mother behavioral factors, and Ob- Gyns tendency to CS instead of interventional NVD (Table 3).

Innovative strategies suggested improving Ob-Gyn residents' basic obstetric skills and confidence in performing rare procedures. For example, educational Videos and simulators can be repeatedly used, to review the methods and simulators to practice the weak area of the procedures. A study showed the effectiveness of the simulation-based curriculum in improving the amniocentesis skills of Ob-Gyn residents (18).

Board-certified Ob-Gyns Growth trends

The supply of the board-certified Ob-Gyns increased over the past decades. The trend toward an increase in applicants for Iranian Ob-Gyn Board exam will likely continue as more Ob-Gyn residents graduate. Increase of admission rate of Ob-Gyn residents leads to increase of board-certified physician in this specialty.

Although the annual number of Ob-Gyns annually accepted in specialty board exam increased (from 70 in 1979 to 212 in 2017) this number grew by 203%(Table 1), the proportion of graduates accepted in Ob-Gyn decreased (from 93% in 1979 to 77.6% in 2017) and this proportion declined by 16.8%. (Table 1)

The reason for the lower acceptance rate is the board examination exam comes with the higher stake and highest standards in the last decade. High stake board exam became an educational policy because by board certification (19), Ob-Gyn specialists can apply for academic positions in universities and apply for the fellowship entrance exam.

Ob–Gyn Fellowship programs

Increase of board-certified rate of Ob-Gyns leads to an increase in the number of those pursuing fellowship training. Fellowship programs are contributing to enhance the Ob-Gyns training, and also help faculty recruitment and progress (1,4). As Ob-Gyn continues to evolve, specialists must prepare for the future. Considering the expansion of women's health care demands, robust projections are needed periodically for developing the Ob-Gyns fellowship programs addressing Iranian women health needs for both the near and far future.

Active Female Ob –Gyn Growth

Between 1979 and 2017 the number of Iranian female active Ob-Gyns grew by 995.8% and their proportion increased by 350%. The absolute change in the proportion of active female Ob-Gyns was +70% (Table 1). The upward growth of female Ob-Gyns is a global trend. In the US between 2001 and 2006, gynecology becomes the surgical specialties with the highest percentage of women entering training and the number of female Ob-Gyns has a steady increase over the past decades and constitutes 48% of all US Ob-Gyns (20).

This trend has benefits and implications for the profession. Ob-Gyn are a surgical subspecialty focusing on the reproductive system of women. Historically the obstetric has been a female-dominated field because most of the women have demand for the same-gender physician. Several studies have investigated patients' preference for the gender of their doctor. Women were more likely to prefer the same gender physicians than males (21).

Now representing 90% of all active Ob-Gyns in Iran and the percentage will increase further as more male Ob-Gyns of the baby boomer genera-

tions retire. Contemporary Ob-Gyn Annual Survey revealed that female surgeons are more likely to reduce their clinical work time for balancing work and home life (10,22).

Another challenge is that female specialists are less likely to work in deprive areas. Advanced medical centers are not distributed equally between provinces, particularly in remote areas in Iran, and it may be necessary to make adjustments to the workforce. Shortages in many areas may worsen if the trend remains constant. Accepting more female residents from depriving areas of Iran is suggested as a possible strategy for enhancing the retention of local Ob-Gyns to serve in their own regions.

Considering the female Ob-Gyn work preferences offers an opportunity to enhance work-life balance according to their lifestyle and life-stage needs. A flexible schedule will improve female Ob-Gyns experience (22). Office-based practice and expanding use of new technology are suggested as a possible strategy for enhancing the Ob-Gyn services for both female physicians and patients. Text messages, smart-phone applications, and video calls can allow patients quick access to follow-up care and could change the Ob-Gyn practice (23).

Growth of aging Ob –Gyn workforce

A large number of Ob-Gyns are approaching the age of retirement. About 55% of Iranian Ob-Gyns are between 35-50 years, 32% of currently active Ob-Gyns are over 50 yr old, and 14% of them are more than 65 yr old. The numbers indicate a wave of Ob-Gyns retirements. Some academic centers reported that female satisfaction and productivity increase significantly later in their careers (22). Worldwide, physicians are planning to accelerate their retirement plans while they plan to reduce their work hours (23).Most of the Ob-Gyns start to leave the workforce at age 60 yr and retire at an age of 65 yr, this aging physician population could affect access to women's health services within the decade (24). Losing the work effort of older Ob-Gyns is inevitable. According to these trends, approximately 20% of Iranian Ob-Gyns have to reduce their work efforts within the next 5 yr and some of them will retire.

Growth of Ob-Gyns per 100,000 populations

Between 1979 and 2017, the proportion of Ob-Gyns to 100,000 population in Iran increased by 70%. The arguments on the adequacy of physicians are intense. An adequate supply of OB-Gyns is necessary to factor (not enough) for optimal women's health care delivery (20).The ideal ratio varies depending on regional needs, the services, and technology available and the work patterns (25, 26).

The Graduate Medical Education National Advisory Committee (GMENAC) recommended 4.7 general surgeons per 100,000 people in the United States. This ratio was 12 for American OB-Gyns in 2012 (20,27).

Our findings revealed that, in 2017, there were one active Ob-Gyns for every 12422 people and there were 8.05 gynecologists in practice per 100,000 population and met the suggested SPR benchmark.

Over the next decade, the demand for Ob-Gyns services is projected to increase globally (25,28). A policy to handle this greater demand is by increasing the number of Ob-Gyn residents and the decision would have a substantially delayed effect on the workforce (comparing Fig.1 and 2). However, expanding the number of Ob-Gyn residency positions is not a complete solution.

Ob-Gyn workforce Geographic Distribution

Although much attention is given to implications of overall adequate Ob-Gyn workforce less attention perhaps given to the fair distribution of the workforce across the country and patient access to care in rural and deprive areas (26). Studies warn about geographic imbalances in the availability of Ob/Gyns (26,28,29). The forecasted demand will vary geographically in large countries like Iran, especially provinces vulnerable to this imbalance.

Based on population distribution, the Ob-Gyns workforce is mal-distributed among and within country/provinces. The majority of the workforce is located in Tehran and predominantly in

the capital cities of the provinces (1,29).There is a considerable disparity between different regions of the country in terms of access to Ob-Gyns and studies shows that there is clearly an unequal distribution of the Ob-Gyns particularly in deprived areas in Iran (30). Encouraging local Ob-Gyns to serve in their own geographical regions (urban or rural) through incentives or through the regionalized recruitment is suggested strategy.

Conclusion

Over the last 4 decades Ob-Gyn specialty education in Iran has witnessed remarkable achievements, resulting in the improvement of women health indicators. Growth trends suggest that the overall number of Ob/Gyns in Iran is at the highest per capita since1979. In the near future, Ob-Gyn specialty education in Iran will need to undergo major reforms. When planning for these reforms, decision-makers should consider the current trends that affect practice in the future. Ob-Gyns workforce planning for the future needs to improve. Further studies should consider Ob-Gyn's distributions across the country. Ongoing research should focus on the effects of emerging care delivery models and changing practices pattern of female ob-gyn supply and potential implications of the evolving technologies on ob-gyn practice and women's health care demand.

Ethical considerations

Ethical issues (Including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgements

The author would like to thank the Academy of Medical Science of the Iran, Council on Medical Specialty Training and Medical Council of Iran. This original article extracted from part of Dr. Shima Tabatabai PhD and Post-doctoral research projects in Medical Education.

Conflict of interest

The authors declare that there is no conflict of interest.

References

1. Simforoosh N, Ziaee SA, Tabatabai S (2014). Growth trends in medical specialists' education in Iran; 1979 – 2013. *Arch Iran Med,* 17(11):771 –5.
2. Tabatabai S, Simforoosh N (2020). Health Care and Medical Education to Promote Women's Health in Iran; Four Decades Efforts, Challenges and Recommendations. *Arch Iran Med,* 23(7):469-479.
3. Tabatabai S, Simforoosh N (2020). Preference for Patient -Urologist Gender Similarity and Its Implications for Urology Departments: A Systematic Narrative Review and Thematic Analysis. *Urol J,* 17(6): 568-577.
4. IHS Inc.(2015). The Complexities of Physician Supply and Demand: Projections from 2013 to 2025. Prepared for the Association of American Medical Colleges. Washington, DC: Association of American Medical Colleges. Available from: https://www.kff.org/wp-content/uploads/sites/3/2015/03/ihsreportdownload.pdf
5. Tabatabai S, Javadi MA (2019).Ophthalmic education and ophthalmologists growth trends in Iran (1979–2016).*J Ophthalmic Vis Res*, 14(2):185-194.
6. Johnson RB, Onwuegbuzie AJ (2004). Mixed methods research: a research paradigm whose time has come. *Educational Researcher*, 33(7): 14-26
7. American colleges of surgeons health policy research institute (2010).The Surgical Workforce in the United States: Profile and Recent Trends. Available from: https://docplayer.net/35383-The-surgical-workforce-in-the-united-states-profile-and-recent-trends.html
8. Iranian Obstetrics & Gynecology curriculum development committees (2017) .Obstetrics & Gynecology specialty curriculum the Secretariat of the Council on Medical Education and

Specialty Training of MOHME. Available from: https://cgme.behdasht.gov.ir/uploads/Sp_ObstetricsGynecology.pdf

9. Accreditation Council for Graduate Medical Education. Minimum thresholds for obstetrics and gynecology procedures. Available from:https://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/220_ObstetricsAndGynecology_2020.pdf?ver=2020-06-29-162338-630 [Accessed May 1, 2019.]
10. Kane SM, Siddiqui NY, Bailit J, et al (2010).Duty hour restrictions, ambulatory experience, and surgical procedural volume in obstetrics and gynecology. *J Grad Med Educ*, 2(4):530–5.
11. Bruce PJ, Helmer SD, Osland JS, et al (2010). Operative volume in the new era: a comparison of resident operative volume before and after implementation of 80-hour work week restrictions. *J Surg Educ*, 67(6):412–6.
12. Althabe F, Belizn JM (2006). Caesarean section: the paradox. *Lancet,* 368(9546):1472-3.
13. Nagy S(2014). [Changing trends and indications for cesarean section in the last few decades]. *Orv Hetil,* 155(29):1140–6.
14. Islamic republic of Iran, ministry of health and medical education. Available from http://behdasht.gov.ir/index.jsp?siteid=1&pageid=1508&newsview=184825 [Accessed May 1, 2019]
15. Ahmad-Nia S, Delavar B, Eini-Zinab H, et al (2009). Caesarean section in the Islamic Republic of Iran: prevalence and some socio-demographic correlates. *East Mediterr Health J,*15(6):1389-98.
16. Wagner M (2000). Choosing caesarean section. *Lancet,* 356(9242):1677-80.
17. Azami-Aghdash S, Ghojazadeh M, DehdilaniN, et al (2014). Prevalence and causes of cesarean section in Iran: systematic review andmeta-analysis. *Iran J Public Health,* 43(5): 545–555.
18. Pittini R, Oepkes D, Macrury K, et al (2002).Teaching invasive perinatal procedures: assessment of a high fidelity simulator-based curriculum. *Ultrasound Obstet Gynecol,* 19(5):478–83.
19. Cassel, CK, Holmboe, ES (2008). Professionalism and accountability: the role of specialty board certification. *Transactions of the American Clinical and Climatological Association,* 119, 295–304.
20. Rayburn WF (2017).*The obstetrician-gynecologist workforce in the United States: facts, figures and implications*. 7th ed. Washington (DC): American Congress of Obstetricians and Gynecologists, United States, p:189. NLM ID:101542193
21. Simforoosh N, Tabatabai S, Ziaee SA (2014). Achievements in postgraduate urologic education in Iran: A quantitative study. *Urol J*, 10(4):1119-25.
22. Bettes BA, Strunk AL, Coleman VH, et al (2004). Professional liability and other career pressures: Impact on obstetrician-gynecologists' career satisfaction. *Obstet Gynecol* , 103(5 Pt 1):967-73.
23. Tabatabai, S (2013). Effects of Physician-Patient Electronic Communications on the Quality of Care. *International Journal of Reliable and Quality E-Healthcare (IJRQEH),* 2(2): 54-62.
24. Anderson BL, Hale RW, Salsberg E(2008). Outlook for the future of the obstetrician-gynecologist workforce. *Am J Obstet Gynecol,* 99(1):88.e1-8.
25. KolarsJC (2001). Forecasting physician supply and demand. *Med Educ*, 35:424-425.
26. Hollier LM, Promecene PA, Owens MY, et al (2015). Women's Health Care Teams and the Future of Obstetrics and Gynecology. *Obstet Gynecol,* 26(6):1285-1289.
27. Poley S, Belsky D, Gaul K, et al (2009). Longitudinal Trends in the U.S. Surgical Workforce, 1981-2006. *Bull Am Coll Surg,* 94(8):27-31.
28. Grover A, Orlowski J M, and Erikson C E(2016).The Nation's Physician Workforce and Future Challenges. *Am J Med Sci,* 351 (1): 11-9.
29. Tabatabai S, Ziaee S A, Simforoosh, N (2014). Evidence-based health human resources planning and medical professionals' education in Iran. *BMC Health Services Research,* 14: 123.
30. Noori Hekmat S, Hashemi H, Haghdoost A, et al (2018). Specialized and Geographic Distribution of Specialists in Iran in 2016 and its Estimates in 2026. *IRJE,* 13(5) :122-132 .