



After 20 years of low fertility, where are the obstetrician-gynecologists?

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Korea has entered a stage of low fertility, with a total fertility rate of 1.178 in 2002 and 0.92 in 2019. The low birth rate has led to the closure of obstetric hospitals and clinics from 1,371 maternity health facilities in 2003 to 541 in 2019, which is 39.5% compared to 2003. Since 2011, the Ministry of Health and Welfare has been operating an "Obstetrically Underserved Areas Support Project," however, a shortage of obstetrician-gynecologists (OB/GYNs) who can participate in labor and delivery is a major problem. In 2019, there were 5,800 OB/GYNs practicing. Of these, 4,225 (72.8%) were working in obstetrics-gynecology hospitals, each responsible for 2,855 fertile women. Their average age was 51.8 years. A total of 2,659 (45.9%) worked in clinics and 3,110 (73.6%) were working in metropolitan districts. Only 124 OB/GYNs (2.9%) worked in vulnerable rural areas. OB/GYNs working in obstetric hospitals were responsible for 113.8 newborns in 2019. Their average age was 50.1 years. Of them, 67.4% were working in hospitals, 74.1% in urban areas, and only 60 specialists (2.3%) were working in rural areas. To establish a safe childbirth environment during an era of low fertility, it is important to have obstetricians in charge of childbirth. The government should establish a comprehensive long-term plan to resolve the shortage of OB/GYNs.

Keywords: Obstetrics; Physicians; Medically underserved area; Fertility

Introduction

Korea has stated in the constitution its obligation to maternal safety, and the World Health Organization recommends that medical accessibility be established for prenatal management for the sake of maternal and child health [1].

Medical accessibility is influenced by physical, financial, and cultural obstacles. Physical obstacles include the geographic inequality of medical facilities, difficulties in travel, and financial loss due to long distances from facilities [2]. The best option for excellent maternity-related medical accessibility is to have an obstetric hospital nearby.

The persistence of a low birth rate in the last 20 years has led to difficulties in the management of obstetrics-gynecology (OBGYN) hospitals and clinics, causing many to close down. In the early stages of the low birth rate era, closures were mostly in vulnerable rural areas with few childbirths. However, with the apparent permanent low birth rate, closures are currently becoming more common throughout the nation, hampering medical accessibility for pregnant women [3].

The decrease in medical accessibility from closures of domestic obstetric hospitals and clinics has had a severe impact

on maternal and child health, including maternal mortality. In 2011, the maternal mortality ratio (MMR) was 17.2 [3,4], which was 2.1 times higher than the Organization for Economic Co-operation and Development MMR average of 8.2, and 4.2 times higher than the MMR of 4.1 in Japan [5]. According to a report published in Korea in 2019, pregnant women residing in obstetrically underserved areas (OUAs) showed an abortion rate of 4.6% and an inadequate prenatal care of 7.2%, which were significantly higher than those in obstetrically sufficient areas [6,7].

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In 2011, the Ministry of Health and Welfare started the "Obstetrically Underserved Areas Support Project." To improve medical accessibility, 19 local governments opened obstetric hospitals and clinics in OUAs, supported facility, equipment, and operational expenses, and provided additional medical reimbursements for obstetric procedures. However, 65 of the 250 local governments still do not have obstetric hospitals or clinics [8].

Experts have provided various explanations as to why OUAs still exist, but the factors are complex. When the issue of OUAs first arose in 2010, the difficulty of operating obstetric hospitals and clinics was considered the most crucial factor. The government perceived that supporting facilities with equipment, rebuilding costs, and hospital operational expenses would resolve the problem of OUAs [9]. However, despite the government's support project for OUAs in 2011, OUAs remained, showing the limitations of the government's policies to resolve the issue.

Adequate equipment and staffing of obstetrician-gynecologists (OB/GYNs), particularly obstetricians, is crucial for the stable operation of obstetric hospitals. According to a 2014 report, the most important factor in the safety of childbirth in obstetric hospitals and clinics is the obstetric staff. In particular, the presence of an obstetrician is the most crucial factor for improving pregnancy outcomes in high-risk pregnant women [10]. However, various factors have led to difficulties in recruiting OB/GYNs for OUAs, impeding safe pregnancy and childbirth.

Becoming an OB/GYN requires 11 years of education in total; six years of medical college, 1 year of internship, and 4 years of residency. For a stable labor supply of OB/GYNs, supply and demand must be foreseen for long-term planning and comprehensive policy support.

As there have been insufficient studies on the supply and demand for OB/GYNs in Korea, it has unfortunately been difficult to establish countermeasures for OUAs and the management of high-risk pregnant women. To assist in establishing policies for supply and demand, this review article analyzes the status of OB/GYNs in charge of pregnancy and childbirth during this era of low fertility.

Status of OBGYN hospitals and clinics

According to the 2019 Health Insurance Review and Assess-

ment Service (HIRA), there were 2,081 OBGYN hospitals and clinics in Korea. An analysis of 17 provinces showed that Seoul had the most number of OBGYN facilities (503), followed by Gyeonggi (403). The area with the least number of facilities was Sejong (8), followed by Jeju (29). Seoul, Gyeonggi, and Incheon, the capital area, had 999 OBGYN facilities, or 48% of the total in Korea [11].

It is important that OBGYN clinics, used mostly by women of childbearing age, operate adequately for medical accessibility. The national average of OBGYN hospitals and clinics per 10,000 women of childbearing age was 1.72, and each facility was responsible for 5,797.8 fertile women. Daegu had the highest OBGYN hospital and clinic count for fertile women in Korea at 2.3 per 10,000 women, and there were 4,329.2 of them per facility, the lowest in the country. Sejong had the lowest ratio for the number of OBGYN facilities in Korea to the number of women of childbearing age at 0.9 per 10,000 women, and there were 11,192.7 fertile women per facility (Table 1).

The capital area had the most number of OBGYN hospitals and clinics per 10,000 women of childbearing age at 1.55, which is lower than the national average. The number of women of childbearing age per facility was 6,469, with the ratio of OBGYN clinics to the number of fertile women also being higher than the national average.

Status of maternity health facilities

According to the 2019 National Health Insurance Service (NHIS) and HIRA, 741 maternity health facilities had labor and delivery rooms; 726 obstetric hospitals and clinics and 15 midwifery birth centers. In total, 541 maternity health facilities, 526 obstetric hospitals and clinics, and 15 midwifery birth centers had at least one childbirth in 2019 [12] (Table 1).

Classified by type, there were 260 obstetric clinics, 142 obstetric hospitals, 83 general hospitals, and 41 tertiary care hospitals. Interestingly, labor and delivery were managed in public health centers until 2013, but not after 2014 [13] (Table 2).

Based on an analysis of the 541 maternity health facilities that managed childbirth in 2019, Gyeonggi had the highest number of maternity health facilities with 122, followed by Seoul with 94. Sejong and Ulsan had the lowest at 4 and 9, respectively (Table 1). The capital area had 246 clinics,

Table 1. Status of obstetrics and gynecology hospital and clinics and maternity health facilities in 17 provinces (2019)

Province	OBGYN hospitals & clinics			Maternity healthcare facilities			Newborns	OBGYN hospi- tals & clinics per 10,000 women of childbearing age	Women of childbear- ing age	Women of childbearing age per OBGYN hospi- tals & clinics	Maternity healthcare facilities per 1,000 newborns	Newborns per maternity healthcare facilities
	OBGYN hospitals & clinics	Obstetric hospitals & clinics	Midwifery birth center	Subtotal	Women of childbear- ing age	Newborns						
Seoul	503	91	3	94	2,503,982	53,673	2.01	4,978.1	571.0	1.75		
Busan	168	35	1	36	752,426	17,049	2.23	4,478.7	473.6	2.11		
Daegu	129	23	0	23	558,471	13,233	2.31	4,329.2	575.3	1.74		
Incheon	93	29	1	30	711,176	18,522	1.31	7,647.1	617.4	1.62		
Gwangju	76	9	0	9	360,458	8,364	2.11	4,742.9	929.3	1.08		
Daejeon	74	23	0	23	358,714	8,410	2.06	4,847.5	365.7	2.73		
Ulsan	50	9	0	9	264,093	7,539	1.89	5,281.9	837.7	1.19		
Sejong	8	4	0	4	89,542	3,819	0.89	11,192.8	954.8	1.05		
Gyeonggi	403	116	6	122	3,247,415	83,198	1.24	8,058.1	682.0	1.47		
Gangwon	59	23	0	23	309,384	8,283	1.91	5,243.8	360.1	2.78		
Chungbuk	69	20	1	21	340,338	9,333	2.03	4,932.4	444.4	2.25		
Chungnam	71	26	0	26	446,009	13,228	1.59	6,281.8	508.8	1.97		
Jeonbuk	85	29	0	29	375,347	8,971	2.26	4,415.8	309.3	3.23		
Jeonnam	59	14	0	14	353,505	10,832	1.67	5,991.6	773.7	1.29		
Gyeongbuk	96	26	1	27	519,431	14,472	1.85	5,410.7	536.0	1.87		
Gyeongnam	109	37	1	38	722,100	19,250	1.51	6,624.8	506.6	1.97		
Jeju	29	12	1	13	152,814	4,500	1.90	5,269.4	346.2	2.89		
Total	2,081	526	15	541	12,065,205	302,676	1.72	5,797.8	559.5	1.79		

OBGYN, Obstetrics and Gynecology.

Table 2. Change of maternity health facilities based on type of maternity healthcare facility 2003-2019

Provinces	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Reduction rate (%)
Tertiary hospital	42	42	42	43	43	43	44	44	44	43	43	42	42	42	42	41	41	2.4
General hospital	175	156	151	138	133	125	112	108	100	97	91	90	85	89	85	86	83	52.6
Hospital	136	139	136	130	123	127	123	124	135	141	145	147	141	145	148	145	142	-4.4
Clinics	992	955	866	789	710	640	564	518	484	448	409	376	334	313	290	279	260	73.8
Midwifery birth center	25	18	18	18	17	18	16	14	13	13	17	20	18	18	17	16	15	40.0
Public health center	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	100.0
Total	1,371	1,311	1,214	1,119	1,027	954	860	808	777	743	706	675	620	607	582	567	541	60.5

or 45.5% of all maternity health facilities. Many maternity health facilities are based in the capital area because 6,462,573 women of childbearing age, which represents 53.6% of the total in Korea, reside in the capital area.

Since pregnant women generally use maternity health facilities, an analysis of “maternity health facilities per pregnant woman” is a significant indicator of whether the facilities they actually use are operating properly. However, since there are no national statistics on the number of pregnant women in Korea, this can be indirectly confirmed by the number of childbirths and newborns. The statistics on childbirth are based on medical reimbursement payment requests from private maternity health facilities, and the statistics on newborns are based on birth registrations managed by Statistics Korea, a government organization; therefore, the figures are considered more accurate. Thus, the statistics of maternity health facilities per newborn have been used as an indirect indicator of maternity health facilities per pregnant woman in this study.

The number of maternity health facilities per 1,000 newborns was 1.79, with 559.5 newborns per facility. Jeonbuk had the most number of obstetric hospitals and clinics, with 3.23 per 1,000 newborns, and the least number of newborns, with 309.3 per obstetric hospital and clinic, showing the highest maternity health facilities to pregnant women ratio. Sejong had the least number of obstetric hospitals and clinics, with 1.05 per 1,000 newborns, and the highest level of newborns, with 954.6% per obstetric hospital and clinic. Sejong was the most underprivileged city for maternity services in Korea because it had a high total fertility rate of 1.47 and insufficient obstetric infrastructure due to the city being newly established. However, as Sejong is increasing its number of obstetric clinics, accessibility to obstetric medical services is likely to improve. Amongst established provincial areas, Gwangju had the least number of obstetric hospitals and clinics with 1.08 per 1,000 newborns, and the highest level of newborns with 929.3% per obstetric hospital and clinic, thereby lacking in obstetric hospitals and clinics for local pregnant women (Table 1).

Changes in maternity health facilities

As Korea entered a period of low fertility in the 2000s, many maternity health facilities with financial difficulties closed.

From 1,371 in 2003, the number decreased by about 90 annually until 2009, and only 541 obstetric facilities remained in 2019, which accounted for a 60.5% reduction. In particular, 73.8% of the clinics closed, which was the highest percentage, 52.6% of general hospitals stopped providing obstetric care, and 40% of midwifery birth centers closed [12,13] (Table 2).

Most provincial areas showed a decrease in maternity health facilities; compared to 2003, the largest decrease was in Gwangju (77.5%), while the smallest was in Jeju (31.6%). In contrast, the number of obstetric hospitals and clinics in Sejong increased (Table 3).

In 2003, 2.77 maternity health facilities existed per 1,000 newborns, and 361.1 newborns were born per facility. Since then, the number of maternity health facilities per 1,000 newborns has been steadily decreasing, and the number of newborns per maternity health facility has been increasing. As a result, the maternity care environment was badly affected by 2015, with 1.41 maternity health facilities per 1,000 newborns and 707.1 newborns per facility. After 2015, the number of newborns decreased at a faster rate than the closure of obstetric hospitals and clinics, consistently reducing the number of newborns per maternity health facility; by 2019, 559.5 babies were born per facility (Table 1).

Status of OB/GYNs

Since the liberation and Korean War, pregnancy and child-birth dramatically increased during the baby boom era, leading to a rapid increase in demand for OB/GYNs, but various practical difficulties led to insufficient numbers. Therefore, in 1951, the government implemented a specialist system to increase the number of competent OB/GYNs. In 1957, the Korean Society of Obstetrics and Gynecology (KSOG) provided a unified nationwide training curriculum, and the current specialist system was implemented to allow one to become a specialist after 4 years of residency and an exam. Previously, an OB/GYN designation was granted based on a document review, not by an exam. Seven OB/GYNs were appointed under the new system for the first time in 1953. A specialist exam was finally implemented in 1960, and it produced 7,569 specialists in 2019 [14].

The supply of new specialists was 130 per year by the mid-1980s and over 200 in the 1990s. It peaked at 270 in 2001.

However, low rates of fertility, excessive work demands, increasing medical disputes, lack of a compensatory system, and the government's mistaken reduction of the residency training program led to a decrease in the number of specialists. By 2012, there were only 90 new specialists, the lowest since 1982 [15].

According to the NHIS, the number of practicing OB/GYNs in 2019 was 5,800. Most specialists worked in Seoul (1,544), followed by Gyeonggi (1,257). The new city of Sejong had the lowest number of specialists at 18, and Jeju had the lowest number among conventional provincial areas at 66.

The number of practicing OB/GYNs per 10,000 women of childbearing age was 4.81 nationwide, and each OB/GYN was responsible for 2,080.2 of them. Seoul, having the most number of OB/GYNs, had 6.17 specialists per 10,000 women of childbearing age, and each OB/GYN oversaw 1,621.8 of them. Sejong had the least number of OB/GYNs, with 2.01 specialists per 10,000 women of childbearing age, and 4,974.6 per OB/GYN, the highest in Korea (Table 4). Although 5,800 specialists were currently practicing, only 4,225 were working in OBGYN hospitals and clinics, accounting for 72.8% of the total clinical specialists [16].

An analysis of OB/GYNs working in OBGYN hospitals and clinics according to area showed that Seoul had the most number of specialists (1,100), followed by Gyeonggi (951). The area with the least number of specialists was Sejong (14), followed by Jeju (49). The ratio of OB/GYNs working in OBGYN hospitals and clinics to the total number of practicing OB/GYNs was the highest in Daejeon (80.4%) and the lowest in Gyeongnam (48.6%) [17].

Of 2,505 OB/GYNs, 59.3% working in OBGYN hospital and clinics were male, and 1,720 were female. However, only Seoul had more female than male specialists (638 and 462, respectively). The area with the highest number of male specialists was Jeonnam, with 92 (87.6%) (Table 5).

Each OB/GYN working in an OBGYN hospital and clinic was responsible for an average of 2,855.7 women of childbearing age, and there were 3.5 specialists for every 10,000 fertile women. Although Seoul had the highest number of OB/GYNs working in OBGYN hospitals and clinics, the number of OB/GYNs per woman of childbearing age was the highest in Daegu at 4.55 for every 10,000; however, its ratio of fertile women to specialist was the lowest in Korea at 2,198.7 women. The area with the least number of OB/GYNs per woman of childbearing age was Sejong, followed

Table 3. Change of maternity healthcare facilities in 17 provinces 2003-2019

Province	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Reduction rate (%)
Seoul	264	236	222	194	183	168	151	143	138	131	124	118	109	105	98	98	94	64.4
Busan	80	78	70	63	62	64	53	50	51	43	44	43	38	37	36	37	36	55.0
Daegu	43	46	39	35	35	29	29	30	28	41	35	38	26	27	25	24	23	46.5
Incheon	85	77	70	60	56	49	47	42	43	25	26	32	34	33	31	30	30	64.7
Gwangju	40	39	35	35	31	30	27	25	23	20	24	21	14	13	12	9	9	77.5
Daejeon	63	60	56	55	51	51	41	41	36	38	29	31	30	30	28	29	23	63.5
Ulsan	23	24	23	21	18	18	14	15	15	14	13	11	10	8	8	10	9	60.9
Sejong	-	-	-	-	-	-	-	-	-	-	2	2	2	2	2	4	4	-
Gyeonggi	312	296	272	250	230	200	185	173	167	172	165	155	142	137	135	129	122	60.9
Gangwon	56	56	54	52	46	44	38	34	31	32	31	27	24	23	24	23	23	58.9
Chungbuk	65	65	58	52	49	43	41	38	37	36	30	29	29	27	23	23	21	67.7
Chungnam	70	62	55	56	54	49	42	40	37	36	32	29	28	29	28	25	26	62.9
Jeonbuk	58	62	56	49	50	46	42	41	40	37	37	34	33	32	32	28	29	50.0
Jeonnam	49	46	39	38	29	32	28	22	21	17	14	16	17	15	13	16	14	71.4
Gyeongbuk	61	61	58	57	52	52	43	40	38	34	36	31	29	30	32	29	27	55.7
Gyeongnam	83	85	89	85	66	64	65	61	58	52	50	44	41	45	42	42	38	54.2
Jeju	19	18	18	17	15	15	14	13	14	15	14	14	14	14	13	13	13	31.6
Total	1,371	1,311	1,214	1,119	1,027	954	860	808	777	743	706	675	620	607	582	567	541	60.5

Table 4. Status of obstetrician and gynecologists in 17 provinces (2019)

Province	Practicing OB/GYNs	OB/GYNs working in hospitals & clinics	OB/GYNs working in OBGYN hospitals & clinics	Practicing OB/GYNs per 10,000 Women of childbearing age	Women of childbearing age per Practicing OB/GYNs	OB/GYNs working in OBGYN hospitals & clinics per 10,000 Women of childbearing age	Women of childbearing age per OB/GYNs working in OBGYN hospitals & clinics	OB/GYNs working in obstetric hospitals & clinics per 10,000 Women of childbearing age	Women of childbearing age per OB/GYNs working in obstetric hospitals & clinics
Seoul	1,544	1,100	661	6.17	1,621.8	4.39	2,276.3	2.64	3,788.2
Busan	453	312	204	6.02	1,661.0	4.15	2,411.6	2.71	3,688.4
Daegu	318	254	138	5.69	1,756.2	4.55	2,198.7	2.47	4,046.9
Incheon	294	209	150	4.13	2,419.0	2.94	3,402.8	2.11	4,741.2
Gwangju	215	159	84	5.96	1,676.5	4.41	2,267.0	2.33	4,291.2
Daejeon	199	160	102	5.55	1,802.6	4.46	2,242.0	2.84	3,516.8
Ulsan	115	87	47	4.35	2,296.5	3.29	3,035.6	1.78	5,619.0
Sejong	18	14	9	2.01	4,974.6	1.56	6,395.9	1.01	9,949.1
Gyeonggi	1,257	951	639	3.87	2,583.5	2.93	3,414.7	1.97	5,082.0
Gangwon	143	105	68	4.62	2,163.5	3.39	2,946.5	2.20	4,549.8
Chungbuk	140	108	70	4.11	2,431.0	3.17	3,151.3	2.06	4,862.0
Chungnam	185	132	95	4.15	2,410.9	2.96	3,378.9	2.13	4,694.8
Jeonbuk	185	145	88	4.93	2,028.9	3.86	2,588.6	2.34	4,265.3
Jeonnam	158	105	64	4.47	2,237.4	2.97	3,366.7	1.81	5,523.5
Gyeongbuk	215	154	100	4.14	2,416.0	2.96	3,372.9	1.93	5,194.3
Gyeongnam	295	181	116	4.09	2,447.8	2.51	3,989.5	1.61	6,225.0
Jeju	66	49	24	4.32	2,315.4	3.21	3,118.7	1.57	6,367.3
Total	5,800	4,225	2,659	4.81	2,080.2	3.50	2,855.7	2.20	4,537.5

OB/GYN, Obstetrician and Gynecologist; OBGYN, Obstetrics and Gynecology.

by Gyeongnam. Sejong had 1.56 OB/GYNs for every 10,000 women of childbearing age, with 6,395.9 women per specialist. In Gyeongnam, there were 2.5 OB/GYNs for every 10,000 women of childbearing age, with 3,987.5 women per specialist (Table 4).

The average age of OB/GYNs was 51.8 years; 55.5 years

for males, and 46.5 years for females. Gyeongbuk had the highest average age in Korea, while Seoul had the lowest at 51.1 years. There was a discrepancy between male and female doctors. The average age of male OB/GYNs was the highest in Gyeongbuk at 60.2 years, while OB/GYNs in Jeju had the highest average age at 51.4 years. The city with the

Table 5. Sex ratio of OB/GYN in 17 provinces (2019)

Province	OB/GYNs working in OBGYN hospitals & clinics			OB/GYNs working in obstetric hospitals & clinics		
	Male	Female	Total	Male	Female	Total
Seoul	462	638	1,100	334	327	661
Busan	179	133	312	117	87	204
Daegu	154	100	254	95	43	138
Incheon	144	65	209	102	48	150
Gwangju	77	82	159	47	37	84
Daejeon	111	49	160	75	27	102
Ulsan	58	29	87	32	15	47
Sejong	11	3	14	7	2	9
Gyeonggi	528	423	951	372	267	639
Gangwon	87	18	105	53	15	68
Chungbuk	87	21	108	56	14	70
Chungnam	104	28	132	75	20	95
Jeonbuk	106	39	145	71	17	88
Jeonnam	92	13	105	58	6	64
Gyeongbuk	134	20	154	89	11	100
Gyeongnam	133	48	181	86	30	116
Jeju	38	11	49	21	3	24
Total	2,505	1,720	4,225	1,690	969	2,659

OB/GYN, Obstetrician and Gynecologist; OBGYN, Obstetrics and Gynecology.

Table 6. Workplace of obstetrician and gynecologists based on the type of medical facility (2019)

	OB/GYNs working in OBGYN clinics			OB/GYNs working in obstetric clinics		
	Male	Female	Total	Male	Female	Total
Tertiary hospital	229	139	368 (8.7)	229	139	368 (13.8)
General hospital	441	254	695 (16.4)	329	219	548 (20.6)
Hospital	654	414	1,068 (25.3)	523	350	873 (32.8)
Convalescent hospital	139	11	150 (3.6)	0	0	0
Clinics	1,040	901	1,941 (45.9)	609	261	870 (32.8)
Oriental medicine hospital	2	1	3 (0.1)	0	0	0
Public health center	0	0	0	0	0	0
Total	2,505	1,720	4,225 (100)	1,690	969	2,659 (100)

Values are presented as number (%).

OB/GYN, Obstetrician and Gynecologist; OBGYN, Obstetrics and Gynecology.

youngest male specialists was Sejong, with an average age of 53.1 years, while Incheon had the youngest female specialists, with an average age of 43.6 years.

Based on the type of medical facility, 1,941 (45.9%) of all OB/GYNs working in OBGYN hospitals and clinics were working in clinics, while 1,068 (25.3%) were working in hospitals (Table 6). Based on area, 3,110 OB/GYNs (73.6%) were working in metropolitan districts, with 991 being specialists (23.5% in cities), and 124 (2.9%) in vulnerable rural areas. In particular, 84% of female specialists worked in urban areas.

Status of OB/GYNs in obstetric hospitals and clinics

An obstetrician is a doctor who takes care of pregnant women and delivers babies. Unfortunately, there are no domestic or academic data for obstetricians. An indirect indicator is the number of specialists working in obstetric hospitals and clinics that report having a delivery room, but this has its limitations in that the count is higher than the number of actual obstetricians. According to NHIS statistics, the number of OB/GYNs working in obstetric hospitals and clinics was 2,659 in 2019, with 45.9% practicing OB/GYNs, and 62.9% working in OBGYN hospitals and clinics participating in deliveries (Table 4).

Seoul had the most number of specialists (661), followed by Gyeonggi (639), while the area with the highest ratio of OB/GYNs working in obstetric hospitals and clinics was Incheon. Overall, 71.8% of OB/GYNs were working in obstetric hospitals and clinics. The area with the least number of OB/GYNs working in obstetric hospitals and clinics was Sejong (9). For conventional provincial areas, Jeju had the lowest ratio of OB/GYNs working in OBGYN hospitals and clinics with 48.9%, and 24 specialists.

To learn about accessibility for pregnant women, the main users of obstetric hospitals and clinics, the numbers of newborns and specialists in obstetric facilities were analyzed. The number of OB/GYNs working in obstetric hospitals and clinics nationwide for every 1,000 newborns was 8.78 and the average number of newborns for each OB/GYN working in obstetric facilities was 113.8.

Seoul had the highest ratio of OB/GYNs working in obstetric hospitals and clinics for every 1,000 newborns (12.3), which was the highest in Korea; however, the number of newborns for each specialist was 81.2, which was the low-

est in the country. Sejong had the least number of specialists with 2.36 per 1,000 newborns, while each specialist oversaw 424 newborns (Table 4).

Among the OB/GYNs working in obstetric hospitals and clinics, there were 1,690 male specialists (63.6%) and 969 female specialists (36.4%). The area with the lowest ratio of male specialists was Seoul with 334 (50.5%), while the area with the highest ratio was Jeonnam with 58 (90.6%) (Table 5).

The average age of OB/GYNs working in obstetric hospitals and clinics was 50.1 years, with males at 53.7 years, and females at 43.9 years. Jeonnam had the highest average age in Korea at 56 years, while Sejong had the lowest at 47.4 years. Male specialists working in Jeonnam were the oldest at 56.1 years, while female specialists working in Daegu were the youngest at 40.4 years.

Based on the type of medical obstetric facility where OB/GYNs were working, 873 specialists (32.8%) were working in hospitals, while 868 (32.6%) were working in clinics (Table 6). Based on the areas where OB/GYNs were working in obstetric hospitals and clinics, 1,969 specialists (74.1%), were working in metropolitan districts, 630 (23.7%) were working in cities, and only 60 (2.3%) were working in vulnerable rural areas.

Plans to procure obstetricians

In an era of low fertility, the decrease in the number of obstetric hospitals and clinics is not limited to vulnerable local areas, but is a nationwide phenomenon, and there is a lack of improvement in domestic mother and child health indexes. The government has attempted to establish a maternity infrastructure with projects for OUA support, but OUA areas still exist. The recruitment of OB/GYNs is crucial to rebuilding the damaged maternity infrastructure, and calculating the appropriate number of obstetricians is an important task.

In the past, Korean society did not provide adequate rest or appropriate compensation for obstetricians, and enforced personal sacrifice to operate obstetric hospitals with an inadequate number of obstetricians. More recently, the quality of personal life is being prioritized, and future OB/GYNs expect adequate compensation with an assurance of quality of life, as in developed countries.

For this reason, there should be a social consensus to

recruit obstetricians on conditions such as salary, working hours, and breaks, as well as conditions for their quality of life as a doctor. However, there is still no social consensus on this matter, so it is difficult to predict how many specialists will be needed. Nevertheless, we can make predictions based on Korea's neighboring country, Japan. Japan has established a work schedule of assigning 100 deliveries for each OB/GYN annually, one duty per week, and paid leave.

When considering Korea's domestic situation, 302,676 babies were born in 2019, and when an obstetrician is assumed to be assigned 10 deliveries monthly or 120 deliveries annually, the required number of obstetricians is 2,522. When weekly duty and paid leave are provided, there should be 52 days of paid leave annually, so an additional 419 specialists are needed, making a total of 2,941, which is 282 more than the currently practicing 2,659 specialists.

Obstetricians have been complaining of various issues in clinical practice. The first is the high work intensity and deterioration of the quality of life. In the 2019 NIHS data, the average number of annual deliveries for a specialist working in an obstetric facility was 114. However, according to the 2019 KSOG survey, the average number of deliveries for an obstetrician was 16 per month or 192 per year, which differed from official statistical data from the government [18]. Therefore, it can be assumed that the actual number of obstetricians is low, their work intensity is high, and their quality of life is poor.

The second is the fear of medical disputes. In the 2019 KSOG survey, 55% of specialists who did not participate in deliveries reported that they did not perform deliveries due to "medical disputes and lawsuits." Another serious issue is that only 43% of the residents who become specialists participate in deliveries. The biggest reason for not participating in deliveries is concerns about medical accidents and mental stress regarding deliveries [18].

The third is the closure of OBGYN hospitals and clinics due to financial difficulties in this era of low fertility and the resulting uncertainty about their status. The high labor intensity, impaired quality of life, high risk of medical malpractice litigation, and insecure positions have led to the low involvement of OB/GYNs in deliveries, with only 45.9% of OB/GYNs practicing in clinics and 62.9% participating in deliveries in obstetric hospitals and clinics [18].

The first task in rebuilding obstetric infrastructure is to recruit competent obstetricians. To do so, the long-term

demand for OB/GYNs must be calculated, so that plans to obtain new OB/GYNs and recruit existing OB/GYNs can be implemented.

A new OB/GYN specialist requires 11 years of education, including medical college; therefore, long-term plans are needed to support programs, such as scholarships and the overseas training of medical students. In addition, support programs, such as training subsidies, foreign exchange, and public health and military doctor support policies are also necessary during residency. As the development of a new specialist takes time, another way to recruit obstetricians is to hire existing OB/GYNs. To do this, the government must create a support system to resolve the issues that concern OB/GYNs. First, a system to resolve medical disputes is necessary. To improve existing uncontrolled medical malpractice compensation, the government must create a full compensation budget for no-fault medical disputes, with an increase in compensation of up to 300 million won. Second, obstetricians who currently work at the hospital level or in higher level medical facilities may be employed doctors; 67.4% of OB/GYNs work in obstetric hospitals, and government support may not directly benefit them. Supportive regulations, such as night duty compensation for obstetricians and 24-hours rest after such duty, must be legislated as direct improvements [19]. Third, a policy to set an obstetric reimbursement fee from the national health insurance according to the number of newborns must be implemented so obstetric hospitals and clinics can continue to operate. In this era of low fertility, the number of newborns will continue to decline, and this will be a critical issue with regard to the operation of obstetric hospitals. To overcome these challenges, various new maternity-associated reimbursement fees must be added, and existing fees must be raised so that maternity hospitals may operate smoothly. Finally, a re-education system, such as a clinical medical personnel education center, could be provided to medical personnel with insufficient delivery experience.

Conclusions

When an era of low fertility began in Korea in the early 2000s, many obstetric hospitals and clinics in rural areas closed. Recently, obstetric hospitals in both rural and urban areas have been ceasing to operate. Only 541 maternity

health facilities were opened in 2019, a decrease of 60.5% compared to 2003. Obstetric hospital and clinic closures has had a negative influence on maternal and child health, leading to increases in maternal mortality and the rate of miscarriages in OUs.

Although the government has implemented various programs to resolve the problem of OUs, they face many difficulties for various reasons. In particular, the recruitment of obstetricians is the biggest difficulty in solving the issues of underserved areas.

It is important to recruit obstetricians to be in charge of childbirth during an era of low fertility. However, the recruitment of obstetricians is difficult because of reasons such as high labor intensity, medical lawsuits, and low compensation. Thus, the government should create a long-term comprehensive supportive plan for obstetricians to work in obstetric hospitals, taking into consideration their quality of life. This will contribute to safe childbirth and overcome the current low fertility rates in Korea.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Ethical approval

This study does not require approval of the Institutional Review Board because no patient data is contained in this article. The study was performed in accordance with the principles of the Declaration of Helsinki.

Patient consent

Written informed consent and the use of images from patients are not required for the publication.

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