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The Trend of cataract surgery most common in Koreans and the Occurrence risk factors in middle-aged and older Adults - Focused on National Health Service's Surgical Statistics in 2020 –

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Abstract

The purpose of this study is to investigate the incidence rate, surgery tendency, and risk factors of cataracts among the elderly in Korea. The subjects were 40-95 years old men and women using the National Health Services' surgical statistics. Among the 33 major surgeries, which increased by 1.1% per year for the last 20years (1.6 million), the most operated surgery in 2020 was cataract surgery (454,000), the number of which was 858.8 per 100,000 people. Among the surgical patients, cataract patients (7.9% increased) was the third largest among the top (2016-2020) constantly with annually 2.2% increasing for 20 years (19.95 million). The medical expenses of major surgeries (excluding non-benefit) increased by an average rate of 9.3% per year over the 20 years (7,204 billion won) out of a total medical expenses of 7.2 trillion won, and the cataract surgery (813.2 billion won) was the second largest among the medical expenses in 2020 (top 3). This study showed that there was a high correlation between cataract and smoking, low income, and low-educated, whereas being no concentration of cataract patient in tertiary hospitals.

Keywords: *Incidence Rate of Cataracts, Eye Disease, Tendency of Surgery Change, Risk Factor in Middle-Aged*

1. INTRODUCTION

Cataract, which refers to a disease that literally causes the lens of the eye to become white, is so named because the eyes of a person with cataract that should have been black looks white. As the original transparent lens of the eye becomes cloudy, the clear lens appears white [1].

The white cloudy patches are due to trauma to the eye. Naturally, when the lens of the eye is subjected to an external shock, the transparent and soft lens of the eye is damaged, resulting in opacity. Inflammation caused by other eye diseases might also cause damage to the lens. However, although the mechanism has not been clearly elucidated, the risk factors known to cause the lenticular opacity include diabetes, alcohol intake, sun exposure, smoking, steroid drug use, and senile cataracts that are the most common cause of cataracts. Literally, it develops gradually with age for no reason [2].

The proportion of the elderly population in Korea is aging at the fastest rate in the world due to the effects of improved health and nutrition along with the improvement in income level, following which, the proportion of the elderly population of 20.8% is predicted in 2026 [3], It is expected to enter a super-aged society [3]. An

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increase in the elderly population due to an aging is leading to an increase in interest in a healthy old age, and health problems of the elderly in an aging society have a direct impact on the quality of life. Among age-related health problems, eye abnormalities may lead to discomfort in all areas related to maintenance of daily life, social life, and information and media activities in modern society. People with visual impairment feel a sense of withdrawal and isolation in social relationships beyond their visual activities, which leads to a sense of hopelessness in life [4]. Cataract (47.8%) is the most common cause of irreversible blindness in the ophthalmic field worldwide, which is a disease in which the lens of the eye becomes cloudy, which causes visual impairment along with loss of vision [5]. Looking at the recently reported prevalence of cataract in Korea, the data analyzed for men and women over 40 showed a high prevalence of 40.2% [6]. This prevalence is considered to be a senile change that accompanies an increase in age, but besides age, not only lifestyles such as smoking and alcohol, but also socioeconomic factors such as education level and average monthly income, hypertension and diabetes have been reported as factors affecting the onset of cataracts [7].

Also, recently, it has been reported that even the components of metabolic syndrome, which are a combination of abdominal obesity and fasting blood sugar, are related to the onset of cataracts. It is known that the opacity of the lens of the eye is affected by various factors [8].

However, in Korean, the relationship between these related factors according to age and gender has not been published so far, so in this study, by analyzing the factors related to the trend of cataract surgery in middle-aged and elderly Koreans over 40 years who had health surveys and ophthalmic examinations from 2016 to 2020 among the surgical statistics of the National Health Service, it intends to be used as basic data for future epidemiological studies of cataract patients.

2. TARGET AND METHOD

The 2020 Statistical Yearbook of Major Surgery, which analyzed detailed data on the payment of health insurance and medical benefits in 2020 issued by the National Health Insurance Corporation, was used. No. 350004), The Annual Statistical Yearbook for Major Surgery in 2020 is nationally approved statistics (approval no. 350004) by the National Statistical Office according to Article 18 of the Statistical Act, and can be used as reference data in establishing health and medical policies among surgeries performed in Korea. As a result, this study analyzed the billing statements for inpatient treatment expenses of patients whose treatment date is in 2020.

The 33 major surgeries included 15 surgeries, such as cataract surgery, tonsillectomy, and coronary artery bypass surgery, collected by the OECD, and 18 surgeries for which the patient's medical expenses were high or the number of surgeries was increasing recently.

3. RESULT

The number of 33 major surgeries increased from 1.79 million cases in 2016 to 1.95 million cases in 2020, an annual average increase of 2.2% for 5 years, among the most frequent surgeries (top 15), the top 3 ranks were (1) partial mastectomy (16.1%) > (2) endoscopic and percutaneous biliary tract surgery (7.9). %) > (3) cataract surgery (7.9%) [9].

The number of surgeries per 100,000 people in 33 major surgeries increased from 3,431 cases in 2016 to 3,695 cases in 2020, an annual average increase of 1.9% over the past five years.

Looking at the number of surgeries per 100,000 people, (1) cataract surgeries - 1,329 cases > (2) cesarean section - 554 cases > (3) general spinal surgery - 356 cases, which was three times the number of other surgeries [9].

Table 1. Trend of increase/decrease in the number of frequent surgeries

(unit: case, %)

Division			2016	2017	2018	2019	2020	Average annual rate of change (2016-)
Rank.		Total (33 major surgeries)	1,798,585	1,840,989	1,870,385	1,996,261	1,953,665	2.2
Top	1	partial mastectomy	20,218	26,158	84,498	37,254	36,737	16.1
	2	endoscopic and percutaneous biliary tract surgery	42,885	45,949	51,146	54,498	58,091	7.9
	3	cataract surgery	518,663	549,471	592,191	689,919	702,621	7.9

Note) 1. Based on the average annual increase/decrease rate of the number of surgeries for 5 years from 2016 (3rd place at the top/bottom of the rate of change among the top 15 frequent surgeries)
2. Endos56copic lower pain surgery is excluded from the 2020 number of surgeries due to the EDI code change.

Table 2. The number of major surgeries per 100,000 people by year

(unit: case, %)

Division		2016	2017	2018	2019	2020	Average annual rate of change (2016-)
Rank.	Total (33 major surgeries)	4,925,116	5,278,660	5,894,767	6,702,970	7.020.379	9.3
1	general spine surgery	580,727	607,373	676,860	800,156	918.154	12.1
2	cataract surgery	494,448	531,789	608,123	716,732	813.176	13.2
3	stent implantation	501,030	579,970	640,765	697,586	707.805	9.0
4	knee replacement surgery	524,610	552,146	605,774	720,060	672.296	6.4
5	cholecystectomy	289,521	310,790	362,766	413,972	438.820	11.0
6	endoscopic and percutaneous biliary tract surgery	202,017	233,044	288,497	331,688	371.685	16.5
7	hepatic embolization	231,858	250,251	285,202	326,597	342.650	10.3

Note) 1. Ranking is based on surgery fees in 2020 (top 7)

In the medical expenses of major surgeries by year, and among the trend of medical expenses per case of 33 major surgeries, the medical expenses for 33 major surgeries (excluding non-benefits as items covered by health insurance and medical benefits) increased by 9.3% annually from 4.925.1 trillion won in 2016 to 7.204 trillion won in 2020.

In 2020, surgery with high medical expenses was (1) general spine surgery (918.2 billion won) > (2) cataract surgery (813.2 billion won), showing that cataract surgery also accounts for a high proportion.

Table 3. Trend of major surgery fees by year

(unit: one million won, %)

Division		2016	2017	2018	2019	2020	Average annual rate of change (2016-)
Rank.	Total (33 major surgeries)	4,925,116	5,278,660	5,894,767	6,702,970	7.020.379	9.3
1	general spine surgery	580,727	607,373	676,860	800,156	918.154	12.1
2	cataract surgery	494,448	531,789	608,123	716,732	813.176	13.2
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7	hepatic embolization	231,858	250,251	285,202	326,597	342.650	10.3

In terms of the medical expenses per surgery by year, the medical expense per major surgery increased by an average of 7.0% per year from 2.75 million won in 2016 to 3.59 million won in 2020, among which, the surgery with the lowest medical expense per case in 2020 was (1) hemorrhoid surgery (1.15 million won) > (2) cataract surgery (1.6 million won), showing that the cost compared to surgery did not decrease.

Table 4. Trend of medical expenses per surgery by year

(unit: One thousand won, %)

Division			2016	2017	2018	2019	2020	Average annual rate of change (2016-)
Rank.		Total (33 major surgeries)	5.9	5.8	5.8	5.6	5.4	-2.2
Top	1	knee replacement surgery	21.1	21.0	21.2	21.1	20.4	-0.8
	2	hip arthroplasty	20.4	19.6	20.0	19.7	18.6	-2.3
	3	skull base	20.4	18.5	19.6	17.0	17.6	-3.5
…								
Bot-tom	1	cataract surgery	1.2	1.2	1.2	1.1	1.1	-1.3
	2	varicose vein ligation and removal surgery	2.2	2.3	2.3	2.2	2.1	-1.8
	3	hemorrhoid surgery	2.8	2.8	2.7	2.7	2.6	-2.0

Note) 1. Medical expense per surgery = medical expenses / number of surgeries
2. Ranking is based on medical expenses per surgery in 2020 (3rd place at top/bottom)

In terms of the medical expenses per surgery by year, the number of hospitalization days per surgery has been on a steady decline every year, with an average annual decline of 2.2% since 2016,

In 2020, surgery with the shortest hospitalization days per case was (1) cataract surgery (1.1 days) > (2)

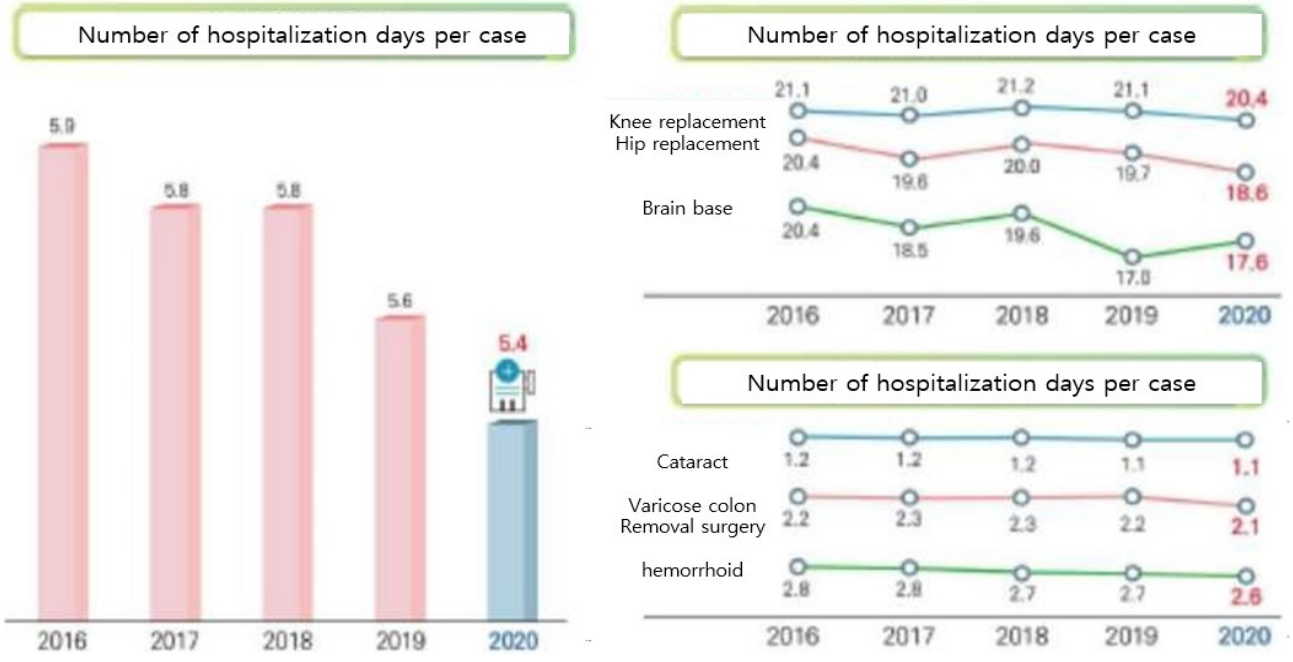
varicose vein ligation and removal surgery (2.1 days) > (3) hemorrhoid surgery (2.6 days). indicating that patients were discharged from the hospital on the same day or the next day.

Table 5. The number of hospitalization days per surgery by year

(unit: day,%)

Division			2016	2017	2018	2019	2020	Average annual rate of change (2016-)
Rank.		Total (33 major surgeries)	2,746	2,867	3,152	3,358	3,593	7.0
Top	1	coronary artery bypass surgery	26,567	27,377	29,981	32,390	33,298	5.8
	2	heart surgery	26,946	28,823	32,144	35,393	32,901	5.1
	3	skull base	14,750	14,754	17,132	17,453	19,598	7.4
…								
Bot-tom	1	hemorrhoid surgery	908	923	1,019	1,120	1,152	6.1
	2	cataract surgery	958	968	1,024	1,039	1,157	5.0
	3	varicose vein ligation and removal surgery	1,058	1,163	1,222	1,297	1,368	6.6

Note) 1. Number of hospitalization days per surgery = Number of hospitalization days / Number of surgeries
2. Ranking is based on medical expenses per surgery in 2020 (3rd place at top/bottom)



In the status of the top 5 surgeries by age in 2020, the surgery, which had the highest number of surgeries, showed significant differences by age group. For those under 9 years of age, the number of tonsillectomy, inguinal and femoral hernia surgery, and laminar resection was higher, and for teenagers, laminar resection, tonsillectomy, and hemorrhoid surgery were followed in that order. In their 20s and 30s, cesarean section, hemorrhoid surgery, and appendectomy were followed in that order. In their 40s, hemorrhoid surgery was the most common, followed by cataract surgery.

Then, from the age of 50s, cataract surgery increased significantly, and after the age of 60s, cataract surgery was followed by musculoskeletal-related surgery (general spinal surgery, knee replacement surgery).

Table 6. trends in the number surgeries by age

(unit: number of people)

Div.	total	1st	2nd place	3rd place	4th place	5th place
Total	1,598,587	cataract surgery	general spine surgery	hemorrhoid surgery	cesarean section	cholecystectomy
Under 9 yrs. Old	19,041	454,068	178,854	167,522	145,878	84,048
		tonsillectomy	inguinal and femoral hernia surgery	appendecto-my	heart surgery	cleft lip and cleft palate surgery
		8,238	4,914	2,642	1,596	693
Teen-ager	28,439	appendecto-my	tonsillecto my	hemorrhoid surgery	endoscopic lower sinus surgery	general spine surgery
		10,282	5,055	2,540	1,483	818
20's	94,437	cesarean section	hemorrhoi d surgery	appendecto-my	tonsillectom y	induced resection
		26,142	24,184	12,325	8,039	5,866
30's	200,279	cesarean section	hemorrhoi d surgery	appendecto-my	cholecystect omy	general spine surgery
40's	175,697	107,597	31,482	12,616	10,314	6,178
		hemorrhoid surgery	cataract surgery	Hysterecto-my	cholecystect omy	general spine surgery
50's	267,348	37,070	19,942	17,427	15,399	13,805
		cataract surgery	hemorrhoi d surgery	general spine surgery	cholecystect omy	stent implantation
60's	353,585	90,834	36,874	27,236	17,707	12,364
		cataract surgery	general spine surgery	hemorrhoid surgery	knee replacement surgery	stent implantation
70's	318,828	148,255	45,149	24,103	22,137	20,183
		cataract surgery	general spine surgery	knee repl. surgery	stent implantation	cholecystectomy
Over 80	145,983	142,704	48,047	34,646	17,622	12,786
		cataract surgery	general spine surgery	hip arthroplasty	Endoscopic and percutaneous biliary tract surgery	stent implantation
		49,067	34,927	10,701	10,630	9,475

In terms of the share of the number of surgeries by type of nursing institution by year, out of 1.95 million major surgeries, it was followed by clinics with 768,000(39.3%), general hospitals with 420,000 (21.5%), hospitals with 398,000 (20.4%), and tertiary hospitals with 368,000 (18.8%).

The average annual increase/decrease rate of the market share by type of medical care institution over the past five years was in the order of clinics (2.7%), general hospitals (-0.4%), hospitals (-2.0%), and tertiary hospitals (-2.3%).

Table 7. Excluding dental clinics, health institutions, and oriental medicine hospitals

(unit: case, %)

Division	Total (33 major surgery)	Tertiary hosp.	Share	General hosp.	Share	Hosp.	Share	Clinic	Share
2016	1,793,535	370,689	20.7	390,395	21.8	397,024	22.1	635.180	35.4
2017	1,840,989	380,964	207.	405,531	22.0	407,457	22.1	646.674	35.1
2018	1,870,385	385,296	20.6	409,504	21.9	401,422	21.5	673.808	36.0
2019	1,996,261	396,938	19.9	435,875	21.8	409,975	20.5	753.208	37.7
2020	1,953,665	367,976	18.8	419,733	21.5	397,738	20.4	767.963	39.3
Aver. annual rate of change (2016-)	2.2	-0.2	-2.3	1.8	-0.4	0.0	-2.0	4.9	2.7

Excluding cataract surgery, which ranks first in the total number of surgeries in the number of frequent surgeries (top 5) in 2020 by type of medical care institution, endoscopic and percutaneous biliary tract surgery (35,000 cases) and cholecystectomy (29,000 cases), stenting (29,000 cases).

hemorrhoids surgery (113,000 cases), cesarean section (48,000 cases), and endoscopic sinus surgery (12,000 cases) were shown to be widely implemented, indicating a difference according to the type of medical care institution.

Table 8. Excluding dental clinics, health institutions, oriental medicine hospitals

(unit: case)

Rank.	Total (33 major surgeries)	Tertiary hosp.	Gen. hosp.	Hospital	Clinic
1	cataract surgery	cataract surgery	appendectomy	general spine surgery	cataract surgery
	702,621	46,064	55,595	110,971	548,054
2	general spine surgery	endoscopic and percutaneous biliary tract surgery	cholecystectomy	cesarean section	hemorrhoid surgery
	188,394	35,310	49,831	70,228	113,483
3	hemorrhoid surgery	cholecystectomy	general spine surgery	cataract surgery	cesarean section
	169,669	28,952	48,153	68,832	47,663
4	cesarean section	stent implantation	cataract surgery	hemorrhoid surgery	endoscopic lower sinus surgery
	146,427	28,707	39,599	45,905	12,078
5	cholecystectomy	Hepatic embolization	Stent implantation	knee replacement surgery	varicose vein ligation and removal surgery
	86,274	27,270	37,994	39,336	10,018

4. REVIEW

The total number of cataract surgeries in this study was 454,056 as of 2020, which was the number one, and the number of surgeries per 100,000 people also increased from 848 in 2013 to 1127 in 2018, and then to 1329 in 2020. In particular, in the case of surgeries with the highest annual average growth rate (2016-2020) among the most frequent surgeries in Korea (top 15), cataract surgery had the third highest rate, with partial mastectomy (16.1%↑), endoscopic and percutaneous biliary tract surgery (7.9%↑), and cataract surgery (7.9%↑) showing the highest increase rate. This rate of increase is very high, and cataracts in the elderly population account for as many as 50% of all eye diseases [10]. Cataract, which has such a high prevalence, is also known to increase every year as other related factors act together in addition to age. The related risk factors for cataracts identified so far include smoking and drinking [6], socioeconomic factors [7], obesity [11], metabolic syndrome [12], and outdoor activities [13]. In Korea, the relationship between household income level as a socioeconomic factor and cataracts was recently suggested [14]. However, in Korea, gender and age-related factors have not been suggested yet, and it has been reported that there are differences by race in the form of cataract occurrence [15]. It can be seen that the Korean adults in this study are also the target of the onset getting younger.

In addition, cataract surgery accounted for the second largest amount of medical expenses (top 2) in 2020 in terms of major surgical fees (excluding non-benefit). appearing found that general spine surgery (918.2 billion won) and cataract surgery (813.2 billion won) have been consuming the imminent amount of 1 trillion won. This increase in surgery fees leads to a burden on all households. An aging and an increase in the population due to the development of modern medicine and improved health and nutrition lead to an increase in the prevalence of cataracts, which in turn leads to an increase in medical expenses. If a factor that might suppress the occurrence of cataracts is discovered, it is estimated that the currently performed cataract surgery would be reduced by about 45% [16]. Therefore, preventive studies related to the onset of cataracts in a qualitative aspect will bring very important meaning.

For patients with major surgeries by age group, cataract surgery is the number one surgery for each age group and for those in their 50s or older, suggesting that the senile cataract is the biggest cause of cataracts, whose prevalence increases with age after middle-aged people.

In other words, it is known that the prevalence of cataracts reaches 80% in the 60s and 70s, starting from the 40s and increasing significantly over the age of 50. So, why does the lens of the eye become cloudy with age? Unfortunately, only several hypotheses have been reported so far, and the exact mechanism has not been elucidated. One of the hypotheses is that the proteins that make up the lens of the eye break down with age, and in the process of regrouping together, large protein masses are formed, resulting in opacity. [5]

Among the total 33 surgeries among the most frequent surgeries (top 3) by type of medical care institution, cataract surgery took the lead, with over 700,000 surgeries. In other words, cataract surgery (702,621 cases), general spinal surgery (188,394 cases), hemorrhoid surgery (169,669 cases), cataract surgery (46,064 cases), endoscopic and percutaneous biliary tract surgery (35,310 cases), and cholecystectomy in tertiary hospital-level frequent surgery (28,952 cases), cataract surgery is the highest, and in hospital-grade frequent surgery, general spine surgery (110,971 cases), caesarean section (70,228 cases), and cataract surgery (68,832 cases) rank third, and cataract surgery (548,054 cases), hemorrhoid surgery (11 3,483 cases), and cesarean section (47,663 cases) took the overwhelming first place.

In view of the above, the related factors of cataract are highly related to smokers, low income, and low educated. In addition, although gender and age were adjusted, other related factors according to gender and age could not be found. Another domestic result suggests a relationship between cataract and metabolic syndrome. Metabolic syndrome is also linked with a combination of abdominal obesity, dyslipidemia, impaired

fasting blood sugar, high blood pressure, and hypertriglyceridemia, which are chronic diseases that are increasing recently. Also, according to the results of Park et al., the higher the number of components of the metabolic syndrome, the higher the risk of cataract development, but only subjects aged 65-94 years (average 68.9 years) were included here. As such, in this study, the factors related to the onset of cataracts in the middle-aged (ages 40 to 64) and the elderly (ages 65 to 94) among men and women were affecting all groups in general, and the specific related factors were derived in each group, demonstrating meaningful results.

5. CONCLUSION

In conclusion, the number of cataract surgeries increased at an average annual rate of 5.9% during the 8 years of period from 2013 to 2020, and the number of surgeries per 100,000 among patients undergoing surgery showed an increasing trend among those in their 40s, 40s, 50s, and 60s together with a phenomenon of patient concentration, however, there was no concentration of cataract patients to tertiary hospitals nationwide.

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